The Professional seals and signatures affixed hereon indicate the professionals’ review and participation in the preparation of the Contract Specifications.

John Coad
Section: 01 46 01
Divisions: 21, 22, 23

Monica Moravec
Sections: 01 57 13, 01 57 19, 01 57 24, 01 71 23, 01 74 00, 31 11 00, 31 20 00, 31 23 19, 31 23 33, 32 11 23, 32 12 16, 32 13 13, 32 16 13, 32 31 13, 33 01 00, 33 11 00, 33 30 00, 33 40 00, 33 46 00

Rick Smith
Sections: 01 57 15, 31 09 00

Steve Dekleva
Division 02
Keith Abey
Sections: 03 11 00, 03 15 13,
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Bruce Erickson
Sections: 03 05 15, 03 15 00,
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David Hewitt
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John Nesholm
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PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. The Work to be performed under this Contract, including furnishing all tools, equipment, materials, supplies, and manufactured articles; furnishing all labor, transportation, and services, including fuel, power, water, and essential communications.

2. Provision of all work, materials, and services not expressly indicated in the Contract Documents which may be necessary for the complete and proper construction of the Work and administration of the Contract.

B. [Related Sections]

1. Section 01 12 16, Work Sequence: For additional Constraints on Construction.

1.02 WORK OF THIS CONTRACT

A. The Work of this Contract consists of:

1. The civil and architectural finishes work for the Brooklyn Station and entrances, including mechanical and electrical elements, and surface features. The work includes all station structures, including: cast-in-place and precast concrete, station vertical circulation, mechanical, electrical, lighting, signage, and landscaping.

2. The following is a breakdown of the activities foreseen:

a. Prepare and install exterior walls, including waterproofing membrane.

b. Install internal walls – basement level.

c. Install basement slab.

d. Install internal walls – mezzanine level.

e. Install station mechanical, electrical and plumbing.

f. Install mezzanine slab.

g. Install internal walls – upper level.

h. Install roof slab.

i. Install above-grade structures.
j. Carry out site finishing works and landscaping including elevators/escalators, pedestrian/bike/van/bus access, finished site grading, landscaping and site restoration for the Roosevelt Station Site.

3. This work is scheduled for construction as follows:
   b. Scheduled Substantial Completion Date: 2nd quarter 2020.

B. The above description is not intended to be complete. The Work to be completed is provided for in the Contract Documents. The listing in Article 1.02A herein is not intended to relieve the Contractor of the responsibility for reading and understanding the Contract Documents.

C. Contract Completion Time
   1. Achieve Substantial Completion within 960 Days from the date of Notice to Proceed.

1.03 DAYS/HOURS OF WORK

A. Conform to requirements of applicable jurisdictions regarding limitations on work hours.

B. Unless otherwise approved in writing by the Resident Engineer, the following maximum work hours have been established. Obtain all necessary permits and approvals to work outside of these hours. The hours of work require all other Specifications to be met:
   1. Project Site:
      a. Weekdays: [__] am to [__] pm.
      b. Weekends: [___] am to [___] pm.
      c. For restrictions on traffic and special events relating to hauling, see Section 01 55 00 - Vehicular Access and Parking, Section 01 55 26 - Traffic Control, and Contract Drawings.

C. For planned work shifts outside the established work day during the established work week, give the Resident Engineer 48 hours advance notice.

D. Holidays: When coordinating with Sound Transit and Project Stakeholders, note that the following recognized holidays:
   1. New Year’s Day, Martin Luther King Jr.’s Birthday, Presidents’ Day (Third Monday in February), Memorial Day, Fourth of July, Labor Day, Veterans’ Day (Eleventh day of November), Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day. In the event a holiday falls on Sunday, the following day, Monday, shall be observed as such holiday. In the event a holiday falls on Saturday, the preceding day, Friday, shall be observed as such holiday. Monday holidays shall be honored in keeping with Federal law.

E. The schedule shall comply with the additional construction constraints contained elsewhere in the Contract Documents

1.04 CONSTRAINTS ON CONSTRUCTION

A. Noise Constraints:
1. If noise from Work outside of the work hours stated in Section 01 11 00, Summary of Work, is conducted outside the limits of the designated construction staging areas is anticipated to exceed the local noise ordinance, obtain a noise ordinance variance and comply with its requirements.

2. Be aware of local jurisdiction's noise ordinance. Review the Ordinance with respect to the anticipated Work to ensure that the noise limitations imposed are not exceeded.

3. [Sound Transit has applied for a Technical Variance to allow for certain construction activities and the operation of construction equipment to proceed 24 hours per day and 7 days per week within the limits of the construction staging areas. When approved by the local authority having jurisdiction, incorporate the Nighttime Construction Noise Variance Application into the Contract.]

1.05 WORK UNDER OTHER SOUND TRANSIT CONTRACTS OR BY SOUND TRANSIT STAFF

A. Contract N125 consists of utility relocations at Brooklyn and Roosevelt Stations and North Portal sites, excavation and support of Brooklyn and Roosevelt Station box and North Portal excavations, and bored tunnels from North Portal to UW Station including tunnel structures, inverts, raceways, walkway, cross-passages and tunnel mechanical and electrical installations.

1. This work is scheduled for construction as follows:
   a. Start date: 3rd quarter 2013.
   b. Completion date: 1st quarter 2018.

B. Contract N180 consists of the furnishing and installation of all trackwork (ballasted and direct fixation types) and special trackwork, including high strength straight rail, concrete crossties, high resilient direct fixation fasteners, concrete for cast-in-place plinths, and floating track slab with noise/vibration damping elements for the UW and designated properties, and all other pertinent materials to furnish an acceptable track system.

1. This work is scheduled for construction as follows:
   a. Start date: 3rd quarter 2015.
   b. Completion date: 1st quarter 2019.

1.06 SPECIFICATION LANGUAGE

A. Contract Specifications are written mostly in imperative and streamlined form. Unless indicated otherwise, this imperative language is directed to the Contractor. Additionally, the words "shall be" shall be included by inference where a colon (:) is used within sentences or phrases.

1. Examples:
   b. Adhesive: Spread with notched trowel.

B. Related Sections: Individual Contract Specification Sections may include an Article entitled "Related Sections". Contract Specification Sections are listed within the Article to assist the Contractor in locating certain but not all related work. The list is not to be considered all inclusive. All Contract Specifications are required to complete the work.
C. Whenever there is wording stating that an item is “as specified”, “as indicated”, or “as shown”, the reference is to all Contract Specifications and all Contract Drawings in the Contract Documents. Stating “as specified”, “as indicated”, or “as shown” does not refer necessarily to a Contract Drawing or Contract Specification, but it refers to either.

D. The words “Provide” and “Furnish” shall mean supplying, installing, and incorporating into the Work including all labor, materials, supplies, and equipment including testing and commissioning necessary to do so. The word “Supply” shall mean to acquire, deliver, and transfer the item to Sound Transit as specified.

E. Unless otherwise indicated, all materials and equipment incorporated into the Work shall be as specified and shall be new.

F. Federal, State, and Local Laws: Statutes and Regulations are not individually referenced. This provision incorporates by reference the latest version of statutes, laws and regulations. In case of conflict between the requirements of the Contract Specifications and requirements of the statutes and regulations, the Contractor shall bring them to the attention of the Resident Engineer. Lacking a specific response, the more stringent shall control. In no case can this Contract Specification be interpreted to override statutes and regulations of governing authorities.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01 12 16

WORK SEQUENCE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for completion time, work sequence, constraints, hours of work, and liquidated damages.

B. Schedule and conduct all work in a manner consistent with the Contract, and comply with the construction schedule, the specific work sequence, Contract milestones, and constraints of the work as specified.

C. Plan the sequence of construction to accommodate all Contract requirements.

D. Related Sections:
   1. Section 01 11 00, Summary of Work: For Days/Hours of Work and Constraints on Construction.
   2. Section 01 12 19, Contract Interface.
   3. Section 01 41 26, Permits.
   4. Section 01 55 00, Vehicular Access and Parking.
   5. Section 01 55 26, Traffic Control.
   6. Section 01 57 15, Temporary Construction Noise and Vibration Control.
   7. Section 01 57 19, Temporary Environmental Controls.

1.02 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Construction Staging Plan: Within 30 Days of Notice to Proceed (NTP).

1.03 DEFINITIONS

A. Site Access at Brooklyn: Written notice issued by Sound Transit establishing the date on which the Contractor may commence mobilization, including delivery of equipment and materials and construction of the Work on the Brooklyn Station site.

1.04 CONSTRUCTION STAGING PLAN

A. For the Brooklyn Station Site, construction activities and use of the property shall be in accordance with the Milestones and Constraints listed in Article 1.08 and Article 1.09 respectively herein and in accordance with Exhibit 1, Site Access Plan.
B. Prepare a Construction Staging Plan describing the work area boundaries and utilization of the space within the work area for the Brooklyn Station Site during all phases of the N140 Contract. Include expected start dates and end dates for each phase.

1.05 START TIMES

A. Notice to Proceed (NTP) will be issued shortly after the Notice of Award.
   1. This will authorize commencement of all Contract Work except that work requiring Site Access at Brooklyn.
   2. Specifically included in this authorization are planning, submittals, scheduling, and other administrative activities.
   3. The NTP will be the start date for all Contract milestones, time-based incentives, and substantial completion dates established herein.

B. Site Access at Brooklyn may not proceed until authorized by the Resident Engineer in accordance with the Contract Provisions.
   1. Authorization of Site Access at Brooklyn will allow mobilization of equipment, materials and other elements to the Brooklyn site.

1.06 WORK SEQUENCE

A. Prior to Site Access: activities will be limited to those described in Article 1.05 A.

B. Construction activities will be scheduled in accordance with the availability of areas described in Article 1.04, Construction Staging Plan and Article 1.09, Constraints.

C. Major construction activities include:
   1. Mobilization at Brooklyn Station.
   2. Completion of Brooklyn Station concrete and finishes.
   3. Construction of Brooklyn Station entrances and accesses.
   4. Installation and testing of all electrical and mechanical equipment.
   5. All site restoration works.
   6. Completion of all Punch List items.
   7. De-mobilization.

1.07 COMPLETION_TIMES

A. Complete the work within 960 Days after the effective date of NTP in accordance with the General Conditions. Work complete by this time shall include:
   1. Substantial completion of all Work.
   2. Demobilization from the Brooklyn Station Site.

B. Achieve acceptance within the specified time stated in the Certificate of Substantial Completion as required.
C. Post Substantial Completion Site Services and Support will include fitting of permanent tunnel sump pumps (yet to be finalized), providing attendance and support of System-wide Contractors during systems testing and commissioning, attendance and participation in the System-wide integrated testing and commissioning, and pre-revenue testing. Intermittently run and provide periodic verification of mechanical and electrical systems during these time periods. This Phase ends with Milestone 4.

1.08 CONTRACT MILESTONES

A. Milestone 1: Completion of all work necessary to achieve Basic Structure Completion of the Brooklyn Station, excluding the pedestrian subway and west entrance structure, per Sections 01 12 19 and 01 32 13 for handover of the trainways, as defined in Exhibit 3, to the N180 Contractor no later than 372 Days after receiving the final Site Access at Brooklyn per Section 1.06 Work Sequence.

B. Milestone 2: Completion of all work necessary to achieve Room Access Completion for all system rooms in the Brooklyn Station per Exhibit 2 for use by System-wide Contractors per Sections 01 12 19 and 01 32 13 no later than TBD Days after receiving the final Site Access at Brooklyn per Section 1.06 Work Sequence.

C. Milestone 3: Substantial Completion of all Work excluding Site Services and Support no later than 960 Days after receiving the final Site Access at Brooklyn per Section 1.06 Work Sequence. Complete all work associated with this Milestone which includes:

   1. Completion of surface restoration at Brooklyn Station and demobilization other than is necessary to provide Site Services and Support.

D. Milestone 4: Acceptance of all Work inclusive of completion of Site Services and Support:

   1. Achieve Milestone 4 in accordance with the Contract Documents

1.09 CONSTRAINTS

A. Traffic Control and Vehicular Access and Parking around the N150 site: Section 01 55 26, Traffic Control, and Section 01 55 00, Vehicular Access and Parking.

B. Brooklyn environmental considerations: Section 01 57 19, Temporary Environmental Controls.

C. Interfaces with N125, N180 and N830: Section 01 12 19, Contract Interface.

D. The Station Box internal bracing design shown as part of N125 providing temporary support of excavation requires that the construction of the station box be completed up through the top of the station roof before excavation of the pedestrian concourse commences. If simultaneous excavation of the pedestrian concourse directly adjacent to the Station Box is planned, the pedestrian concourse shoring system shall be designed to accommodate the bracing loads from the Station Box. Reference drawing N14-SM026 for more detailed information.

E. Site Access at Brooklyn Station will be available no earlier than November 14, 2017.

F. Permanent station 26kV power from N125 will be complete and available no later than TBD Days after receiving the final Site Access at Brooklyn per Section 1.06 Work Sequence.
G. Closure of temporary openings as defined in the Coordinated Installation Program (CIP) shall remain open for use by System-wide Contractors and closed no earlier TBD Days after receiving the final Site Access at Brooklyn per Section 1.06 Work Sequence.

H. Coordinate with the System-wide Contractors between Milestone 2 and through Milestone 3. Coordinate handover of all completed rooms in accordance with the Coordinated Installation Program no later than the date established in Article 1.08 herein.

I. Commissioning of the tunnel ventilation system must be complete by the date established for Milestone 3.

1.10 HOURS/DAYS OF WORK AND ASSOCIATED CONSTRAINTS

A. The Contractor’s attention is directed to the City of Seattle Noise Ordinance. The Contractor shall review the Ordinance with respect to the anticipated Work to ensure that the noise limitations imposed are not exceeded.

B. If noise from Work outside of the above hours conducted outside the limits of the designated construction staging areas is anticipated to exceed the City of Seattle Noise Ordinance, the Contractor shall obtain a noise ordinance variance from the City of Seattle and comply with its requirements. The Contractor’s attention is directed to the City of Seattle Street Use Division at (206) 684-5253, for noise ordinance variance limitations and application procedures.

C. Unless otherwise approved in writing by the Resident Engineer, the following maximum work hours have been established. The Contractor shall obtain all necessary permits and approvals to work outside of these hours. The hours of work require all other Specifications to be met:

1. Brooklyn Station Site:
   a. Weekdays: 7 am to 10 pm.
   b. Weekends: 9 am to 10 pm.
   c. For restrictions on traffic and special events relating to hauling, see Section 01 55 00, Vehicular Access and Parking, and Contract Drawings.

2. For planned work shifts outside the planned work day during the planned work week, the Contractor shall give the Resident Engineer 48 hours advance notice.

D. When coordinating with Sound Transit and Project Stakeholders, the Contractor shall note that the following are Sound Transit recognized holidays:

1. New Year’s Day, Martin Luther King Jr.’s Birthday, Presidents’ Day (Third Monday in February), Memorial Day, Fourth of July, Labor Day, Veterans’ Day (Eleventh day of November), Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day. In the event a holiday falls on Sunday, the following day, Monday, shall be observed as such holiday. In the event a holiday falls on Saturday, the preceding day, Friday, shall be observed as such holiday. Monday holidays shall be honored in keeping with Federal law.

E. The Contractor’s schedule shall comply with the additional construction constraints contained elsewhere in the Contract Documents.
1.11 LIQUIDATED DAMAGES

A. Liquidated Damages for failure to achieve Milestone 1 by the date established in Article 1.08.A herein shall be as follows:
   1. $5,000 per Day.

B. Liquidated Damages for failure to achieve Milestone 2 by the date established in Article 1.08.B herein shall be as follows:
   1. $10,000 per Day.

C. Liquidated Damages for failure to achieve Milestone 3 by the date established in Article 1.08.C herein shall be as follows:
   1. $10,000 per Day.

D. Liquidated Damages for failure to achieve Substantial Completion of all Work excluding Site Services and Support by the date established in Article 1.08.D herein shall be as follows:
   1. $15,000 per Day.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
EXHIBIT 1 – SITE ACCESS PLAN (TBD)
EXHIBIT 2 – N150 SYSTEM ROOMS (TBD)
PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies the conditions of the Brooklyn Site at specified times related to coordination required with other work on the site.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the Work required by the Contract Documents.

1. Section 01 12 16, Work Sequence.
2. Section 01 31 14, Coordination with Others.
3. Section 01 50 00, Temporary Facilities and Controls.
4. Section 01 57 13, Temporary Erosion and Sediment Control.
5. Section 01 57 24, Temporary Site Water Discharge.
6. Section 01 77 00, Closeout Procedures.
7. Section 01 78 39, Project Record Documents

1.02 DEFINITIONS

A. Working Interface: Two or more contractors working in the same site area at the same time that requires close coordination between the contractors.

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.
B. Letter of Agreement.
C. Warranty and Certification.
D. Record Drawings.
E. As-built Drawings of Contract N140.

1.04 GENERAL

A. To reach Substantial Completion, the Contractor is required to complete all work as required by the Contract.

B. The Contractor can meet with the Resident Engineer and Sound Transit and agree that Sound Transit will take responsibility for some of the Contractor's Temporary Close-Out
requirements in meeting Substantial Completion. Temporary Close-Out requirements are those Milestone requirements that relate only to the completion or removal of temporary items, including, but not limited to, erosion control items, demolition of existing facilities, construction fencing, construction lighting, temporary construction offices, temporary utility connections, and temporary paving. Temporary Close-Out requirements do not include Record Documents or any portion of permanent facilities indicated as completed in the Contract Documents.

C. If the Contractor proposes any modifications to the Close-Out requirements listed in Section 01 77 00, Closeout Procedures, a written agreement (Letter of Agreement) between the Contractor and Sound Transit on the specific Site of the Milestone, may be accepted by the Resident Engineer as part of support for Substantial Completion of the Milestone.

1. Details and requirements of the Letter of Agreement related to the Work shall be at no cost to Sound Transit.

2. Submit signed Letter of Agreement to the Resident Engineer in support of acceptability of identified parts of Milestones with the request for Substantial Completion of Milestone.

3. In the transitioning of the Sites to Sound Transit, coordinate, cooperate, and work with the Resident Engineer during the transition of the Sites in support of the Milestones.

D. Geotechnical Instrumentation System

1. Geotechnical instrumentation system, including measuring instruments (both permanent installations and temporary installations), data acquisition systems, and data loggers shall be handed over to the Resident Engineer at the Substantial Completion date.

2. Data Acquisition
   a. Provide data loggers and data acquisition system, including software and user manuals.

3. Data Format
   a. Provide all data acquired during the course of the work in an electronic format, capable of being opened by MS Excel.

1.05 WARRANTY

A. Warrant that the Work being turned over meets the requirements of the Contract and all regulatory requirements.

B. In the event that subsequent inspection discovers latent defects in the Work, make repairs as directed.

1.06 RECORD DRAWINGS OF EXISTING FACILITIES AT TURNOVER MILESTONES

A. Format and Procedures: In accordance with Section 01 78 39, Project Record Documents.
1.07 CONDITIONS ON THE __________ SITE UPON HANDOVER FROM __________

A. The following Articles B. through J represent the site conditions and items which the __________ Contractor will assume responsibility for after the transfer from the __________ Contractor upon Site Access.

B. Construction power:
   1. __________ will handover temporary construction power service per the Contract Documents.
   2. See Section 01 51 15 Temporary Electrical Power.

C. Construction water service:
   1. __________ will provide sub-metering for temporary construction water service per the Contract Documents.
   2. See Section 01 50 00, Temporary Facilities Controls.

D. Fire water service:
   1. __________ will handover access for temporary construction fire water service per the Contract Documents.

E. City water service:
   1. Be responsible for providing the service connection for temporary city water service supply as required.

F. Construction sanitary sewer:
   1. __________ will provide access to piping and special connections for temporary construction sanitary sewer service per the Contract Documents.
   2. See Section 01 50 00, Temporary Facilities Controls.

G. Construction telephone and Internet services:
   1. Be responsible for providing telephone and Internet services as required.

H. Construction lighting:
   1. __________ will handover temporary perimeter site lighting facilities per the Contract Documents.
   2. See Section 01 50 00, Temporary Facilities and Controls.

I. Site access and security:
   1. __________ will handover existing perimeter construction fencing, gates and noise walls per the Contract Documents.
   2. See Section 01 50 00, Temporary Facilities and Controls.

J. Site grading and asphalt condition:
   1. __________ will handover existing site grading and asphalt surfacing.
K. Wheel wash:
   1. Be responsible for providing, operating and maintaining a wheel wash as required.

L. Erosion control system per the Contract Documents section 01 57 13 Temporary Erosion and Sediment Control.
   1. [_____] will handover the temporary erosion and sediment control (TESC) system facilities per the Contract Documents.

M. Dewatering and process water treatment system:
   1. Be responsible for maintaining the dewatering and process water treatment system facilities on site and as coordinated with the N125 Contractor.

N. Geotechnical instrumentation system:
   1. Will be provided per the Contract Documents. Be responsible for the geotechnical instrumentation system, including measuring instruments (both permanent installations and temporary installations), data acquisition systems, and data loggers.

O. Maintenance of Traffic-Road closure and detours:
   1. Be responsible for the closure of NE 43rd Street between Brooklyn Avenue NE and 12th Avenue NE.

P. Site Contractor’s office and parking:
   1. Be responsible for providing office and parking facilities on site as required.

1.08 CONDITIONS REQUIRED AT THE BROOKLYN STATION SITE FOR INTERFACE WITH THE SYSTEM-WIDE CONTRACTORS THROUGH THE COORDINATED INSTALLATION PROGRAM TIME PERIOD.

A. Site area
   1. Site area as defined in the Contract Documents.

B. Hoisting facilities
   1. Coordinate with System-wide Contractors.

C. Personnel access
   1. Be responsible to provide stairway and/or service elevator for tunnel access North and South from Brooklyn Station.

D. Delivery Access
   1. Coordinate with the System-wide Contractors for major equipment and material delivery including delivery of concrete and of the floating track slabs to the tunnels.

E. Temporary power
   1. Be responsible to maintain sub-meters for temporary power for ventilation, lights, and other requirements within the tunnels for the System-wide Contractors.
F. Temporary tunnel water discharge
   1. Coordinate with System-wide Contractors and agree on discharge water requirements. Provide discharge treatment as agreed.

G. Temporary tunnel ventilation
   1. Coordinate with the System-wide Contractors and agree on ventilation routes and modifications as required and coordination of switchover from temporary to permanent tunnel ventilation.

H. Tunnel access
   1. Be responsible to provide access to tunnels for the System-wide Contractors personnel.

I. Station construction power and water service
   1. Provided to the System-wide Contractors as part of the Coordinated Installation Program

J. Construction sanitary sewer
   1. Do not provide.

K. Construction telephone and Internet services:
   1. Do not provide.

1.09 CONDITIONS REQUIRED TO ACHIEVE BASIC STRUCTURE COMPLETION

A. All structural works completed and area is clean, dry and weather proof. Substructures for entrances, head houses and vent shafts are to be completed to above grade level, and temporarily protected against weather.

B. Voids, utility ducts, cable shafts and basements completed and the area(s) clear of all obstructions, debris, and water.

C. All electrical grounding is installed and tested.

D. Partition walls completed, except for those to be completed following Contractor's and System-wide Contractors' plant and equipment deliveries.

E. Trenches, plinths, penetrations, access openings, grooves for concealed conduits, hold down anchors as per System-wide Contractor requirements completed.

F. Cast-in items installed.

G. All cast-in lifting facilities installed and tested.

H. Temporary openings for System-wide Contractors shall be available.

I. Temporary sump pumps and all pipe works including discharge pipe connections to surface in place.

J. Falsework, formwork and physical obstructions for all other temporary works related to the structure removed.
K. Temporary power supply outlet and hoisting shall be available for use by the System-wide Contractors.

1.10 CONDITIONS REQUIRED TO ACHIEVE BROOKLYN STATION ROOM ACCESS COMPLETION

A. Brooklyn Station Room Access Completion. This includes the following work for all rooms in the Brooklyn Station. These requirements are inclusive of cable chambers, passageways and corridors adjacent to these rooms and associated battery rooms should the batteries be housed in separate rooms:

1. Completion of the floor and wall finishes.
2. Structure clean, dry and weather proof.
3. Installation of temporary or permanent doors with locks(s).
4. Cast-in items installed including cable trays, support framing and items required for use by System-wide Contractors.
5. Trenches, plinths, penetrations, access openings, grooves for concealed conduits, hold down anchors for use by System-wide Contractors.
7. HVAC and lighting installed and functioning.
8. Testing of all cast-in lifting/pulling hooks.
9. All works including testing (with permanent power) except for integrated testing (done by System-wide Contractor per Coordinated Installation Program).

1.11 CONDITIONS REQUIRED AT BROOKLYN STATION SITE FOR SUBSTANTIAL COMPLETION OF THE WORK

A. Construction power:

1. Be responsible for removing all Contractor furnished temporary distribution equipment, cable and conduit.
2. Establish and test permanent power supply for the station equipment.

B. Construction water service:

1. Be responsible for removing service connection.
2. Establish and test permanent water supply for the station equipment.

C. Fire water service:

1. Be responsible for removing service connection for temporary construction supply.
2. Establish and test permanent fire water supply.

D. Construction sanitary sewer:

1. Be responsible for decommissioning and removing temporary construction sanitary sewer service.
2. Establish and test permanent sanitary sewer connections.

E. Construction telephone and Internet services:
   1. Be responsible for decommissioning service.

F. Construction lighting:
   1. Be responsible for removing temporary lighting facilities.
   2. Establish and test permanent power supply for lighting and other electrical equipment.

G. Site access and security:
   1. Be responsible for removing existing construction fencing, gates, and noise walls.

H. Site grading and asphalt condition:
   1. Be responsible for preparing and completing final site grading, landscaping, and hardscaping in accordance with the contract documents.

I. Wheel wash:
   1. Be responsible for decommissioning wheel wash(es).

J. Erosion control system:
   1. Be responsible for decommissioning and removing the temporary erosion and sediment control (TESC) system for the site.

K. Dewatering and process water treatment system:
   1. Be responsible for removing all facilities of the dewatering and process water treatment system for the site.
   2. Establish permanent dewatering system for the Station and complete connections to appropriate utility.

L. Site Contractor’s office and parking:
   1. Be responsible for removing all facilities of the office and parking at the site.

1.12 CONDITIONS PROVIDED AT THE [_____] SITE, CROSSOVER, AND TUNNELS SITE TO THE SYSTEM-WIDE CONTRACTORS DURING THE COORDINATED INSTALLATION PROGRAM TIME PERIOD

A. Site area
   1. Site area as defined in the Contract Documents.

B. Hoisting facilities and scaffolding platforms access
   1. Provided to the System-wide Contractors as part of the Coordinated Installation Program

C. Personnel access
1. Be responsible to provide stairway or service elevator to track way level for the System-wide Contractors.

D. Track way possession
   1. Be responsible to provide track way possessions in accordance with Section 01 12 16, Work Sequence.

E. Temporary power
   1. Be responsible to supply sub-meters for temporary power for ventilation, lights, and other requirements within the tunnels for the System-wide Contractors.

F. Temporary tunnel dewatering
   1. Coordinate with System-wide Contractors and agree on dewatering requirement.

G. Temporary tunnel ventilation
   1. Coordinate with the System-wide Contractors and agree on ventilation requirements, ventilation routes and coordination of switchover from temporary to permanent tunnel ventilation.

H. Running tunnel access
   1. Be responsible to provide access to tunnels for the System-wide Contractors in accordance with Section 01 12 16, Work Sequence.

I. Construction power and water service
   1. Provided to the System-wide Contractors as part of the Coordinated Installation Program

J. Construction sanitary sewer
   1. Provided to the System-wide Contractors as part of the Coordinated Installation Program

K. Construction telephone and Internet services:
   1. Do not provide.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 01 15 00
THIRD PARTY AGREEMENTS

PART 1 - GENERAL

1.01 SUMMARY
A. This Section includes specifications regarding third party agreements with the Washington State Department of Transportation and City of Seattle Department of Transportation.

1.02 DEFINITIONS
A. SDOT: City of Seattle Department of Transportation
B. WSDOT: Washington State Department of Transportation

1.03 THIRD PARTY AGREEMENTS
A. Sound Transit has executed an agreement with WSDOT, which grants permission to Sound Transit to construct tunnels within Interstate Route I-5 right-of-way. The requirements of this agreement, as related to the Contractor's responsibilities, are contained in the Contract Documents.
B. Sound Transit has executed an agreement with SDOT, which allows detours of local streets and restricts truck hauling operations. The requirements of this agreement, as related to the Contractor's responsibilities, are contained in the Contract Documents.
C. Sound Transit has not executed an agreement with the City of Seattle which allows a variance from its Noise Ordinance.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for measurement and payment as they apply to the Work, including provisions applicable to lump sum prices, unit prices and provisional sums.

1.02 MEASUREMENT AND PAYMENT OF PROVISIONAL SUMS

A. Items agreed upon during Pre-Construction Services as Provisional Sums will be measured and paid for as agreed upon. Payment will only be made for work that has been satisfactorily completed. The following items are currently identified Provisional Sums.

B. Unidentified Contaminated Soil and Water. (Note: these are not anticipated to be required, review subsequent to 60%)

1. The work of this item includes costs associated with Unidentified Contaminated Soil and Water not shown or specified in the Contract Documents.

2. Measurement: No separate measurement will be made for this item.

3. Payment: This item will be paid for in accordance with the General Conditions for Payment on a Time and Material Basis for work satisfactorily completed as approved by the Resident Engineer.

4. The estimated provisional sum for this item shall be $250,000.

C. Unidentified Utility Conflicts.

1. The work of this item includes costs associated with requirements of resolving unidentified utility conflicts.

2. Measurement: No separate measurement will be made for this item.

3. Payment: This item will be paid for in accordance with the General Conditions for Payment on a Time and Material Basis for work satisfactorily completed as approved by the Resident Engineer.

4. The estimated provisional sum for this item shall be $100,000.

D. Partnering Facilitator and Facilities.

1. The work of this item includes direct costs associated with the Partnering facilitator and facilities. This does not include costs for employees to attend Partnering sessions.

2. Measurement: No separate measurement will be made for this item.
3. Payment: This item will be paid for in accordance with the General Conditions for Payment on a Time and Material Basis for work satisfactorily completed as approved by the Resident Engineer.

4. The estimated provisional sum for this item shall be $50,000.

E. Contractor Acquired Permit Fees.
1. The work of this item includes direct permit fees associated with Contractor Acquired Permits.
2. Measurement: No separate measurement will be made for this item.
3. Payment: This item will be paid for in accordance with the General Conditions for Payment on a Time and Material Basis for work satisfactorily completed as approved by the Resident Engineer.
4. The estimated provisional sum for this item shall be $30,000.

F. Archaeological Investigations not specified in the Contract Documents. (Note: not anticipated to be required. To be reviewed post 60%)
1. The work of this item includes costs associated with supporting archeological investigations not specified in the Contract Documents, and as directed by the Resident Engineer.
2. Measurement: No separate measurement will be made for this item.
3. Payment: This item will be paid for in accordance with the General Conditions for Payment on a Time and Material Basis for work satisfactorily completed as approved by the Resident Engineer.
4. The estimated provisional sum for this item shall be $30,000.

G. Community Impact Mitigation not shown or specified in the Contract Documents.
1. The work of this item includes costs associated with additional community impact mitigation not shown or specified in the Contract Documents.
2. Measurement: No separate measurement will be made for this item.
3. Payment: This item will be paid for in accordance with the General Conditions for Payment on a Time and Material Basis for work satisfactorily completed as approved by the Resident Engineer.
4. The estimated provisional sum for this item shall be $200,000.

H. Reimbursement of Dual Benefits costs.
1. The work of this item includes costs associated with Dual Benefits reimbursement in accordance with the Labor Compliance Manual.
2. Measurement: No separate measurement will be made for this item.
3. Payment: This item will be paid for in accordance with the General Conditions. No Contractor markup shall be allowed on these costs.
4. The estimated provisional sum for this item shall be $200,000.

I. RE-Directed Unanticipated Traffic Control.
1. The work of this item includes costs associated with RE Directed Unanticipated Traffic Control
2. Measurement: No separate measurement will be made for this item
3. Payment: This item will be paid for in accordance with the General Conditions for Payment on a Time and Material Basis for work satisfactorily completed as authorized and approved by the Resident Engineer.
4. The estimated provisional sum for this item shall be $100,000.

J. RE-Directed Unanticipated TESC.

1. The work of this item includes costs associated with RE Directed Unanticipated TESC
2. Measurement: No separate measurement will be made for this item
3. Payment: This item will be paid for in accordance with the General Conditions for Payment on a Time and Material Basis for work satisfactorily completed as authorized and approved by the Resident Engineer.
4. The estimated provisional sum for this item shall be $200,000.

K. Reimbursement of Change Notice Work Directives (CN-WD).

1. The work of this item includes reimbursement of Change Notice Work Directives.
2. Measurement: No separate measurement will be made for this item. The work of this item includes costs associated with eligible work directives as directed by the Resident Engineer.
3. This item will be paid for in accordance with General Conditions for Payment on a Time and Material Basis for work satisfactorily completed as approved by the Resident Engineer.
4. The estimated provisional sum for this item shall be $100,000.

L. Reimbursement of Post-Substantial Completion Support Services.

1. The work of this item includes reimbursement of Change Notice Work Directives.
2. Measurement: No separate measurement will be made for this item. The work of this item includes costs associated with eligible work directives as directed by the Resident Engineer.
3. This item will be paid for in accordance with General Conditions for Payment on a Time and Material Basis for work satisfactorily completed as approved by the Resident Engineer.
4. The estimated provisional sum for this item shall be $200,000.

1.03 SUBMITTALS

A. Formats for Submittals

1. Hard Copy Formats
a. Schedule of Values: Medium 8-1/2 inches by 11 inches in size.

2. Electronic Copy Format
   a. Draft Schedule of Values, Final Schedule of Values and Revised Schedule of Values: Electronic file in Microsoft Excel format and in .PDF format.

B. Schedule of Values
   1. Schedule of Values: One (1) paper copy and two (2) electronic copies (.XLS and .PDF). Submit within 30 Days of the effective date of the Notice to Proceed.
   2. Revised Schedule of Values: One (1) paper copy and two (2) electronic copies (.XLS and .PDF). Submit as required.

C. Conform to the same requirements as the original submittals for all re-submittals.

1.04 SCHEDULE OF VALUES

A. Develop and use the Schedule of Values to provide an allocation for measurement and payment.

B. Develop the Schedule of Values to an appropriate level of detail to ensure accurate payment for the Work accomplished.

C. Obtain the agreement of the Resident Engineer on the Schedule of Values. No payment shall be made prior to an agreed upon Schedule of Values.

D. Include an updated version of the Schedule of Values with each progress payment request. Update the Schedule of Values to include:
   1. Dollars earned and percent complete for the current progress payment period.
   2. Dollars earned and percent complete to-date, excluding the current progress payment period.
   3. Total dollars earned and percent complete to-date.
   4. Total dollars remaining.

E. Ensure that:
   1. The total value of the line items in the Schedule of Values plus any approved Change Orders or authorized CN-WDs is equal to the current contract price.
   2. Activity values are rounded to the nearest hundred dollars.
   3. The value of stored material, as defined in the General Conditions, is identified in the Schedule of Values with both a material-purchase activity and a separate, corresponding cost-loaded installation activity in the Construction Schedule(s).

F. If required by the Resident Engineer, present documentation substantiating the cost allocations for line items within the Schedule of Values.
1.05 LUMP-SUM MEASUREMENT

A. Lump-sum measurement will be for the entire item, unit of Work, structure, or combination thereof, as specified and as indicated in the Contract Price Schedule.

1. If the Contractor requests progress payments for lump-sum items or amounts in the Contract Price Schedule, such progress payments will be made in accordance with a well-balanced, detailed program of payment-apportioning, prepared by the Contractor and submitted to the Resident Engineer for approval.

2. Each applicable lump-sum item shall show fixed definable and measurable quantities where possible and unit prices as developed and assigned by the Contractor to the different features of the Work and major subdivisions thereof. The summation of extensions of quantities and unit prices and related costs shall equal the amount of the lump sum contract price or lump sum item indicated in the Contract Price Schedule.

3. Following the Resident Engineer's approval, this price breakdown will be incorporated into the Schedule of Values, from which progress payments will be made in accordance with the General Conditions, reflecting the progress expressed in earned value that occurred during the payment period as approved by the Resident Engineer.

1.06 PROVISIONAL SUMS

A. Description: Provisional Sums, if specified in the Contract Documents and indicated in the Contract Price Schedule, are for work to be furnished, performed and completed for such sums as are acceptable to the Resident Engineer, and will include the cost to the Contractor of all materials and equipment to be delivered and installed under the specific provisional sum. The Provisional Sums specified in the Contract Specifications and indicated in the Contract Price Schedule are exclusive of Work indicated in the Contract Documents for which payment is included under other specifically designated items in the Contract Price Schedule.

B. Administration: Work under a Provisional Sum must be specifically authorized and any amount included in the Contract Price but not used in the course of the Work shall be returned to Sound Transit by way of deductive Change Order.

1.07 MEASUREMENT OF QUANTITIES FOR UNIT PRICES

A. Measurement Standards:

1. All Work to be paid for at a contract price per unit measurement, as indicated in the Contract Price Schedule, will be measured by the Resident Engineer in accordance with United States Standard Measures.

2. A ton shall consist of 2,000 pounds avoirdupois.

B. Measurement by Weight:

1. Reinforcing steel, steel shapes, castings, miscellaneous metal, metal fabrications, and similar items to be paid for by weight shall be measured by scale or by handbook weights for the type and quantity of material actually furnished and incorporated into the Work.

2. Unless shipped by rail, material to be measured and paid for by weight shall be weighed on sealed scales regularly inspected by the Washington State Department of Agriculture's Weights and Measures Section or its designated representative, furnished by and at the expense of the Contractor. All weighing,
measuring, and metering devices shall be suitable for the purpose intended and shall conform to the tolerances and specifications as outlined in Washington State Department of Transportation Standard Specifications, Division 1, General Requirements, Article 1-09.2, Weighing Equipment.

3. Provide or utilize platform scales of sufficient size and capacity to permit the entire vehicle or combination of vehicles to rest on the scale platform while being weighed. Combination vehicles may be weighed as separate units provided they are disconnected while being weighed. Scales shall be inspected and certified as often as the Resident Engineer may deem necessary to ascertain accuracy. Costs incurred as a result of regulating, adjusting, testing, inspecting, and certifying scales shall be borne by the Contractor.

4. A licensed weighmaster shall weigh all Contractor-furnished materials. The Resident Engineer may be present to witness the weighing and to check and compile the daily record of such scale weights. However, in any case, the Resident Engineer will require that the Contractor furnish weight slips and daily summary weigh sheets. In such cases, furnish a duplicate weight slip or a load slip for each vehicle weighed, and deliver the slip to the Resident Engineer at the point of delivery of the material.

5. If the material is shipped by rail, the certified car weights will be accepted, provided only actual weight of material will be paid for and not minimum car weights used for assessing freight tariff. Car weights will not be acceptable for material to be passed through mixing plants. Material to be measured by weight shall be weighed separately for each bid item under which it is to be paid.

6. Trucks used to haul material being paid for by weight shall be weighed empty daily and at such additional times as the Resident Engineer may require. Each truck shall bear a plainly legible identification mark. The Resident Engineer may require the weight of the material verified by weighing empty and loaded trucks on such other scales as the Resident Engineer may designate.

C. Measurement by Volume:

1. Measurement by volume will be by the cubic dimension indicated in the Contract Price Schedule. Method of volume measurement will be by the unit volume in place or removed as shown on the Contract Drawings or as specified.

2. When material is to be measured and paid for on a volume basis and it is impractical to determine the volume by the specified method of measurement, or when requested by the Contractor in writing and accepted by the Resident Engineer in writing, the material may be weighed in accordance with the requirements specified for weight measurement. Such weights will be converted to volume measurement for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Resident Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities will be accepted.

D. Measurement by Area: Measurement by area will be by the square dimension shown on the Contract Drawings or as specified. Method of square measurement will be as specified.

E. Linear Measurement: Linear measurement will be by the linear dimension listed or indicated in the Contract Price Schedule. Unless otherwise indicated, items, components, or Work to be measured on a linear basis will be measured at the centerline of the item in place.

F. Field Measurement for Payment:
1. The Contractor shall take all measurements by providing equipment, workers, and survey crews as required to measure quantities in accordance with the provisions for measurement specified herein. Unless otherwise specified, all quantities shall be calculated using dimensions shown on the Contract Drawings. No allowance will be made for specified tolerances.

2. The Resident Engineer will verify all quantities of Work performed by the Contractor on a unit-price basis, for progress payment purposes.

1.08 VALUES OF UNIT PRICES

A. The number of units and quantities contained in the Contract Price Schedule as estimated quantities are approximate only, and final payment will be made for the actual number of the units and quantities that are incorporated in the Work and required by the Contract.

B. In the event that work or materials or equipment are required to be furnished to a greater or lesser extent than is indicated in the Contract Documents, such work or materials or equipment shall be furnished in greater or lesser quantities in accordance with the General Conditions.

1.09 REJECTED, EXCESS, OR WASTED MATERIALS

A. Quantities of material wasted or disposed of in a manner not called for under the Contract; rejected loads of material, including material rejected after it has been placed by reasons of the failure of the Contractor to conform to the provisions of the Contract; material not unloaded from the transporting vehicle; material placed outside the lines indicated on the Contract Drawings or established by the Resident Engineer; or material remaining on hand after completion of the Work, will not be paid for, and such quantities shall not be included in the final total quantities. No additional compensation will be permitted for loading, hauling, and disposing of rejected material.

1.10 BID ITEM MEASUREMENT AND PAYMENT

A. The Contract price paid for each item will be payment in full for furnishing all labor, materials, tools, equipment and incidentals, and doing all work necessary to complete the Work specified in the Contract Documents.

B. The items listed on the Contract Price Schedule will be measured and paid for as described below. Payment will only be made for work that has been satisfactorily completed. For items not listed in the Contract Price Schedule but considered necessary to complete the Work, separate measurement and payment will not be made. All costs in connection with those items of work will be considered to be included with related items of work in the Contract Price Schedule or incidental to the Work.

1. Bid Item #1: [Brief, summary description used in bidding schedule].
   a. Item Description: The Work of this item includes [expanded description].
   b. Measurement: This item will be measured by [unit of measure].
   c. Payment: This item will be paid for [type of payment].

2. Bid Item #2: [Brief, summary description used in bidding schedule].
   a. Item Description: The Work of this item includes [expanded description].
   b. Measurement: This item will be measured by [unit of measure].
   c. Payment: This item will be paid for [type of payment].
3. Bid Item #3: [Brief, summary description used in bidding schedule].
   a. Item Description: The Work of this item includes [expanded description].
   b. Measurement: This item will be measured by [unit of measure].
   c. Payment: This item will be paid for [type of payment].

   [Below are three sample Measurement and Payment Clauses. The first describes an example Lump Sum item.]

4. Bid Item #1: All the Work of this Contract, excluding Bid Items [______].
   a. Item Description: The Work of this item includes [expanded description].
   b. Measurement: This item will be measured as a lump sum unit.
   c. Payment: This item will be paid for at the Contract lump sum price as specified in the Contract Price Schedule.

   [The following describes an example Provisional Sum item.]

5. Bid Item #2: [Brief, summary description, as used in bidding schedule].
   a. Item Description: The Work of this item includes [expanded description] as indicated in the Contract Documents.
   b. Measurement: [No separate measurement will be made for this item.]
      [This item will be measured by [unit of measure]] [other].
   c. Payment: This item will be paid for in accordance with the General Conditions for Provisional Sum Payments for work satisfactorily completed as authorized and approved by the Resident Engineer.

   [The following describes an example Unit Price item.]

   a. Item Description: The Work of this item includes [expanded description] as indicated in the Contract Documents.
   b. Measurement: This item will be measured by [unit of measure].
   c. Payment: This item will be paid for at the Contract unit price for the quantity measured as specified above.

1.11 [ATTACHMENTS]
   A. Use drawings or sketches as necessary to better define the limits of pay items that are in close proximity and that have no clear boundary in the Contract Drawings.

1.12 MEASUREMENT AND PAYMENT
   A. Separate measurement and payment will not be made for the work required under this Section. All costs in connection with the work specified herein will be considered to be included with the related item of work in the Contract Price Schedule or incidental to the work.
PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for substitutions.

B. Refer to Request for Substitution Form, following this Section.

C. Applies to substitutions after Notice of Award.

1.02 DEFINITIONS

A. Substitutions: Proposed changes by the Contractor in products, materials, equipment, from those required by and Contractor elected changes to the Contract Documents.

1.03 SUBMITTALS

A. Substitution Requests: Submit each request for consideration on a separate request form.

B. Submit substitution request under Section 01 25 00, Substitution Procedures, and not under the technical specification section containing the originally specified item. Upon approval of the substitution request, submit product data under the technical specification section of the originally specified item.

C. Submit Request for Substitution Form provided in Exhibit A. Supplement the form with the following documentation in addition to the requirements stated on the form.

1. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

2. Coordination information, including a list of changes or modifications needed for other parts of the Work, and for construction performed by other Sound Transit contractors, that will be necessary to accommodate proposed substitution.

3. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Contract Specifications Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

4. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

5. Samples, where applicable or requested.

6. Certificates and qualification data, where applicable or requested.
7. List of similar installations for completed projects with project names and addresses and names and addresses of architects, engineers, and owners.

8. Material test reports from a qualified Independent Testing Laboratory indicating and interpreting test results for compliance with requirements indicated.

9. Detailed Contractor’s Construction Schedule(s) using original products, methods or materials and a detailed comparison of Contractor’s Construction Schedule using proposed substitution(s) with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, reasons for all lack of materials, lack of availability or delays in delivery, and normal lead time between receipt of purchase order and delivery lead time when purchase order is received.

10. Contractor’s certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

11. Contractor’s certification that it issued the purchase order in sufficient time to return original products.

1.04 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified Independent Testing Laboratory to perform compatibility tests recommended by manufacturers.

1.05 PROCEDURES

A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXHIBITS

A. Request for Substitution Form

END OF SECTION
SECTION 01 25 00 - EXHIBIT A
REQUEST FOR SUBSTITUTION FORM

TO: ____________________________________________

We hereby submit for your consideration the following item instead of the specified item for the above solicitation:

SPECIFICATION

<table>
<thead>
<tr>
<th>SECTION</th>
<th>ARTICLE</th>
<th>SPECIFIED ITEM</th>
</tr>
</thead>
<tbody>
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</table>

Proposed Product Option/Substitution: ____________________________________________

Attach complete technical data, including laboratory tests, and other information as required in Section 01 25 00, Substitution Procedures, to verify statements below.

Include complete information on changes to Contract Drawings and/or Contract Specifications that proposed product option/substitution will require for its proper installation.

Fill in Blanks Below:

A. Does the product option/substitution affect dimensions shown on Contract Drawings?

B. What effect does product option/substitution have on other work? __________________________

C. Differences between proposed product option/substitution and specified item?

D. Manufacturer’s guarantees of the proposed and specified items are:
   □ Same    □ Different (explain on attachment)

E. Value Engineering Change Proposal (VECP) attached:
   □ Yes (attached)   □ No

The undersigned states that the function, appearance and quality of the proposed items are equivalent or superior to the specified item.

Submitted By: ____________________________

For Use by Sound Transit:

□ Accepted   □ Accepted As Noted

Signature ____________________________

□ Not Accepted

Firm ____________________________

By ____________________________

Date ____________________________

Address ____________________________

Remarks ____________________________

Date ____________________________

Telephone ____________________________

END OF FORM
SECTION 01 27 00
DISPUTE REVIEW BOARD

PART 1 - GENERAL

1.01 SUMMARY
   A. This Section includes specifications for establishing and operating a Dispute Review Board (DRB) to assist in and facilitate the avoidance and timely, impartial resolution of disputes.
   B. Sound Transit and the Contractor acknowledge that DRB reports shall not be binding on either party, and shall not be admissible in subsequent dispute resolution proceedings.
   C. All disputes referred to the DRB shall be subject to the dispute resolution process herein described as a condition precedent to initiating a subsequent dispute resolution process such as arbitration or litigation for that dispute.

1.02 DISPUTES ELIGIBLE FOR CONSIDERATION BY THE DRB
   A. Except as explicitly otherwise provided, disputes exceeding $250,000.00 in proposed value and that are actionable under the provisions of the General Conditions may be referred to the DRB.

1.03 DRB QUALIFICATIONS
   A. Board members shall be experienced in the interpretation of contract documents and the resolution of construction disputes and in the type of construction to be performed.
   B. The following definitions apply for the purpose of setting forth experience and disclosure requirements.
      1. Party directly involved: Sound Transit or the Contractor.
      2. Contractor includes all joint-venture partners individually.
      3. Party indirectly involved: The construction manager, designers, architects, engineers, or other professional service firms or Consultants, Subcontractors of any tier, and suppliers on this project.
      4. Financial ties: all ownership interest, loans, receivables, or payables.
   C. Eligibility:
      1. Direct Employment:
         a. Current employees of any of the parties directly or indirectly involved are prohibited from serving as Board members.
         b. Prospective Board members who were past employees of one of the parties directly involved must obtain permission from the other party prior to appointment.
c. Previous direct employment by one of the parties indirectly involved shall be disclosed.

2. Consulting Assignments:
   a. Individuals who are employed in a consulting capacity by any of the parties directly involved are prohibited from serving as Board members.
   b. Prospective Board members who are currently employed as consultants by one of the parties indirectly involved shall obtain permission from the other party prior to appointment.
   c. Previous employment as a consultant by any party directly or indirectly involved shall be disclosed.

3. Financial Ties:
   a. Individuals with financial ties to any of the parties directly involved are prohibited from serving as Board members.
   b. Current financial ties to any of the parties indirectly involved shall be disclosed.
   c. Previous financial ties with any party, directly or indirectly involved, shall be disclosed.

4. Close Personal or Professional Relationships:
   a. Individuals with close personal or professional relationships with a key member of any party directly involved are prohibited from serving as Board members.
   b. Such current relationships with a member of any party indirectly involved in the Contract shall be disclosed.
   c. All past personal or professional relationships with a key member of one of the parties directly or indirectly involved shall be disclosed.

5. All past and current service as a Board member on projects where any of the parties directly or indirectly involved on this Contract were also involved shall be disclosed.

6. No member shall have had substantial prior involvement in the project, in the judgment of Sound Transit and the Contractor.

D. Ongoing Responsibilities: While serving as a Board member on this project, no member shall participate in any discussion contemplating the creation of an agreement or making an agreement with any party directly or indirectly involved in the Contract regarding employment or fee-based consulting services, or any other business arrangement after the Contract is completed.

1.04 ESTABLISHMENT OF THE DRB

A. After award of the Contract, Sound Transit and the Contractor shall meet to discuss and establish the qualifications upon which nominees are to be evaluated and to jointly select prospective nominees.
B. Sound Transit and the Contractor shall provide to the DRB nominees a list of the construction manager, designers, architects, engineers, professional service firms, consultants, joint-venture partners, Subcontractors, and suppliers involved, or likely to be involved in the project, with a listing of key personnel of each. DRB nominees shall provide the following, pursuant to the above requirements and in addition to the nominee's full name and contact information, to both parties:

1. Resume showing construction experience qualifying the person as a DRB member.

2. Resume showing past DRB participation, if any. List each DRB assignment separately, indicating the name and location of the project, dates of DRB service, name of owner, name of contractor, contract value, nominating party if applicable, names of the other Board members and the number of disputes heard.

3. Disclosure statement describing past, present, and anticipated relationships, including indirect relationships through the nominee's full-time employer, if any, to the project, and with all parties directly and indirectly involved in the Contract. Disclose close professional or personal relationships with key members of all these parties.

4. Disclosure is a continuing obligation of all Board members throughout the life of the Contract.

C. Sound Transit and the Contractor shall then have three weeks to solicit and receive information from prospective candidates, and another two weeks to review and to jointly agree on the final selection of the three members to serve on the DRB. In the event that all three members were not selected from the initial pool of nominees, the process shall be repeated.

D. If the DRB Chair has not already been appointed as part of the selection process, then as soon as is practicable the Board members shall nominate the Chair and submit the nominee's resume and request approval by Sound Transit and the Contractor.

E. Sound Transit, the Contractor and the DRB shall execute the Three-Party Agreement at the first DRB meeting.

1.05 DRB MEETINGS

A. The DRB will visit the project site and meet with representatives of the parties at quarterly intervals and at other times requested by the parties.

B. Each meeting shall include an informal discussion and a field observation of the work in progress. The discussion and field observation shall be attended by personnel of Sound Transit and the Contractor.

1.06 DISPUTE RESOLUTION PROCESS

A. Prior Good-Faith Negotiation:

1. Sound Transit and the Contractor shall enter into good-faith negotiations to settle a dispute before referring such dispute to the DRB.

2. These good-faith negotiations shall be founded on the principle of full and timely disclosure of each party's position to the other party, including the exchange of pertinent supporting records, analyses, expert reports, and similar
documentation, and shall proceed without delay following the inception of the dispute. Such good-faith negotiations may involve the solicitation and rendering of a DRB advisory opinion as described herein.

B. Dispute Referral:

1. A dispute may be referred to the DRB by either Sound Transit or the Contractor. The dispute referral shall be made in writing to the DRB Chair with a copy concurrently provided to the other Board members and the other party.

2. If the Contract stipulates a precedent dispute resolution process prior to referral to the DRB, and if one party fails to meet or adhere to the time requirements set forth under the Contract for this process, the other party may then refer the dispute to the DRB. In the event that the Contract does not specify such precedent process, or specifies a precedent process without time requirements, either party may refer the dispute to the DRB after passage of a reasonable period of time without progress toward a negotiated settlement and the DRB will determine if the dispute should be heard.

3. The dispute referral shall concisely define the nature and specifics of the dispute that are to be considered by the DRB and the scope of the recommendation requested.

4. The DRB Chair shall confer with the parties to establish a due date for delivering pre-hearing submittals, and a date, time, and location for convening the DRB hearing. Hearings shall be convened at the next periodic meeting, unless the parties agree to a shorter or longer period.

C. Pre-Hearing Submittal:

1. Sound Transit and the Contractor shall each prepare a pre-hearing submittal and transmit it to all three members of the DRB and the other party. The pre-hearing submittal, comprising a position paper with such backup data as is referenced in the position paper, shall be tabbed, indexed, and the pages consecutively numbered.

2. Both position papers shall, at a minimum, contain the following:
   
a. A joint statement of the dispute, and the scope of the desired report, placed in a prominent location. The language of this joint statement shall summarize in a few sentences the nature of the dispute. If the parties are unable to agree on the wording of the joint statement of dispute, each party's position paper shall contain both statements, and identify the party authoring each statement.

b. The basis and justification for the party's position, with reference to Contract language and other supporting documents for each element of the dispute. In order to minimize duplication and repetitiveness, the parties may identify a common set of documents that will be referred to by both parties and submit them in a separate package.

c. When the scope of the hearing includes quantum, the referring party shall include a schedule impact analysis and full cost details, calculated in accordance with methods set forth in the Contract. This requirement does not apply if the report is to be made for entitlement alone or for entitlement with guidelines for quantum.
3. The number of copies, distribution requirements, and time for submittal will be established by the DRB and communicated to the parties by the Chair.

D. DRB Hearings:

1. Sound Transit will arrange for or provide hearing facilities at or near the site.

2. Attendance:
   
   a. Sound Transit and Contractor shall both limit attendance at the hearing to personnel directly involved in the dispute and participants in the good-faith negotiations that were conducted prior to submittal to the DRB except as noted below.

   b. Prior to the date established for the hearing, each party shall provide a list of proposed attendees to the DRB and to the other party. In the event of any disagreement, the DRB shall make the final determination as to who attends the hearing.

   c. Attorneys shall not participate in the hearing. Attorneys representing the parties are permitted to attend dispute hearings, provided that prior permission is obtained from the other party.

   d. At DRB hearings regarding claims by a Subcontractor, including pass-through claims by a lower tier Subcontractor or supplier, against the Contractor which are actionable by the Contractor against Sound Transit, the Contractor shall require and ensure that each Subcontractor involved in the dispute has present an authorized representative with actual knowledge of the facts underlying the Subcontractor claims.

3. The conduct of the hearing shall be established by the DRB according to its operating procedures and generally be consistent with the following guidelines:

   a. The party that referred the dispute to the DRB shall present its position first, followed by the other party.

   b. Both parties shall be allowed successive rebuttals, ensuring a full and adequate opportunity to present their position, and to rebut the opposing party’s position, until, in the DRB’s opinion, all aspects of the dispute have been fully and fairly covered.

   c. The DRB shall be fully prepared to, and may at any time, ask questions, request clarifications, or ask for additional data and job records.

   d. Either party may request that the DRB direct a question to, or request a clarification from the other party. The DRB shall determine at what point in the proceedings such requests may be made and if they will be granted. In general, the DRB will not allow one party to be questioned directly by the other party.

   e. In difficult or complex cases, additional hearings may be necessary to facilitate full consideration and understanding of the dispute.

   f. The DRB, in its discretion, may allow introduction of arguments, exhibits, handouts, or documentary evidence that were not included in that party’s pre-hearing position paper and have not been previously submitted to the other party. In such cases the other party will be granted time to review and prepare a rebuttal to the new material.
E. Failure to Prepare a Pre-Hearing Submittal or Attend a DRB Hearing:

1. In the event that either party fails to deliver a pre-hearing submittal by the date established by the DRB, the DRB shall, at its discretion, determine whether the hearing shall proceed as originally scheduled, or whether additional time shall be provided and a new date established. On the final date and time established for the hearing, the DRB shall proceed with the hearing utilizing the information that has been submitted.

2. In the event that some or all of the representatives of either party fails to appear at the appointed time of a DRB hearing, the DRB shall proceed with the hearing. The hearing shall take place as if all party representatives were in attendance, and the DRB shall consider all evidence brought before it and hear testimony from those party representatives that are present.

F. Use of Outside Experts:

1. By Sound Transit or the Contractor:
   a. A party intending to offer an outside expert’s analysis at the hearing shall disclose such intention in writing to the other party and to the DRB no less than 30 Days prior to the due date for delivering the pre-hearing submittal. The expert’s name and a general statement of the area of the dispute that will be covered by his or her testimony shall be included in the disclosure.
   b. Upon receipt of the above disclosure, the other party shall have the opportunity to secure the services of an outside expert to address or respond to those issues that may be raised by the other party’s outside expert. The disclosure requirements shall be the same as that specified above, except the time requirement is 10 Days.
   c. The cost for securing outside expert services shall be borne by the party securing such services.

2. By the DRB:
   a. Prior to arranging for outside experts, the DRB shall obtain prior approval from Sound Transit and the Contractor by providing:
      1) A statement explaining why the expert assistance is needed.
      2) An estimate of the cost of the expert assistance.
      3) A disclosure statement, in accordance with the requirements of Article 1.04B.3, herein, using the criteria established in Article 1.03C, herein.
      4) A confidentiality statement, consistent with the DRB’s such agreement, executed by the proposed expert.
   b. The DRB Chair shall include the cost of the outside expert in his or her regular invoice, and provide a copy of the invoice. Invoices shall be in accordance with the requirements for Board member invoices.
   c. The Contractor and Sound Transit shall equally bear the cost of the services of the outside expert employed by the DRB.
G. DRB Report:

1. The DRB’s recommendations for resolution of a dispute will be formalized in a written report with format as determined by the DRB and signed by all Board members. The report should include a concise description of the dispute, short statements of each party’s position, findings as to the facts of the dispute, discussion and rationale for the recommendation(s), and the recommendation(s). The report shall be submitted concurrently to the parties, as soon as possible after completion of the hearing as agreed by all parties.

2. If the DRB cannot arrive at a unanimous report, the Board shall prepare minority findings and recommendation(s), which, together with the majority findings and recommendation(s) shall comprise the DRB report. The report shall identify the issues of disagreement, along with the reasons for disagreement.

3. Clarification:
   a. Either party may request clarification of a report within 10 Days following receipt of the report. Within a reasonable period of time, the DRB shall provide written clarification to both parties.
   b. Requests for clarification shall be submitted in writing simultaneously to the DRB and to the other party.
   c. Only one request for clarification per dispute from each party will be allowed.

4. Reconsideration:
   a. Either party may request reconsideration of a report, within 10 Days following receipt of the report, when new information is obtained or developed that was not known at the time of the hearing, or when, in the party’s opinion, the DRB misunderstood or failed to consider pertinent facts of the dispute. Within a reasonable period of time, the DRB shall provide written reconsideration to both parties.
   b. Requests for reconsideration shall be submitted in writing simultaneously to the DRB and to the other party.
   c. The Board will not entertain requests for reconsideration that amount to a renewal of prior argument or additional argument based on facts available at the time of the hearing.
   d. Only one request for reconsideration per dispute from each party will be allowed.

5. Acceptance:
   a. Sound Transit and the Contractor shall submit their written acceptance or rejection of the report concurrently to the other party and to the DRB within 14 Days of receipt of the report or following receipt of responses to requests for clarification or reconsideration.
   b. Failure by either party to accept or reject within the specified period shall be construed as acceptance of the report by that party.
c. Acceptance by Sound Transit of a report on entitlement only, or on entitlement with guidelines for quantum, does not obligate Sound Transit to any particular quantum amount.

H. Advisory Opinions:

1. An advisory opinion serves as a method for potentially avoiding a DRB hearing. It is not intended to replace the dispute resolution process specified herein, but may be implemented as part of the good-faith negotiations conducted between the parties.

2. When mutually agreed by Sound Transit and the Contractor, the DRB may, at its discretion, provide an advisory opinion on any issue.

1.07 COMPENSATION

A. Sound Transit and the Contractor shall each bear their respective in-house costs and costs of providing those DRB-related services for which such responsibility has been allocated herein.

B. Sound Transit and the Contractor shall equally bear the cost of the DRB’s as set forth in the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. A. This Section specifies the use and preservation of Contractor’s Escrow Bid Documentation, as defined in Paragraph 4.04 of Section 00 21 13, Instructions to Bidders, herein (hereinafter also referred to as “Bid Documentation”, “Bid Document” or “Documents”). The Bid Documents provided by the Contractor shall be specific enough that a third person could look at the Bid Documents and determine the labor, material and equipment costs for each Contract Division and Specification Section within the Division. The Documents shall also identify field and home office overhead and profit. The Contractor shall execute the enclosed Escrow Bid Documentation Instruction Agreement and submit it no later than the meeting to review the Bid Documents as set forth in Article 1.03A, herein.

B. An Escrow Price Documentation Agreement is appended to this Section.

1.02 ESCROW BID DOCUMENTATION DEFINITION

A. The terms “Escrow Bid Documentation”, “Bid Documentation” and “Bid Documents” as used in this Section include, but are not limited to, the following documents:

1. Anticipated, detailed project schedule at the time of the bid
2. Scope of work on which the Contractor requested the subcontractors and suppliers to submit their proposals/quotations.
3. Proposals/quotations from subcontractors and suppliers with all backup documentation including the conditions and pricing.
4. Quantity takeoff documents including calculations.
5. Labor rates and the attendant development file(s).
6. Equipment rates and the attendant development file(s).
7. Equipment proposals / quotations including conditions and pricing.
8. Assumptions or details used to develop the production rates assumed in the estimate and project schedule.
9. All survey notes or calculations; site visit notes or documents and any notes from prebid meeting(s).
10. Takeoff sheets, cut and add sheets, and any and all backup documentation.
11. Bid estimate from summary level to the lowest level of detail commensurate with the capabilities of the Contractor’s estimating system including all notes and assumptions for each activity and/or bid item and including crew sizing, equipment utilization, material consumption rates, and subcontractor pricing.
12. All writings, drafts, working papers, take off sheets, phone logs, computer printouts, charts, electronic data, spreadsheets, drawings, scope of work narratives or outlines, photographs, and any other documentation or data compilations which contain or reflect all information, data, and calculations compiled to, referred to, related to, and/or used for the above list of items.

13. All manuals, books, and/or reference guides which used by in determining the bid for this Contract. If such manuals, books, and/or reference guides are standard in the industry, they may be included in the Bid Documentation by reference provided the reference includes the title, edition, publication date, and author.

B. If the Contractor provides rolled up take off sheets or electronic data for any aspect of the Escrow Bid Documentation, the Contractor shall also provide the backup documentation supporting the rolled up take off sheets and electronic data.

C. The term Escrow Bid Documentation does not include the bid documents provided by Sound Transit for use by the Contractor in bidding on this Contract.

D. Unsuccessful Bidder(s) shall not destroy, throw away, or write over Escrow Bid Documentation or any other documentation used in, referenced, and referring to the its bid until the return of the its bid bond by Sound Transit.

1.03 DELIVERY OF BID DOCUMENTATION TO SOUND TRANSIT

A. The Contractor shall submit the initial request for Escrow Bid Documentation to Sound Transit in accordance with Paragraph 4.04, Section 00 21 13, Instructions to Bidders.

B. For each subcontract entered into after the Notice to Proceed, the Contractor shall submit Bid Escrow Documentation in accordance with the procedure noted in Article 1.03A above.

1.04 USE OF PRICE DOCUMENTATION

A. The Contractor agrees that the Escrow Bid Documentation shall contain all documentation used in preparing the Bid. No other Bid Documentation concerning the Contractor's calculation of its bid shall be utilized by the Contractor during disputes and/or litigation of claims brought by the Contractor arising out of this Contract, unless otherwise approved by Sound Transit.

B. The Escrow Bid Documentation may be reviewed and used by joint agreement between Sound Transit and the Contractor having provided representatives to determine the Contractor's bid concept, to evaluate the Contractor's breakdown of Contract Price, or to evaluate productivity and schedule.

C. When a Claim has been filed with Sound Transit by the Contractor or its agents, Sound Transit may create one (1) controlled copy the Escrow Bid Documents and may provide the controlled copy to Sound Transit personnel, agents, or consultants for use in connection with such Claim. Sound Transit will ensure and maintain the confidentiality of the Escrow Bid Documents. Sound Transit, its agents, and consultants, shall maintain such confidential controlled copy of the Bid Documents. Upon resolution of such Claim, Sound Transit shall provide the confidential controlled copy of the Escrow Bid Documents to the escrow facility for storage, unless other Claims are pending.

D. In all other cases, an agreement and representation from both the Contractor and Sound Transit are required to have access to the documents by either side.
E. If a Disputes Review Board or Mediator is used to resolve disputed claims, the Board members and/or Mediator shall have unrestricted use and access to the Escrow Bid Documentation for purposes of evaluating, understanding, resolving and settling disputes/claims. The Disputes Review Board or Mediator shall maintain submitted documents in a file marked confidential and proprietary and shall be returned to Sound Transit at the conclusion of the DRB process.

F. The Escrow Bid Documentation will be returned to the Contractor by Sound Transit within 30 Days after the resolution of all claims, disputes and/or litigation, and the issuance of Final Acceptance.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXHIBIT

A. Escrow Bid Documentation Agreement

END OF SECTION
SECTION 01 27 23 – EXHIBIT A

ESCROW BID DOCUMENTATION AGREEMENT

Public Body: Sound Transit

Contract No.: RTA/LR [_____] 

Project Name: [_____] 

Estimated Contract Completion Date: ____________________________

This Agreement is for the retention of Escrow Bid Documentation submitted in accordance with Specification Section 01 27 23, Escrow Bid Documentation, Contract No. RTA/LR [_____] by [________________], (Contractor) the company hired by Puget Sound Regional Transit Agency (Sound Transit) to perform all the work associated with the Project named above.

Pursuant to Contracts Documents, the parties agree to the following conditions of this escrow Agreement:

1 DURATION AND USE OF BID DOCUMENTATION

A. The Escrow Bid Documentation and affidavit shall remain in a secured location under the control of Sound Transit during the life of the Contract and will be returned to the Contractor by Sound Transit within 30 Days after the resolution of all claims, disputes and/or litigation, and the issuance of Final Acceptance.

B. The Escrow Bid Documentation may be used to determine the Contractor’s bid concept related to Claims arising out of this Contract, and for any other purpose allowed in Contract Specifications Section 01 27 23, Escrow Bid Documentation. Pursuant to that Section, Sound Transit may create one (1) controlled copy of the Escrow Bid Documents, which will be labeled as “Confidential”. Sound Transit will ensure and maintain the confidentiality of the controlled copy of the Escrow Bid Documents. Upon resolution of such Claim, Sound Transit shall provide the confidential controlled copy of the Escrow Bid Documents to the escrow facility for storage, unless other Claims are pending.

C. For purposes of protecting the Escrow Bid Documents, Sound Transit and the Contractor shall each designate three (3) authorized representatives that may access the Escrow Bid Documents. Such designations shall be by letter to the other party. The Contractor and/or Sound Transit may change the authorized representatives only upon written notice to the other party. In the event that a Claim is submitted by the Contractor, Sound Transit may at its sole discretion review the escrowed Bid Documentation. If Sound Transit elects to obtain access to such materials, Sound Transit will notify the Contractor and allow the Contractor equal access. At no time shall the Contractor have access to the Escrow Bid Documents and the affidavit located with the Escrow Bid Documents without the presence of a Sound Transit authorized representative. Following each examination, the Escrow Bid Documentation will be returned to Sound Transit’s offsite document repository.
D. Article 1.01C, above, does not apply when Sound Transit or Contractor accesses their working copies of the Escrow Bid Documentation.

2 AUTHORIZED REPRESENTATIVES
A. For the Contractor are:

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

A. For Sound Transit are:

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

3 REMEDIES FOR REFUSAL OR FAILURE TO PROVIDE OR ALLOW ACCESS TO BID DOCUMENTATION
A. If the Contractor fails or refuses to allow Sound Transit to access, examine, copy, and/or maintain a copy of the Escrow Bid Documentation, the parties agree that:

1. Sound Transit shall be entitled to access the Escrow Bid Documents if Sound Transit provides a declaration and supporting documentation showing that:

   a. Sound Transit provided the Contractor with a minimum of 24-hour written notice of its intent to access and/or copy the Escrow Bid Documentation; and

   b. The Contractor has either failed to acknowledge notice of Sound Transit’s request, is refusing to allow Sound Transit access to the Escrow Bid Documentation, or is refusing to allow Sound Transit to access the Escrow Bid Documentation more than two Days (48 hours) following Sound Transit’s providing notice of its intents to access the Escrow Bid Documents.
Contractor

By: ____________________________
Name: ____________________________
Title: ____________________________
Date Signed: ________________________
Notice to: ________________________
Resident Engineer address

________________________
________________________
________________________

Sound Transit

By: ____________________________
Name: ____________________________
Title: ____________________________
Date Signed: ________________________

END OF EXHIBIT
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PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section includes coordination of Work of the Contract.

B. Coordinate scheduling, submittals, and work of the various Sections of Specifications to ensure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.

C. Coordinate work among parts of the Contract Documents to avoid conflicts and omissions. Take special care to coordinate work which is normally indicated in some but not all Contract, mechanical, electrical and other major Divisions of the Contract Documents.

D. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 01 12 16, Work Sequence.
2. Section 01 12 19, Contract Interface.
3. Section 01 31 19, Project Meetings.
4. Section 01 32 13, Scheduling of Work.
5. Section 01 77 00, Closeout Procedures.

1.02 COOPERATION AND COORDINATION OF WORK

A. Coordination of work among the general and various Subcontractors will be a critical element in the success of this project. Coordinate the installation of the Work and that of Subcontractors to ensure compliance with the contract documents and to expedite the progress of the project.

B. Be responsible for ensuring that the work of Subcontractors complies with General and Special Conditions of the Contract. No additional payments or time extensions will be authorized for failure on the part of Subcontractors to be familiar with and in compliance with the Contract Specifications.

C. Project Coordination and Scheduling Control: Be solely responsible for coordination and close adherence to schedules. Maintain coordination and scheduling control at all times:

1. Each cooperating with Subcontractors in the execution of their work so as to cause no delay in the completion of the Project. This responsibility includes the completion of work in a timely manner and items of equipment connected and fully operating at the time of Substantial Completion of each phase. Each Subcontractor shall diligently comply with the following requirements:
a. Cooperate in planning and layout of the work well in advance of operations to properly interface with work of other trades and Sound Transit's separate contractors.
   1) Include Owner Furnished Equipment (OFE) and Owner Furnished Materials (OFM) items.
   2) Include planning, layout, and review of mock-ups.

b. Inform other trades of requirements at proper time to prevent delay or revisions.

c. Be informed on the requirements of other trades and check own work for conflicts with the work of other trades.

d. Ensure delivery of materials and performance of work on coordinated schedule with other trades.

e. Ensure that the Subcontractors and Equipment Suppliers are responsible for the integration, compatibility and completeness of the installation and operation of the equipment within their respective Contract Specification Sections. Included in such work is conformance with code requirements. If power, piping, ductwork, or other work required for complete installation is not provided by others to equipment location or is not adequate for complete installation, the Subcontractor or equipment Supplier shall be responsible for providing the necessary connections.

f. Notify Resident Engineer in a timely manner of items/issues requiring field verification by Resident Engineer and subconsultants.

2. Schedule and coordinate utility shutdowns with applicable agencies:

   a. Include equipment and utility shutdowns in Construction Schedule(s), required in Section 01 32 13, Scheduling of Work.

   b. Confirm requests for equipment and utility shutdowns in writing to the Resident Engineer not less than 14 Days prior to the proposed date. Include, as a minimum, the following information:
      1) Equipment or utility services affected;
      2) Reason shutdown is required;
      3) Work to be accomplished during the shutdown;
      4) Proposed date and time; and
      5) Duration of the shutdown.

c. The actual time and date of shutdowns will be subject to approval of applicable agency and Resident Engineer.

d. The duration of shutdowns shall be held to a reasonable minimum as determined by applicable agency and Resident Engineer.

e. Ensure that materials and equipment required for the work to be accomplished during shutdown be complete and available on the job for review by Resident Engineer three (3) Days prior to the shutdown, if
requested. If contractor is not adequately prepared, the shutdown will be canceled and rescheduled.

f. Include in the bid all costs associated with equipment and utility shutdowns. Sound Transit will make no extra payment for overtime work, schedule changes, or failure to complete utility connections within authorized shutdown periods.

D. Notification and Correction of Defective Work:

1. Before starting a section of work, ensure each Subcontractor carefully examines preparatory work that has been executed to receive each Subcontractor's work. Check carefully, by whatever means required, ensuring that the work and adjacent, related work will finish to proper contours, planes, and levels.

2. Have the Subcontractor promptly give notice of all defects or imperfections in preparatory work which will in any way affect satisfactory completion of the work. Under no condition shall a section of work proceed prior to preparatory work having been completed, cured, dried, or otherwise made satisfactory to receive such related work.

3. Be responsible for correction of defective work of the Subcontractor providing the defective work. Correction of work due to underlying defects shall be the responsibility of the Contractor or Subcontractor providing work.

E. Dimensions:

1. The primary structural elements are dimensioned on the Contract Drawings. Not all secondary dimensions are shown, such as exact door and window locations, wall configurations, slab slopes and depression, curbs, and the like. Coordination of the structure with the dimensions as shown on the Contract Drawings and Contract items to be embedded, or attached to the structure, is the responsibility of the Contractor. Dimensional discrepancies between Contract Drawings shall be reported to the Resident Engineer before proceeding with the work.

F. Drawings:

1. Make sure the work of each Subcontractor conforms to the intent of the Contract Drawings and Contract Specifications. Contract Drawings are partly diagrammatic and do not intend to show in detail all features of work. Each Subcontractor shall carefully review and understand the intent of the Contract Drawings and Contract Specifications for its work and the work to be performed by other trades. Each subcontractor shall compare related Contract Drawings and Contract Specifications, and thoroughly understand the building conditions affecting their work and the work of other trades.

2. Changes required in the work caused by failure to do so shall be at no expense to Sound Transit.

G. Interferences and Right-of-Way:

1. Make proper provisions to avoid interferences

2. Where conflicts occur, resolve in the following order: Structural work has right-of-way over mechanical and electrical work; concealed mechanical work has right-of-way over concealed electrical work; exposed electrical fixtures have right-of-way over mechanical fixtures.
3. Submit conflicts, which cannot be resolved by right-of-way to Resident Engineer for instructions.

4. Submit reflected ceiling coordination plan showing work by affected trades in accordance with requirements of Section 01 33 00, Submittal Procedures.

H. Equipment Connections: See mechanical and electrical Divisions. Work includes but is not limited to:

1. Verifying utility requirements characteristics of operating equipment are compatible with building utilities.

2. Providing motors and equipment for current characteristics as shown on Contract Drawings for electrical:
   a. Electrical Subcontractor:
      1) Ensure that electrical Subcontractor furnishes and installs wiring and conduit as shown in the Electrical and Systems plans except:
         a) Temperature control wiring.
         b) Equipment control wiring
         c) Interlock wiring
      2) Ensure that electrical Subcontractor furnishes and installs power wiring complete from power source to motor or equipment junction box, including power wiring through starters. Contractor shall ensure that electrical Subcontractor furnishes and installs starters not factory mounted on equipment. After circuits are completed, Contractor shall ensure that electrical Subcontractor is responsible for all power wiring.
   b. Ensure that mechanical Subcontractor, regardless of voltage, furnishes and installs temperature control wiring, and interlock wiring and equipment control wiring for the equipment that the mechanical Subcontractor furnishes.

I. Cooperate and coordinate with all other separate Contractors and subcontractors under Contract with Sound Transit. Refer to Section 01 12 19 Contract Interface, Section 01 32 13, Scheduling of Work for the Coordinated Installation Program requirements and Section 01 12 16, Work Sequence for constraints and sequencing requirements.

J. Coordination Drawings:

1. Prepare coordination drawings, consisting of plans, sections, and details of the facility. Drawings shall depict the interrelationships of components shown on separate shop drawings, the installation sequences, and how work is to be installed or constructed in relation to the work of other trades and existing conditions.

2. The purpose of coordination drawings is to resolve potential dimensional interferences and conflicts of the various trades prior to shop fabrication, construction of wall and floor penetrations or field installation of components and systems. While the designers have exercised the accepted standard of care in performing overall dimensional coordination in the preparation of the construction.
documents, additional factors influence coordination which the Contractor and Subcontractors must address with coordination drawings. Such factors include, but are not limited to specific means and methods, the sequence of work, the characteristics of the specific equipment to be installed (where the documents allow multiple options), recognition of existing conditions, and the bidding assumptions made by each Subcontractor.

3. Show areas to be reserved (kept clear) for code, safety, and maintenance access clearances for all equipment based on manufacturer recommendations. Areas for which coordination drawings are to be prepared include, but are not limited to:

a. Light fixtures, conduit, mechanical piping and duct work.

b. Embedded items in concrete, openings in concrete and concrete masonry.

c. Mechanical and electrical equipment including electrical connections.

d. Miscellaneous Contract:
   1) Masonry and ledger angle layouts.
   2) Precast to structure.

e. Ceiling spaces (see following Articles, herein).

4. Detailed ceiling space coordination drawings:

a. Be responsible for the detailed coordination of all trades involved in installation of mechanical and electrical equipment. These trades and related items of work include, but are not limited to the following:
   1) Mechanical: Equipment, ductwork, fire sprinkler system, piping, and related devices
   2) Electrical: Equipment, panels, lights, conduit, and related devices

b. Submit for review a coordination shop drawing for all items above as they relate to the new and existing conditions, prior to the start of all work. Include that area from 7'-0" above finished floor line to the bottom of structural slab above. This drawing shall be modified and updated as work proceeds and shall be submitted as a record "as-built" drawing.

5. Concrete lift drawings: Submit concrete lift drawings for review prior to placement of all cast-in-place concrete. Drawings shall include form materials, details of all openings and blockouts, location of all embedments, chamfers, anchor bolts, pipe, and HVAC penetrations, conduit penetrations, sills and thresholds, construction joints, water stops, expansion joints, finish designations, concrete hardeners, curing methods, sequence of placements, dowels, slopes, materials, subgrade, vapor barrier, drams, embedded conduits, conduit penetrations, and all other details inherent to a coordinated concrete placement.

6. Prepare coordination drawings in accordance with the same requirements as indicated for shop drawings.
a. Plans shall be at an appropriate scale to depict the necessary detail, but not less than 1/4" = 1'-0".

b. Sections shall be at an appropriate scale to depict the necessary detail, but not less than 1/2" = 1'-0".

c. Drawings shall contain elements of the construction in their correct dimensional relationship, including but not limited to, ceilings, roofs, walls, beams, columns, openings, supports, hangers, earthquake bracing, fixtures, and all other appurtenances.

7. Contractor and each Subcontractor shall sign the coordination drawings to indicate their participation in the coordination process and their agreement that the individual systems and components can be installed as indicated in the drawings and in the conformance with the Contract Documents.

8. Submit these drawings for review and approval prior to installation of any components of the work to be included in order to demonstrate that the installation of the aforementioned items have been coordinated prior to commencement of the work.

1.03 MEETINGS

A. In addition to progress meetings specified in Section 01 31 19, Project Meetings, hold coordination meetings and pre-installation conferences with personnel and Subcontractors to ensure coordination of Work.

1.04 COORDINATION OF SUBMITTALS

A. Schedule and coordinate submittals as specified in Section 01 33 00, Submittal Procedures.

B. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service equipment.

C. Coordinate requests for substitutions, if any, to assure compatibility of space, of operating elements, and effect on work of other Sections.

1. Note that substitutions are not permitted during construction except under the conditions outlined in General Conditions.

1.05 COORDINATION OF SPACE

A. Coordinate use of Project space and sequence of installation of mechanical and electrical work which is indicated diagrammatically on Contract Drawings. Follow routings shown for pipes, ducts, and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

B. In finished areas, except as otherwise shown, conceal pipes, ducts, wiring and the like within the construction. Coordinate locations of fixtures and outlets with finish elements; furring, chases and soffits are specifically not allowed.

1.06 COORDINATION OF CONTRACT CLOSEOUT

A. Coordinate completion and cleanup of work by the various trades involved in preparation for Substantial Completion of the Work.
B. After Sound Transit occupancy of premises, coordinate access to site by the various trades involved for corrections defective work and work not in accordance with Contract Documents, to minimize disruption of Sound Transit's activities.

C. Assemble and coordinate closeout submittals specified in Section 01 77 00, Closeout Procedures.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for constraints on construction and coordination with:
   1. Other Sound Transit Contractors.
   2. King County Metro (KCM)/Link Light Rail.
   3. Local agency departments:
      a. Transportation.
      b. Public works.
      c. Planning and development.
      d. Fire department.
   4. Community relations.

B. This Section is in addition to the coordination requirements contained in the “Coordination with Others” article of the General Conditions.

C. This Section includes specifications for constraints on construction, coordination with the Seattle Department of Transportation (SDOT), King County Metro (KCM), Seattle Department of Transportation (SDOT), Seattle Fire Department (SFD), Seattle Public Utilities (SPU), Seattle City Light (SCL), 360 Networks, Comcast, CenturyLink, University of Washington (UW), and community relations.

D. This Section is in addition to the coordination requirements contained in the General Conditions Article 3.02, Coordination with Others.

E. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor’s responsibility to perform all the Work required by the Contract Documents.

1. Section 01 11 00, Summary of Work.
2. Section 01 12 16, Work Sequence.
3. Section 01 12 19, Contract Interface.
4. Section 01 41 26, Permits.
5. Section 01 51 15, Temporary Electrical Power.
6. Section 33 11 00, Water Utility Distribution Piping.
7. Section 33 30 00, Sanitary Sewageage Utilities.

1.02 SUBMITTALS
A. Track Allocation Request / Work Permit form.
B. Sound Transit / King County - Support of Non-Operations form.
C. Downtown Tunnel / Station Access Permit / Work Permit Request form.

1.03 COORDINATION WITH OTHER SOUND TRANSIT CONTRACTORS
A. The Contractor shall coordinate its Work with the following Sound Transit Contractors. Dates of construction are estimated, and are subject to change.
1. U230, U220, and System-wide Contractors Contracts refer to Section 01 11 00, Summary of Work and Section 01 12 19, Contract Interfaces.
2. Sound Transit's art department refer Section 12 10 00 Art Coordination and Installation
B. Attend meetings scheduled by the Resident Engineer to coordinate work, which potentially impacts the work of others.

1.04 COORDINATION WITH KING COUNTY METRO
A. Work within the Sound Transit Right of Way requires track access permits and coordination with the following agencies, and must be performed during the following approximate hours (start and end times may vary up to 15 minutes):
   Monday, 12:15 am to 4:30 am;
   Tuesday through Saturday, 1:15 am to 4:30 am;
   Sunday, 1:15 am to 5:30 am.
   Special permission for creating a work zone outside these hours is required.
B. Sound Transit may withhold issuing a permit on days requiring emergency operation work (e.g. repairs to the tracks, OCS or other components on the guide-way).
C. King County Metro (KCM) is the operator of Sound Transit's LINK light rail system. Coordinate with KCM through the Resident Engineer.

   KCM Construction
   Information/Coordination: Eric Brumbach
   Phone: (206) 684-2785
   E-mail: construction.coor@metrokc.gov

D. Obtain a Track Access Permit weekly ("Downtown Tunnel / Station Access Permit / Work Permit Request Form") from KCM prior to working, and coordinate with the following:

   KCM DSTT Contact: Donald Brewer
   Cell: (206) 786-2818
   E-mail: donald.brewer@kingcounty.gov

1. Fill out a Downtown Tunnel/Station Access Permit/Work Permit Request Form (see attachment at end of section).
E. Contact King County Metro Link Representative for all work occurring within or along Sound Transit right-of-way, Sound Transit controlled property, or Sound Transit passenger areas.

   Link Light Rail Contact: Tam Swett  
   Phone: (206) 903-7670  
   Cell: (206) 510-3088

1. Fill out a Track Allocation Request/Work Permit Form (Exhibit A).

F. Attend Track Access right-of-way training by Sound Transit and obtain a Track Access Permit weekly ("Track Allocation Request / Work Permit Form") from Sound Transit prior to working. See the Central Link Track Access Permit Process in the following Attachment for details.

G. KCM, LINK Security, or other designated individual will provide access to non-public work areas that are normally locked. All non-public work areas that are normally locked must be secured by KCM or LINK Security prior to leaving the station at the end of the work shift.

H. Each Day, prior to starting work, and upon ending work, call Link Central Control (LCC) at 206-205-8177 and the respective Fire Department to indicate monitoring equipment if being taken out of service. The purpose of this is to prevent false fire alarms due to construction. The Contractor shall not take individual detection devices out of service. Upon notification of LCC by the Contractor, KCM will deactivate detection devices and will call the monitoring service company.

I. Work on electrical systems that require interruption of service to Sound Transit equipment and facilities shall be coordinated through the Resident Engineer. Planned shut-downs that will cause unacceptable service interruptions (as determined by KCM) will be required to be performed when Link light rail passenger service is not operating.

J. Include in coordination with KCM:

1. Allowing for salvage, relocation and/or installation of bus stop shelters, bus stop signs, bus stop trash receptacles, overhead power for electric trolley buses, or other KCM facilities.

2. Accommodation for KCM buses when the Contractor is modifying traffic patterns.
   a. Give 30 Days notice to KCM before traffic control changes are made that will impact the trolley bus wire alignment or bus zones.

3. Assistance and coordination with KCM facility modifications during construction.
   a. Invite KCM to participate in weekly coordination meetings with the other Stakeholders. Report on work completed, upcoming work scheduled and all long-range work issues requiring KCM coordination.

4. Temporary relocation of bus zones and restoration of permanent zones. When upcoming Work will interfere with the use of existing bus zones (bus stops) on the corridor, submit temporary bus zone locations and designs as part of the traffic control plan. Construct approved temporary bus zones at no additional cost to Sound Transit to the following requirements:
   a. Raised landing of 6-inch curb height;
   b. Accessible for wheelchair lift deployment;
c. Safe walkways to adjacent cross streets;
d. Lighted for night use;
e. Minimum 75 feet long; and
f. Minimum 9 feet wide.

5. KCM will provide and install signage and rider alert information at no cost to the Contractor. Existing bus shelters, bus stop signage, and related items will remain the property of KCM. KCM will be responsible for removal and installation of these items.

6. A KCM safety watch or line crew shall be present at the site at all times when the Contractor’s operations will be within 10-feet of energized trolley wires such as when installing traffic signals and poles with mast arms or modifying existing signal heads.
   a. A KCM line crew is required when necessary to barrier the energized trolley wire.
   b. Notify KCM Power Distribution headquarters at (206) 264-6580 at least 10 working days before support work is required.
   c. Costs charged by KCM for a safety watch or line crew required by the Contractor will be borne by the Contractor.

7. Access to Pine Street Stub Tunnel equipment rooms shall be coordinated with the Resident Engineer and King County Metro Transit/King County (KCM).

1.05 COORDINATION WITH SEATTLE DEPARTMENT OF TRANSPORTATION

A. Closely coordinate work activities the [Seattle Department of Transportation].

B. Coordinate through the Resident Engineer for [SDOT], reviews of traffic control plans, proposed modifications to traffic signals, and haul route plans.

C. If surface construction activities affect access to surrounding businesses, post notice signs prior to date of construction.

D. [Pavement Markings: Seattle Department of Transportation (SDOT) crew will install new pavement marking as shown in the Contract Drawings. This Work will be performed in advance of this Contract. Coordinate with City of Seattle through the Resident Engineer to protect pavement markings during construction.]

   SDOT Contact: Reiner Blanco
   Phone: (206) 615-1911

E. [Signaling: SDOT crew will modify the existing traffic signal system. Coordinate with SDOT through the Resident Engineer at least 45 Days prior to switching to new signal system at the intersection or Royal Brougham Way and E-3 Busway.]

   SDOT Contact: Loren Raynes
   Phone: (206) 684-5119
1.06 COORDINATION WITH SEATTLE PUBLIC UTILITIES
A. Coordinate Work affecting Seattle Public Utility’s (SPU) utilities through the Resident Engineer with SPU Water Engineering Division and Sewer/Drainage Division.
B. Procedures for coordination with SPU for Work affecting SPU water lines are covered in Section 33 11 00, Water Utility Distribution Piping and as indicated on the Contract Drawings.
C. Procedures for coordination with SPU for Work affecting SPU sewer lines are covered in Section 33 30 00, Sanitary Sewerage Utilities.

1.07 COORDINATIONS WITH SEATTLE CITY LIGHT
A. Coordinate Work affecting Seattle City Light (SCL) utilities through the Resident Engineer with SCL.
B. Procedures for coordination with SCL for Work affecting SCL power lines are covered in Section 01 51 15, Temporary Electrical Power, and as indicated on the Contract Drawings.
C. Costs charged by SCL for a safety watch or line crew required will be borne by the Contractor.

1.08 COORDINATIONS WITH SEATTLE DEPARTMENT OF PLANNING AND DEVELOPMENT
A. Closely coordinate activities with the [Seattle Department of Planning and Development (DPD)], which has jurisdiction over building permits and compliance.
B. Coordinate Work affecting [Seattle Department of Planning and Development (DPD)] through the Resident Engineer and DPD.

1.09 COORDINATIONS WITH SEATTLE FIRE DEPARTMENT
A. Obtain Seattle Fire Department approval of fire systems and testing thereof.

1.10 COORDINATION WITH 360 NETWORKS
A. 360 Networks has jurisdiction over the fiber optic duct bank system located along the west side of Brooklyn Avenue Northeast and within the project site. The Contractor shall closely coordinate its activities with 360 Networks.
B. Coordinate through the Resident Engineer for 360 Networks reviews of construction activities that will affect the utility.

1.11 COORDINATION WITH COMCAST
A. Comcast has jurisdiction over the fiber optic duct and coaxial system located along the west side of Brooklyn Avenue Northeast and within the project site. The Contractor shall closely coordinate its activities with Comcast.
B. Coordinate through the Resident Engineer for Comcast reviews of construction activities that will affect the utility.

1.12 COORDINATIONS WITH SEATTLE POLICE DEPARTMENT
A. Coordinate with Seattle Police Department for flagging at signalized intersections.
1.13 COMMUNITY RELATIONS

A. Sound Transit will establish a program of public contact for conducting effective relationships with communities and businesses in proximity to the construction areas. Do not initiate contact with the public without Resident Engineer or ST Outreach staff approval.

B. Jointly contact with Sound Transit those residents and business owners who might reasonably be expected to be affected by the construction and make known to them the name of the Sound Transit representative on the worksite with responsibility for community relations and explain to them the means by which the representative can be contacted expeditiously. Stay informed of problems caused by the construction. Post advance notice signs as necessary to inform public and surrounding businesses of upcoming construction activities.

C. Designate an on-site, community relations liaison with 24-hour on-call availability for the duration of the Contract. Community relations liaison duties include:
   1. Assisting Sound Transit in notifying adjacent owners of upcoming work.
   2. Assisting Sound Transit in responding to complaints.
   3. Attending public outreach meetings, as necessary. Meetings can include regular construction information meetings, quarterly open houses, media inquiries, tours, groundbreaking, and other milestone events.

D. Accommodate site tours. Tours shall be arranged through the Resident Engineer.
   1. [The contractor will submit for approval a plan to provide mandatory cultural awareness, anti-harassment, diversity, and sensitivity training, for all employees and subcontractors working on the site more than 10 hours a week. The training must be conducted by a certified trainer from an accredited institution with a minimum of two (2) years professional experience in cultural awareness, anti-harassment, diversity and sensitivity training. Refresher courses will be required for all employees on a yearly basis.]

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

3.01 EXHIBITS:

A. Central Link Track Access Permit Process
B. Track Allocation Request / Work Permit form
C. Sound Transit / King County - Support of Non-Operations form
D. Downtown Tunnel / Station Access Permit / Work Permit Request form

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION
   A. This Section includes specifications for project meetings prior to and during construction.
   B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
      1. Section 01 32 13, Scheduling of Work
      2. Section 01 45 00, Quality Assurance/Quality Control

1.02 SPECIAL MEETINGS
   A. Special meetings will be scheduled and conducted by Sound Transit throughout the course of construction as Sound Transit deems necessary.

1.03 PRECONSTRUCTION MEETING
   A. A pre-construction meeting will be scheduled and conducted by Sound Transit [on or before Notice to Proceed] [not more than [21] Days after the effective date of the Notice of Contract Award]. Attendance is required by the Contractor project manager, superintendent, and other necessary personnel. Sound Transit will provide written notice of this meeting not less than [four (4)] Days prior to the date of the meeting.
   B. At this meeting, Sound Transit will:
      1. Introduce Resident Engineer, governmental agencies, public and private utilities.
      2. Explain and discuss the responsibilities and authorities of the Resident Engineer.
      3. Discuss Equal Employment Opportunity (EEO), Small Business Enterprise (SBE), and affirmative action requirements along with the Community Relations functions.
      4. Discuss Community Relations functions.
      5. Discuss construction quality control requirements, as specified in Section 01 45 00, Quality Assurance/Quality Control.
      6. Discuss Contract quality assurance requirements.
      7. Discuss Safety Certification process requirements.
      8. Discuss Document Control and Management Systems requirements.
      9. Define and establish requirements for safety, first-aid, emergency actions, security, and full-time safety representatives.
10. Explain and discuss selected laws, codes, traffic regulations, and permit requirements of public agencies and their regulations.

11. Discuss procedures for processing Change Notices (CNs), Change Orders (COs), correspondence, Requests for Information (RFIs), shop drawings, submittals, product data, and samples.

12. Discuss monthly progress payments.

13. Discuss Construction Progress Meetings and bi-weekly Quality Control Meetings.

14. Discuss final payments.

15. Discuss project schedule

16. Discuss liquidated damages.

17. Discuss sustainability program.

18. Discuss Special Conditions

19. Introduce project representatives, and briefly describe each person’s responsibilities.

20. Distribute and discuss the list identifying major Small Business and Disadvantaged Business Enterprises (SBE and DBE) Subcontractors including their areas of responsibility.

21. Discuss use of office, streets, rights-of-way, haul routes, storage areas, staging areas, construction areas, and temporary easements.

22. Define housekeeping procedures.

23. Discuss construction means and methods.

24. Describe anticipated means and methods for worksite layout, erosion and sedimentation control plans, haul routes, noise abatement, vibration monitoring, air and water pollution control, excavation support systems, grading paving and fencing, site drainage, and street restoration.

25. Discuss coordination and notifications required for utility work and services.

26. Discuss deliveries and priorities of major equipment.

27. Discuss breakdown of schedule of values lump sum items.

28. Discuss construction progress schedule.

29. Discuss public safety measures.

1.04 CONSTRUCTION PROGRESS MEETINGS

A. Construction progress meetings will be scheduled and conducted by the Contractor and held each week during the period of performance of the Contract for the competent and timely execution of the Contract. Include representatives of Subcontractors who are or will be performing work during the current and following month in the progress meetings.

B. Distribute notices of these meetings before such meetings to Sound Transit and Subcontractors.
C. The agenda for construction progress meetings will be prepared by the Contractor and will generally include the following:

1. Introduce new attendees and areas of responsibility.
2. Review minutes of previous meetings, amend minutes if necessary, and accept minutes.
3. Discuss Construction Safety and report on any safety incidents as well as report on safety statistics.
4. Discuss Community Outreach
5. Discuss SBE/DBE Utilization and Apprenticeship Program issues
6. At each meeting, display and discuss the status of the Critical Path activities. If they are behind schedule, describe the methods intended to be used to bring these activities back on schedule.
7. Discuss corrective measures to maintain progress.
8. Discuss the Three-Week Look- Ahead Schedule submitted as specified in Section 01 32 13, Scheduling of Work, and last work plan for the previous period showing activities accomplished and those not completed in accordance with the prior submittal. Discuss the reasons for failure to complete the work as shown in the schedule and the methods to be implemented to complete the unfinished activities.
9. Confirm that all related submittals have a satisfactory disposition as "No Exceptions Taken" or "Exceptions as Noted – Resubmission Not Required" unless this is not in conjunction with the Readiness Review Meeting indicated in Section 01 45 00, Quality Assurance/Quality Control. If the submittal is "Exceptions as Noted – Resubmission Not Required", confirm that all comments have been implemented.
10. Discuss quality observations, audit or surveillance reports, failed tests, non-conformances, and employee work standards.
11. Discuss coordination of utility work.
12. Discuss utility strikes.
13. Discuss changed conditions, time extensions, and other relevant subjects as they affect the progress of the Work.
14. Discuss the status of Contract changes: new changes, status of negotiations, and completed changes.
15. Discuss Temporary Erosion and Sedimentation Control open items found on field inspection report.
16. Discuss the status of Requests for Information.
17. Discuss commissioning work progress and coordination.

D. Answers will be provided for each of the Contractor’s inquiries, requests for information, or requests for solutions of problems presented during such meetings, when possible, during the meeting itself; those not answered during the meeting will be answered, the
answer documented and presented by the Contractor no later than the next meeting. Sound Transit will record answers provided orally at the meetings in the minutes.

E. Review the minutes of the meeting prepared by Sound Transit and submit all requested corrections. Minutes will be prepared in action-item format with named responsible parties and dates for completion indicated for each item.

1.05 COORDINATED INSTALLATION PROGRAM (CIP) MEETING

A. CIP scheduled and conducted with the System-Wide Contractors to update progress and resolve interface issues.

B. Distribute notices of these meetings to attendees and RE. Frequency as necessary.

1.06 QUALITY CONTROL MEETINGS

A. Attend Quality Control Meetings every 2 weeks with Sound Transit's Representative, the Contractor's Quality Representative, inspectors and Third Parties (if required) to discuss Contract quality issues. Items discussed will be documented by the Contractor's Quality Representative and agreed upon Sound Transit's Representative with due dates for assigned action items. Minutes will be distributed to all attendees and other interested parties. At a minimum, the Quality Control Meetings shall cover topics of:

1. Construction Work Plans
2. Inspections
3. Test Plans, Procedures, and Test Results
4. Non-conformance Reports
5. Safety Critical submittals
6. Audit / Surveillance Findings
7. Off-site activities
8. Materials received
9. Special inspections and tests
10. Updates to As-built Contract Documents

1.07 PROGRESS PAYMENT MEETINGS

A. On the 25th of each month, or subsequent Monday if the 25th falls on a weekend, meet with the Resident Engineer to discuss the monthly progress payment.

1.08 CHANGE ORDER MEETINGS

A. Every two (2) weeks or as necessary, meet with the Resident Engineer to negotiate Change Orders.

1.09 CONSTRUCTION WORK PLAN READINESS REVIEW MEETINGS

A. Attend a Readiness Review Meeting after each Construction Work Plan has been accepted and before beginning associated work activities, as specified in Section 01 45 00, Quality Assurance/Quality Control.
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01 31 23.10
INTERNET BASED DOCUMENT MANAGEMENT SYSTEM

PART 1 - GENERAL

1.01 SUMMARY
A. This Section specifies an Internet-based document management system, the Selected Software required for use by the Contractor and Sound Transit for collaboration, and communications of all Contract related work.

B. Related Sections:
   1. The requirements of this Section are applicable across all Sections of the Contract Documents. Unless otherwise indicated, the Contractor will be responsible for utilizing the Internet-based document management requirements of this Section for all document communications with Sound Transit.

   2. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
      a. Section 01 45 00, Quality Assurance/Quality Control
      b. Section 01 78 23, Operation and Maintenance Data
      c. Section 01 78 39, Project Record Documents

1.02 REFERENCES
A. Sound Transit:
   1. Document Control Desktop Instructions For Construction Contractors Using a SharePoint Collaboration Portal ("Document Control Desktop Instructions").

1.03 SUBMITTALS
A. Initial and Updates of User Identification Information.
B. Proposed schedule of attendance for the Selected Software training sessions.
C. Signed verification that all users have attended Selected Software training provided by ST Document Control.

1.04 DEFINITIONS
A. Document Communication(s):
   1. All documentation and communications required by the Contract Documents including, but not limited to: correspondence, reports, notices, submittals, transmittals, Requests for Information (RFI's), Requests for Change Order, payment applications, Change Orders, claims, change proposals, field directives, meeting agendas, meeting minutes, requests for substitution or deviation, Value Engineering (VE) Change Proposals (VECP), test reports, monitoring reports,
Punch Lists, sketches, product data sheets, and all other formal Contract communications, regardless of medium or physical characteristics.

2. Documents required by the Contract that include written documents, demands, instruments, or directives, unless otherwise indicated in this Section.

B. Electronic Documents:

1. The electronic form or image of document communications that can be stored on and retrieved from an electronic storage device through a collaboration system over the Internet or stored on and retrieved from a CD, DVD or other portable electronic storage device.

2. Includes all written and graphic products produced with computer software or converted to electronic form or electronic image by computer software.

C. Notice:

1. As defined in the Contract.

2. The date captured in the metadata of the Selected Software once a document has been uploaded and distributed (‘checked in’) to the other party; i.e., the ‘modified’ date on the first version of the document transmitted.

3. For submittals or other documents that are not legible, not usable in the electronic format submitted via the IBDMS, or not sufficient for review (i.e., stamped shop drawing), the date of receipt of the hard copy serves as the “notice”.

D. The Selected Software:

1. Utilized by Sound Transit is Microsoft SharePoint, an internet-based document management system. (More information about Microsoft SharePoint is currently available at: http://sharepoint.microsoft.com)

2. Is a document management system for document workflows, communication, collaboration, storage, retention and archiving.

3. Serves as a primary source for project information for communication and collaboration among all project participants by automating various tasks in an organization of modules.

4. Provides secure, permissions-based access requiring the identification of all users and their approved permission levels.

E. Document Control User Instructions: The Document Control Desktop Instructions for the Selected Software demonstrates the modules in the software program and instructions on the use of the modules.

F. Snapshot:

1. A read-only archive of select document data (metadata) on a compact disc (CD) or digital video disc (DVD) medium that is independent of the Selected Software application.

2. Includes only selected document data (metadata) in the Selected Software at the time the Snapshot is produced. Does not include access to the documents, only the metadata.

3. Data contained on the Snapshot is static such that no edits can be made to the data.
4. Provides an archive of document data and allows permanent access to the data after the Selected Software user accounts are no longer available.

1.05 SUBMITTALS

A. Submit the following user identification information for each proposed authorized software user within 10 Days of the effective date of the Notice to Proceed:

1. Name, initials, title, and company affiliation.
2. Work address, phone number, fax number, and email address.
3. Specific job-related functions.
4. Level of authority within the Contractor’s organization.
5. Level of authority requested for each user, for access and use of the Selected Software modules (Read Only or Contribute).
6. Date at which the Selected Software access is required for each individual.

B. Submit an updated list of authorized users as needed, when new users need to be added.

C. Submit request for user access to be rescinded as soon as possible when a user leaves the project or the Contractor determines a user should no longer have access.

1.06 DOCUMENT COMMUNICATIONS

A. Submit and process all Document Communications using the Selected Software, the primary written communication tool for all Document Communications. Deliver any Document Communications that have physical characteristics that cannot be uploaded into the Selected Software to Sound Transit with a transmitting document. Upload the transmitting document into the Selected Software. Unless otherwise indicated, no other form of written Document Communication will be recognized.

B. Submit scanned documents of machine quality (not rescans) unless the original exists in no other form than a copy.

C. Submit documents in PDF format as a single file, unless there is a specific requirement to provide a document in its original format (example: Construction Schedule(s) in native file format), or the single file size is too large to upload to the Selected Software.

D. PDF files may not contain embedded or attached files or documents of any file type.

E. In instances where a record is required in native file format, the native file will be uploaded to the Selected Software as a separate record from the PDF containing the remainder of the submittal. In instances where multiple files are required due to the file size, each of the files will be uploaded to the Selected Software as a separate record in PDF format.

1. If multiple files are required due to the size of the file(s), or due to a requirement to submit a document in its original, native format, each of the files will be submitted under the same correspondence number followed by a unique sequential alphabetic character at the end of the correspondence number for each of the files (Example: U230-CRE-00239, U230-CRE-00239A, U230-CRE-00239B etc.). The Correspondence Name will include the correspondence number followed by the alphabetic character.

2. When possible, convert documents directly from the original format to PDF.
3. Scan black and white documents in black and white format (not color or grey scale) at 300 dpi with Optical Character Recognition (OCR) applied.

4. Where color is required, scan color documents at the lowest resolution possible, with Optical Character Recognition (OCR) applied.

5. For documents with multiple formats (color and black and white pages), scan each page using the methods described above for each type.

F. Do not submit certified payrolls or other document communications which contain private information (such as individual social security numbers, taxpayer identification number, birth date, name of a person known to be a minor, or financial account number) via the Selected Software. Submit a hard copy/paper copy of the transmittal and documents. Submit only the transmittal using the Selected Software.

G. Do not submit emails using the Selected Software. Do not use emails for transmitting official Document Communications, except in the event the Selected Software is temporarily unavailable or not functional, in accordance with Section 1.07G.

H. Use of Selected Software shall not relieve the Contractor of its obligation to provide Sound Transit with hard copies as specified.

I. This Section shall not relieve obligations to provide Sound Transit with Record Drawings in the physical form specified in Section 01 78 39, Project Record Documents.

J. Document Communications and requirements of the Contract that are not to be implemented through the Selected Software are as follows:

K. Notice to Proceed: Delivered in written form as a paper document.

L. Notice of Termination or Suspension: Delivered in written form as a paper document in accordance with the General Conditions.

M. Exceptions noted in specific Sections of the Contract.

N. Substantial Completion: Delivered in written form as a paper document in accordance with the General Conditions.

O. Final Acceptance: Delivered in written form as a paper document in accordance with the General Conditions.

1.07 ACCESS REQUIREMENTS

A. Maintain Contractor’s list of authorized users to reflect current authorized users of the Selected Software. Contractor’s list of authorized users may include Subcontractors and suppliers, as appropriate, to improve communications and coordination within the Contractor’s team.

B. Protect the security of the Selected Software system by limiting access to authorized users only. Take appropriate precautions to maintain the security of the system. Immediately notify the Resident Engineer of all changes to the list of authorized users.

C. Access will only be permitted to certain modules, in accordance with permission levels configured by the Selected Software administrator.

D. Contractor user access rights to the Selected Software site will be restricted to the software site for this Contract only. All user access rights will be rescinded at the end of the Contract.

E. Access permission levels will be established by agreement with the Resident Engineer.
F. Sound Transit reserves the right to deny any user access to the Selected Software.

1.08 USE REQUIREMENTS

A. Use and implement the Selected Software in accordance with the Document Control Desktop Instructions and Sound Transit Records Management training, which will be provided to Contractor-selected staff following Notice to Proceed, and on an as-needed basis for new users.

B. Follow Sound Transit standard document naming and numbering conventions identified in the Contract Documents, Document Control Desktop Instructions and Sound Transit Records Management training.

C. The Selected Software is used for collaboration, for written Contract communication and to record Contract documentation and workflow.

D. Abide by all policies, procedures, and standards established by Sound Transit for the use and application of the Selected Software.

E. Comply with applicable laws and regulations regarding electronic transmission of documents requiring professional engineering stamps or signatures, including provision of hard copies of such documents as appropriate.

Document Communications that require the signature of authorized persons will use an electronic copy or electronic image of a fully executed document containing the required signatures, with submittal of the original signed hard copy/paper document. An approved “image” of the official signature affixed to the document can be used as the electronic record for the Selected Software only when the original hard copy/paper document is provided with an original wet-ink signature on the document.

F. In the event the Selected Software system is temporarily unavailable or not functional (downtime):

1. Notify Sound Transit by telephone or email that the Selected Software is unavailable or not functional.

2. Continue transmitting and receiving Document Communications utilizing other electronic means (email) or hard copies. Maintain records of all Document Communications during the Selected Software downtime and upload the records to the Selected Software when it is operational.

1.09 TRAINING

A. Submit a proposed schedule of attendance for the Selected Software training sessions.

B. It is mandatory that each authorized Selected Software user attend all training sessions as requested prior to use. Submit signed verification of attendance for these sessions.

C. Be responsible for all costs of attendance by the Selected Software users at training sessions.

D. Notify Resident Engineer when new user access and training is required.

1.10 DOCUMENT MANAGEMENT SYSTEM REQUIREMENTS

A. Provide computer hardware and software that meet the requirements of the Selected Software at both field office and home office location(s) where Document Communications on this Contract are generated or processed.
B. Modifications:

1. The Selected Software is continually modified and improved in order to enhance the product and provide additional functionality.

2. The Selected Software has many methods of alerting clients to changes and providing support to the end users.

C. Software, hardware, and Internet access:

1. Minimum software requirements are as follows:
   a. A 32-bit operating system such as Windows XP SP3 or later. Recommend Windows 7.
   b. Internet Explorer Version 8.0 or later.
   c. A business productivity application such as Microsoft Office 2007 or 2010. Recommend Microsoft Office 2010.
   d. A document capture software including optical character recognition (OCR) capabilities, such as Kofax Virtual Re-Scan (VRS) for automated image cleanup.
   e. Adobe Acrobat Professional or Standard 9.0 or later.

2. Minimum hardware requirements are as follows:
   a. Pentium-based (or equivalent) workstation or laptop with a minimum of 1 GB of RAM. Recommend 2 GB RAM.
   b. Recommend hard disk storage space of 85 GB.
   c. Dual core processors
   d. A scanning device with OCR capabilities, capable of scanning a minimum of 11-inch x 17-inch color document into electronic Portable Document Format (PDF) with a minimum density of 300 dpi.
   e. Minimum internet access requirements are as follows:
   f. Broadband connection using Integrated Services Digital Network (ISDN), Digital Subscriber Line (DSL), or better.

3. Minimum internet access requirements are as follows:
   a. Broadband connection using Integrated Services Digital Network (ISDN), Digital Subscriber Line (DSL), or better.
   b. Be responsible for all costs associated with the installation, maintenance, and upgrade of the hardware, software, and Internet access for the duration of the Contract.
   c. Software necessary to create documents in format compatible with and modifiable by the Selected Software or to convert non-electronic documents to such formats. Compatible formats include: Word [2010], Excel [2010], an AutoDesk format modifiable by AutoCAD Map 3D [2011], and Adobe Acrobat X (PDF). Allow for [two] version-upgrades to each software application during the life of the contract.
1.11 RESTRICTIONS AND LIMITATIONS

A. For Document Communication purposes, Business Days and hours are defined as Monday through Friday, 8:00 AM to 5:00 PM, Pacific Time, excluding Sound Transit’s holidays.

B. All Document Communications submitted to Sound Transit through the Selected Software after 3:00 PM, Monday through Friday, will be acknowledged no earlier than the following Business Day.

1.12 SOUND TRANSIT RESPONSIBILITY

A. Provide the Contractor with the Document Control Desktop Instructions within 7 Days of the effective date of Notice to Proceed.

B. Provide Contractor user access to the Selected Software system for the duration of the Contract.

C. Manage the permissions level for all users of the system.

D. Provide the Selected Software training for each authorized user identified by the Contractor.

E. Provide the Selected Software licenses to use the project database for the duration of the Contract.

F. Provide technical support (administration) for the Selected Software through Sound Transit Information Technology group and/or the Selected Software system vendor, who will act solely through and at the request of Sound Transit.

G. Provide guidelines regarding the organization and format of the Selected Software modules and the access permission requirements for each module or element thereof.

H. Allow users to upload, download, and view document communications, and enter or update document data (metadata) as needed, based on permissions.

I. Track history of revisions and activities for documents submitted or managed within the Selected Software, as appropriate.

J. With the prior approval of Sound Transit, exceptions may be made to allow specific items to be transmitted, submitted, responded to, or distributed in hard copy only. In these instances, use the Selected Software to track and expedite processing of these items.

K. At Final Acceptance, Contractor may request a Snapshot from the Selected Software. The Snapshot will include only the document data (metadata) that the Contractor had access to during the Contract.

L. When notified by the Contractor, Sound Transit will deny unauthorized users access to the Selected Software.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY
A. This Section defines the requirements for the Contractor to establish, implement and maintain an effective Document Control and Records Management Program.

1.02 SUBMITTALS
A. Within [five (5)] Business Days of issuance of the Notice to Proceed, the Contractor and the Resident Engineer each designate, and transmit in writing, their respective authorized representatives to receive copies of all or specified correspondence.

B. Within 15 Business Days after the effective date of the Notice to Proceed, the Contractor will submit a Document Control Plan.

1.03 DEFINITIONS
A. Records are defined as documentation required by the Contract. Records include, but are not limited to: Contract Documents, correspondence, email, drawings, shop drawings, specifications, technical reports, Subcontractor documentation, schedules, submittals, test reports, calculations, photographs, progress reports, as-built documents, requests for information (and their responses), certificates of compliance, pay requests, change documents, administrative documents and quality records, generated under the Contract.

B. Quality Records are any Contract documentation that documents or reflect the quality of the products of the Contract. This includes, but is not limited to, inspection and test reports, quality audit and surveillance reports, mill test reports, certificates of compliance, personnel qualifications and certifications, non-conformance reports, corrective action reports, failure analysis reports, instrumentation calibration reports and punch lists.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 DOCUMENT CONTROL

1. Document Control Plan: Prepare and maintain a Document Control Plan detailing the control of receipt, status, maintenance, and transmittal of Contract records and documents using the Internet Based Document System in Section 01 31 23.10, Internet-Based Document Management System and consistent with the Document Control Desktop Instructions for Construction Contractors. The Document Control Plan will address, at a minimum, the following:

2. Detailed methods for storage and recording of electronic and hard copy project records including, but not limited to: correspondence, drawings, progress reports, technical reports, as-built records, specifications, Contract Documents,
submittals, calculations, email, photographs, quality records, Subcontractor
documentation, and administrative documents generated under the Contract.

3. Detailed methods for technical document control, document identification,
storage, access to records, version control and retrieval methods for both hard
copy and electronic records (including email).


5. Detailed processes of controlling documents in draft, finalized documents for
construction, and documents representing final as-built conditions.

6. Detailed Disaster Preparedness and Recovery Plan, including methods to
safeguard records from damage, deterioration, and loss, to maintain backup
records, and to recover records in the event of damage, deterioration and/or loss.

B. Document Control System:

1. Establish a document control system to store and record the large quantity of
electronic and hard copy project records, as defined above.

2. Provide technical document control, storage, and retrieval methods for both hard
copies and electronic records.

3. Do not change or alter Contract records or documents without Resident
Engineer’s written approval.

4. Identify and maintain records and documents in an organized manner.

5. Provide access, identify and control of document versions, including drafts, final
versions, and revisions.

6. Provide technical document control of project record documents

7. Establish correspondence routing, filing, control, and retrieval methods that are
compatible with the Internet-Based Document Management System.

8. Provide access to current revisions of procedures, instructions, Contract
Drawings, and other documents to Sound Transit, appropriate personnel,
Subcontractors and suppliers on a timely basis, ensuring that all parties are
working from current documents.

9. Protect records and documents from damage, deterioration, and loss and
maintain backup records to facilitate restoration of records in the event of
damage, deterioration and/or loss.

   a. Store hard copy records in fireproof cabinets at the Contractor’s work-site
   and maintain a duplicate set at another location. The off-site duplicate
   set may be an electronic image format (i.e. PDF).

   b. Store electronic records on a secure server(s). Back up electronic
   records daily. Store electronic records backup(s) off-site at a secure
   location. Backup storage may be accomplished using a variety of
   medium, including external storage (CDs, DVDs, tapes, microfiche,
   external hard drives) or on a secure, off-site server. Store in an
   environment with appropriate temperature and humidity controls for the
   storage method and media. Ensure equipment and software capable of
storing, reading and reproducing the stored electronic records is available in the event of a disaster.

10. Maintain and retain all records in accordance with the Contractor's Document Control Plan and ST Document Control requirements.

C. Document Preparation and Submission:

1. Contractor designee is to address all project correspondence to the Resident Engineer.

2. Each correspondence package must be submitted as a stand-alone item. Examples: An RFI and a submittal should not be submitted in the same package. Safety Toolbox Meetings should not be submitted with Accident/Incident Reports.

3. Only one subject is to be addressed in a letter / transmittal, and the subject must be clearly identified on the letter / transmittal.

4. All correspondence must reference the Project Name, Procurement Number, Contract Name (and Contract Number e.g. U250), along with the specific subject of the letter. For all replies, refer specifically to prior correspondence to which they relate.

5. Contractor to Resident Engineer Correspondence:
   a. Serialize all correspondence to the Resident Engineer, using the following format:

      | Contract Identifier No: | U250    |
      | Prefix:                | CRE     |
      | Serial No (start at 00001): | XXXXX  |
      | Example:              | U250-CRE-00001 |

6. Resident Engineer to Contractor Correspondence:
   a. Sound Transit will include a sequential “REC” number on all correspondence from the Resident Engineer to the Contractor as follows:

      | Contract Identifier No: | U250    |
      | Prefix:                | REC     |
      | Serial No (start at 00001): | XXXXX  |
      | Example:              | U250-REC-00001 |

7. Maintain separate incoming (REC) and outgoing (CRE) correspondence logs. Periodically compare and reconcile CRE and REC logs, as well as any other logs being maintained to manage the project.

8. In addition to the sequential correspondence serial number, ST has established standard naming and numbering conventions in the Document Control Desktop Instructions for Construction Contractors. The following document types must be sequentially numbered and named, as shown in the following examples:
Contractor Request for Change (RFC)  RFC 006 Description
Change Notice Work Directive (CNWD)  CNWD 014 Description
Change Notice Request for Proposal (CNRFP)  CNRFP 022 Description
Change Order (CO)  CO 002 Description
Field Clarification (FC)  FC 00002 Description
Notice of Intent to Claim (NIC)  NIC 007 Description
Request for Information (RFI)  RFI 00017 Description
Request for Substitution (RFS)  RFS 005 Description

When a supplemental RFI is necessary to clarify an RFI and response, number the supplemental RFI’s the same as the original RFI, followed with an alpha character (sequentially assigned if more than 1 supplemental RFI is needed):

<table>
<thead>
<tr>
<th>Initial RFI</th>
<th>U250 RFI 00017 Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplemental #1</td>
<td>U250 RFI 00017A Description</td>
</tr>
<tr>
<td>Supplemental #2</td>
<td>U250 RFI 00017B Description</td>
</tr>
</tbody>
</table>

9. Submittals: Identify with Contract Specification number, paragraph, and sub-paragraph followed by sequential submittal number, and review cycle. For example:

<table>
<thead>
<tr>
<th>Specification section:</th>
<th>Section 014500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section sequential numbering (starting at 001):</td>
<td>XXX</td>
</tr>
<tr>
<td>Review cycle number (starting at 001):</td>
<td>XXX</td>
</tr>
<tr>
<td>Paragraph:</td>
<td>3.10</td>
</tr>
<tr>
<td>Sub-paragraph</td>
<td>A</td>
</tr>
<tr>
<td>Description of the submittal</td>
<td>Description</td>
</tr>
<tr>
<td>Example:</td>
<td>U250-CRE-00016 014500-001.001 3.10A Description</td>
</tr>
</tbody>
</table>

When a supplemental submittal is necessary, number the supplemental submittal the same as the original submittal, followed with an alpha character (sequentially assigned if more than 1 supplemental submittal is necessary):

<table>
<thead>
<tr>
<th>Initial Submittal</th>
<th>014500-001.001 3.10A Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplemental #1</td>
<td>014500-001.001A 3.10A Description</td>
</tr>
<tr>
<td>Supplemental #2</td>
<td>014500-001.001B 3.10A Description</td>
</tr>
</tbody>
</table>

10. Photo Naming Convention for Contractor digital photos:

a. Apply the following standard naming convention to all Contractor digital photographs:

<table>
<thead>
<tr>
<th>Contract Identifier No:</th>
<th>U250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photographer Initials</td>
<td>KAB</td>
</tr>
<tr>
<td>Date</td>
<td>mm-dd-yy</td>
</tr>
<tr>
<td>Description of Photo Subject</td>
<td>Description</td>
</tr>
<tr>
<td>Example:</td>
<td>U250-Contractor-KAB 03-10-10 Concrete Pour Pier 1</td>
</tr>
</tbody>
</table>

b. Maintain a list of photographers and photographer’s initials.

11. Sequential numbering of Non-Conformance Reports:

a. Number NCRs as follows:
12. ST may identify additional naming and numbering conventions for additional document types as necessary.

3.02 HARD COPY DOCUMENTS

A. Provide Sound Transit with a hard copy (paper-based copy) of each Document Communication for which there is a hard copy source document, photograph, map or drawing which is either scanned or otherwise converted to electronic form or electronic image by computer software.

B. For submittals or other documents that are not legible or usable in the electronic format submitted via the IBDMS, or not sufficient for review (i.e. stamped shop drawing), hard copy submission is required.

C. Do not destroy paper-based Document Communications, even if the Document Communication has been converted to an imaging system and transmitted through the Selected Software, and the hard copy is not required to be submitted to ST.

D. Hard copies are required for the following:

1. Any document requiring a wet signature.
2. CRE (Correspondence from Contractor to RE, signed and sequentially numbered by CRE#).
3. RFC: Signed RFC.
4. CNRFP.
   a. Signed CNRFP.
   b. Signed Contractor Cost and Schedule Proposal.
5. CNWD.
   a. Signed CNWD.
   b. Signed Contractor Cost and Schedule Proposal.
6. CO.
   a. Signed CO.
   b. Signed Contractor Cost and Schedule Proposal.
10. Certified Payroll: Signed payrolls and backup documentation. (Certified payrolls are NOT to be submitted electronically.)

11. VECP: Signed VECP

12. RFS: Signed Request for Substitution package.

13. FC: Signed Field Clarification.

14. Submittal: Signed (stamped, if applicable) transmittal and submittal package.


16. Project Record Documents: Signed, red-lined project record documents.

17. Operations and Maintenance Manuals

18. Other documents identified elsewhere in the Contract.

3.03 EMAIL DOCUMENTS

A. Email is a convenient communication method between parties. However, it is not be used as a substitute for formal, official communication between the Contractor, Sound Transit and its representatives. Contractor use of email does not waive the requirement to submit documentation through the IBDMS and/or in hard copy, and does not meet the requirement for contractual notice.

B. All project documents submitted via email need to follow the standard naming convention in the subject line:

1. Contract # followed by the document type sequential number and description.
   a. Example: UXXX RFI 00047 Wall 32

C. Email that does not address a document type requiring sequential numbering and standard naming, the email subject line needs to begin with the Contract # (e.g., UXXX).

3.04 AUDITS

A. In accordance with General Conditions Section 3.04, Audit Access to Records, Sound Transit, State of Washington or Federal Agencies may audit Contractor records.

B. Sound Transit will periodically audit Contractor’s document control system in accordance with the Contractor’s Document Control Plan and ST Document Control requirements.

C. Make available and provide copies of all record documentation to Sound Transit for audits, assessments and surveillances performed by Sound Transit, State of Washington or Federal Agencies upon request.

D. Facilitate audits, assessments, and surveillances performed by Sound Transit, the State of Washington and Federal Agencies by providing access to its facilities, personnel, and records.
E. Respond to audit, assessment, and surveillance report findings with corrective actions that have, and are to be taken, to correct non-conforming conditions and provide preventative actions that have and are to be taken to prevent a recurrence of the non-conforming conditions. Document the root cause of the non-conforming conditions and provide corrective and preventive actions to the Resident Engineer within 10 Days of the issuance date of the audit, assessment or surveillance report. Document the dates of implementation of the corrective and preventive actions in the response. Failure to provide this information within 10 Days will result in a reduction of the amount approved for payment for the affected Work on the next payment. Provide copies to Sound Transit of record documents as requested during audits or surveillances.

END OF SECTION
SECTION 01 32 13
SCHEDULING OF WORK

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for the preparation, revision, and submittal of cost loaded Contract Critical Path Method (CPM) Schedule.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 01 11 00, Summary of Work.
2. Section 01 12 16, Work Sequence.
3. Section 01 31 14, Coordination with Others.
4. Section 01 31 23.10, Internet-Based Document Management System.
5. Section 01 91 13, General Commissioning Requirements.

1.02 DEFINITIONS

A. Scheduler: The individual or entity assigned by Contractor the responsibility for the development, preparation, and management of all required CPM schedules and submittals.

B. Float: The number of Days by which a work activity identified in the construction schedules could be delayed from its “early start date” until the date upon which the work activity would become a critical path activity.

1.03 SOFTWARE REQUIREMENTS

A. The scheduling software that is utilized by Sound Transit is Primavera Project Management P6 Release 7 by Oracle. In order to insure 100% compatibility with Sound Transit, the contractor shall use the same program, revision number and service pack.

B. The Contractor shall maintain and provide a computer generated log report listing all the changes made between every submitted schedule and its last submitted predecessor schedule using the Claim Digger schedule comparison module provided in Primavera Project Management software bundle.

1. As a minimum this report will show changes for:

a. Added and deleted activities, original durations, remaining durations
b. Activity percent complete, total float, actual Starts/Finishes
c. Calendars, activity descriptions, constraints (added, deleted or changed)
d. Budgeted and total to date contract earnings
e. Added/deleted Relations, changed driving relations
f. Changed relation lags, change critical status

1.04 SUBMITTALS

A. Formats for Submittals:

1. Hard Copy Formats

a. Preliminary Baseline CPM Schedule and Contract CPM Baseline Schedule: Time-scaled network diagram; clearly indicating critical activities; sheets no smaller than 11 inches by 17 inches using landscape orientation.

b. Monthly CPM Schedule Update and Monthly Status CPM Schedule: Time-scaled network diagram, clearly indicating critical activities; sheets no smaller than 11 inches by 17 inches using landscape orientation.

c. Three-Week Look-Ahead Schedule: Sheets no larger than 11 inches by 17 inches and no smaller than 8-1/2 inches by 11 inches using landscape orientation.

d. Schedule Narratives: Medium 8-1/2 inches by 11 inches in size. Charts may be submitted in a medium up to 11 inches by 17 inches in size for reports.

e. Monthly Progress Status Report: Medium 8-1/2 inches by 11 inches in size. Charts may be submitted in a medium up to 11 inches by 17 inches in size.

2. Electronic Copy Format

a. Preliminary Baseline CPM Schedule, and Contract CPM Baseline Schedule: Electronic backup file in its native form (.XER) and in .PDF format.

b. Monthly CPM Schedule Update and Monthly Status CPM Schedule: Electronic backup file in its native form (.XER) and in .PDF format.

c. Monthly Progress Status Report and Schedule Narrative: Electronic file in its native form (.doc) and in .PDF format.

d. For each Claim Digger report described in 1.03 submit one (1) electronic HTML file and one (1) electronic .csv.

B. Schedule submittals, as stated and in accordance with Section 01 31 23.10, Internet-Based Document Management System and Section 01 91 13, General Commissioning Requirements:

1. Preliminary Baseline CPM Schedule and Contract CPM Baseline Schedule: One (1) paper copy, two (2) electronic copies (native file and .PDF) and narrative. Submit at Notice to Proceed (NTP).

2. Monthly Status CPM Schedule: One (1) paper copy, two (2) electronic copies (native file and .PDF) and narrative. Submit no later than the 5th of each month.
3. Monthly CPM Schedule Update: One (1) paper copy, two (2) electronic copies (native file and .PDF) and narrative. Submit no later than the 5th of each month.


C. Monthly Progress Status Report: One (1) paper copy, two (2) electronic copies (.doc and PDF). Submit no later than the 5th of each month.

D. Conform to the same requirements as the original submittals for all re-submittals.

1.05 GENERAL

A. Designate a full time scheduler who will be responsible for the development, preparation, and management of all required CPM schedules. The designated Scheduler/s shall have at least five (5) years of prior experience developing, creating, managing, and reporting on schedules of similar size and complexity to this contract and experience in the designated scheduling software system. Submit a resume outlining the qualifications of the Scheduler to Sound Transit for review at the Pre-Construction Meeting. Should the Scheduler leave the employ of the Contractor, leave the Project, or Sound Transit find the Contractor's Scheduler to be lacking in qualifications or experience the contractor must find a replacement meeting all original qualification requirements within 30 Days. Progress payments will not be processed or authorized until an acceptable Scheduler is provided.

B. Within 14 Days after (NTP) the contractor shall schedule and conduct a pre-scheduling conference with Sound Transit to commence the development of the contract baseline CPM schedule. The preliminary baseline CPM schedule and the requirements of this section will be reviewed at this meeting. The contractor shall be prepared to discuss methodology for the schedule development and sequence of operations, cost loading and resource loading methodology that will provide early and late cash flow curves.

C. Schedules shall represent a practical and logical plan to complete the work within the Contract time, and convey the plan to execute the work.

D. Be responsible for the scheduling and execution of construction in accordance with the Contract Documents.

E. The submittal of schedules shall be understood to be the Contractor's representation that the schedule meets the requirements of the Contract Documents and that the work will be executed in the sequence and duration indicated in the schedule.

F. The contractor shall certify in writing and signed by major subcontractors that the preliminary 90 Day baseline CPM schedule and the contract baseline CPM schedules have been discussed in detail with all subcontractors and major suppliers as it relates to their respective work, and a copy of the certificate submitted to Sound Transit.

G. Failure to include any element of work required for performance of the Contract or failure to properly sequence the work shall not excuse the Contractor from completing all work with the Contract Time.

H. All schedule submittals, excluding monthly progress reports, are subject to Sound Transit acceptance. Sound Transit retains the right to withhold appropriate monies (up to the full value of the progress payment) from each progress payment until the Contractor submits the schedule(s) required in accordance with these provisions.
I. No payments shall be made prior to the submittal of an acceptable Contract Baseline CPM Schedule. The Contract Baseline CPM Schedule cannot be accepted prior to approval of the Schedule of Values.

J. Use the “Retained Logic” preference for scheduling activities.

K. Develop all schedules utilizing industry standard ‘best practices’ including, but not limited to:
   1. All Activities shall have at least one (1) predecessor and one (1) successor, except project start and finish.
   2. All Activities must have a finish successor (FF) or (FS).
   3. Maintain a majority of Finish to Start Relationships.
   4. No use of constraints other than those defined in the Contract Documents without the prior approval of Sound Transit.
   5. No negative leads or lags.
   6. No excess leads or lags without prior justification and approval from Sound Transit.

L. Ensure that all individual construction activities do not exceed 14 Business Days in duration without prior approval of Sound Transit. Subdivide activities exceeding 14 Days in duration to an appropriate level of detail.

M. Subdivide all concrete activities, as a minimum, into formwork, rebar placement, concrete placement and finish sub-activities, and curing periods.

M. Sufficiently describe schedule activities to include what is to be accomplished in each work area. Express activity durations in whole Days. Clearly define work that is to be performed by Subcontractors.

N. Create all schedules in conformance with the work-hours, constraints, and Activity Code Structure, set forth in these Contract Documents.

O. Project Calendars
   1. Work Calendars shall adhere to contract specifications.
   2. Each activity in the schedule shall adhere to a calendar appropriate for the work type.
   3. Calendars shall be maintained at a project level.
   4. Calendar coding structure shall utilize the contract ID #. Example – N140 – 7 day 24 hour.

P. WBS Structure
   1. Project WBS Structure shall provide at a minimum the following:
      a. Pre-Construction.
      b. Construction:
         1) Milestones.
2) Structure:
   a) Work Type.
   b) Etc.

3) Rough In.

4) Finishes.

c. Post-Construction.

2. WBS Structure shall be submitted by the contractor for Sound Transit review at the preconstruction scheduling meeting.

Q. Activity Code Structure:

1. Global codes and EPS codes are not to be used unless approved by ST.

2. Activity Codes shall be maintained at a project level.


4. Each activity shall be identified with codes including as a minimum:
   a. The party responsible for performing the work.
   b. Subcontract Package
   c. The Construction Specifications Institute (CSI) classification associated with the work.
   d. Phasing of the Work in accordance with the Contract Documents and associated milestones.
   e. Area or location of the work.
   f. Cost and resource coding as set forth in these Contract Documents.

R. Cost and Resource Loading:

1. All schedules, with the exception of the Preliminary Baseline Schedule and Three-Week Look-Ahead Schedules are required to be cost-loaded, cost-coded (cost accounts) and resource-loaded.

2. Submit and receive approval of the Schedule of Values allocating the total Contract Cost, along with the Baseline Schedule. The approved Schedule of Values shall be used as the basis for progress payments. Payment for Work shall be made only for and in accordance with those items included in the Schedule of Values.

3. Coordinate items of the Schedule of Values so that there is a corresponding item in the Construction Schedule. The sum of all identical cost-codes shall correlate with individual line items in the Schedule of Values.

4. Change Orders and Provisional Sums are to be added as separate items to the Schedule of Values as they are approved by Sound Transit.
5. Resource identifier for costs shall utilize the contract ID #. Example N150 – Costs.

6. Update cost-loading monthly with modifications made to the cost-loading taking into account actual payment requests, additions, deletions or revisions to activities in the Updated Monthly CPM Schedule.

7. Contractor construction activities are required to be resource-loaded with estimated labor, material, and equipment.

8. Expense Items shall not be utilized for cost loading or resource loading.

1.06 PRELIMINARY BASELINE CPM SCHEDULE

A. Within 14 Days after Notice to Proceed (or Limited NTP), the contractor shall submit a CPM Schedule covering the complete contract work.

1. The purpose of the preliminary baseline CPM schedule is to depict the detailed work activities for the first 90 Days following Notice to Proceed (or Limited NTP). Subsequent activities can be in more summary-level detail. The schedule will assist and serve as the basis of payment between Limited Notice to Proceed and the submittal and acceptance of the Contract Baseline CPM Schedule.

2. Include with the submittal a written narrative that describes the schedule in detail, and the approach to the work that will be employed during the initial 90-day period of the contract.

3. Include all submittal and fabrication activities required to supply construction for the duration of the contract.

4. Indicate on the schedule diagram a clearly defined critical path.

5. If, in the opinion of the Resident Engineer, the schedule is determined to be impractical or not in compliance with the contract documents, the contractor shall revise the schedule and resubmit within seven (7) Days.

1.07 CONTRACT CPM BASELINE SCHEDULE

A. Submit a Contract CPM Baseline Schedule covering the complete Contract, 60 Days following the Notice to Proceed.

B. If in the opinion of the Resident Engineer the schedule is determined to be impractical or not in compliance with the Contract Documents, revise the schedule and resubmit within seven (7) Days.

C. Show clearly on the Contract Schedule the sequence and interdependence of activities and subcontract packages and list specifically:

1. Delivery of Sound Transit-furnished equipment, if any.

2. Inspection of the work including punch list and Acceptance.

3. Work to be performed by other agencies or utilities that affect the schedule.

4. Acquisition of construction permits.

D. Indicate on the schedule diagram a clearly defined critical path.
E. Include with the Schedule submittal a detailed written narrative describing the approach and methods for completion of the work. Include all assumptions and specific schedule risks identified in development of the schedule. Use understandable narrative that conveys schedule information to Sound Transit.

F. A Contract CPM Baseline Schedule showing the work completed in less than the Contract time, which is found practical by Sound Transit, shall be considered to have float (in addition to Sound Transit controlled float). Impractical early-completion schedules will not be accepted by Sound Transit. The float shall be the time between the scheduled completion of the Work and the Contract completion date.

1.08 MONTHLY STATUS CPM SCHEDULE

A. Submit a Monthly Status CPM Schedule.

B. The Monthly Status CPM Schedule shall be the prior month’s Monthly CPM Schedule Update with all actual progress, resources and cost included.

1. The current schedule shall be the later of:
   a. The Contract CPM Baseline Schedule (prior to submittal and acceptance of the first Monthly CPM Schedule Update);
   b. The most current approved Monthly CPM Schedule Update.

C. The Monthly Status CPM Schedule shall have a data date (status) as of the last day of the corresponding month (i.e., for schedules submitted at the beginning of February 2012 the data date shall be 31 January 2012).

D. Incorporate accurate, actual progress, start dates, completion dates, resources and costs so that the Monthly Status CPM Schedule will act as the Project’s As-Built schedule.

   1. If requested provide documentation to substantiate as-built information.
   2. No actual start or finish dates shall be changed or corrected without a narrative explaining the reason for the change and Sound Transit acceptance.

E. If, in the opinion of the Resident Engineer, the information contained in the Monthly Status CPM Schedule is inaccurate and the Contractor cannot substantiate otherwise, revise the schedule accordingly and resubmit within seven (7) Days.

F. Payment shall not be made without a current approved Monthly Status CPM Schedule.

G. The Monthly Status CPM Schedule will be used as a basis for justifying payment and to measure the impacts to the schedule as a result of actual progress on the Project.

1.09 MONTHLY CPM SCHEDULE UPDATE

A. Submit a Monthly CPM Schedule Update with each application for payment.

B. Include in the Monthly CPM Schedule Update a data date (status) as of the last day of the corresponding month (for example; for schedules submitted at the beginning of February 2012 the data date shall be 31 January 2012).

C. Incorporate into the Monthly CPM Schedule Update all progress to-date, in correlation with the Monthly Status CPM Schedule.
D. Address all changes and revisions made in the Monthly CPM Schedule Update in a detailed narrative accompanying the submittal.

E. Address Change Orders, CN-WD’s and Provisional Sums in accordance with the General Conditions and incorporate them into the Monthly CPM Schedule Update as additional schedule activities when required.

F. Include any changes made to the schedule and changes to the cost and resource loading as required. Sum all the remaining Contractor activities to be completed to the remaining cost of the Work.

G. If, in the opinion of the Resident Engineer, the schedule is determined to be impractical or not in compliance with the Contract Documents, revise the schedule and resubmit within seven (7) Days.

H. If, according to the current updated Monthly CPM Schedule Update, the work is more than 14 Days behind the current Milestone, or the schedule contains more than 14 Days of negative float, considering all granted time extensions, submit, prior to the next progress payment, a Recovery Schedule, showing a work plan to complete the work within the required schedule period. Include with the submittal a detailed narrative describing the means and methods proposed to achieve the work in the time period. Sound Transit may withhold approximate progress payments until a revised schedule, acceptable to Sound Transit, is submitted by the Contractor at no additional expense to Sound Transit.

1.10 THREE-WEEK LOOK-AHEAD SCHEDULE

A. Submit a Gantt chart format depicting the intended work activities for the upcoming three-week period plus a one-week retrospective.

B. All activities in the Three-Week Look-Ahead Schedule must correlate to an activity in the current Monthly CPM Schedule Update either as a one-to-one match, or as a subset of activities whose cumulative duration correlate to an activity in the Monthly CPM Schedule Update.

C. Note and explain in writing all deviations, including but not limited to sequences of work, timing, and durations of activities, from the most current Preliminary Baseline CPM Schedule, Contract Baseline CPM Schedule, or Monthly CPM Schedule Update.

D. Portray all activities clearly and legibly on the schedule and include logical activity numbers.

E. Submit the schedule at the weekly progress meeting.

1.11 SCHEDULE NARRATIVES

A. Include with the Contract Baseline CPM Schedule and the Re-Baselined CPM Schedule submittal (if required) a written narrative describing the approach and methods for completion of the work. Use understandable narrative that conveys schedule information to Sound Transit.

B. Include with the Monthly Status CPM Schedule a listing of all activities that were planned on being completed, or worked on during the reporting period but were not and the reason for the lack of activity.

C. Include with the Monthly CPM Schedule Update submittal a written narrative describing:
1. All changes, additions or deletions that have been made to the schedule since the prior month and, with the exception of adding actual durations, and a reason for each of the changes.

2. Provide for activities that were planned on being completed, or worked on during the reporting period but were not, the actions taken that have addressed any adverse impacts to the project.

D. Include in all narratives all assumptions that the Contractor has made in developing and updating the schedule.

E. Include in all narratives all major risk items that could potentially have an adverse impact to the schedule and how these risks are to be addressed.

1.12 MONTHLY PROGRESS STATUS REPORT

A. Sound Transit shall provide the format for the Monthly Progress Status Report at, or prior to, the Pre-Construction Meeting.

B. The Monthly Progress Status Report shall at a minimum include the following:

1. Executive Summary.

2. Contract Status.

3. Schedule Status (baseline versus current forecast):
   a. Milestones.
   b. Contract Completion.
   c. Critical Path.

4. Planned (Baseline) versus actual resources (early and late start).

5. Planned (Baseline) versus actual costs (early and late start).

6. Planned (Baseline) versus actual material (early and late start).

7. Earned value of accepted work based on physical percent complete.

8. Work activities accomplished in the reporting period.

9. Intended work activities for upcoming reporting period.

10. Work that is being performed out of sequence with the current accepted schedule.

11. Problem and risk areas and planned mitigation actions.


15. Status of Contractor procurement items.

C. Community Relations activities as specified in Section 01 31 14, Coordination with Others.

1.13 REVIEW, UPDATE AND REVISIONS

A. Allow for Sound Transit review with comments according to the following schedule from the date of receipt:

1. Preliminary Baseline CPM Schedule: seven (7) Days
2. Contract CPM Baseline Schedule: 14 Days
3. Monthly Status CPM Schedule: seven (7) Days
4. Monthly CPM Schedule Update: 10 Days
5. Three-Week Look-Ahead Schedule: two (2) Days

B. Make all corrections to the schedule requested by Sound Transit and resubmit the schedule for acceptance. If the Contractor does not agree with Sound Transit's comments, provide written notice of disagreement within seven (7) Days from the receipt of Sound Transit's comments for the Contract CPM Baseline Schedule. Sound Transit’s comments to the schedules for which the Contractor disagrees shall be resolved in a meeting held for that purpose, if necessary.

1.14 REQUESTS FOR TIME EXTENSIONS

A. Be responsible for submitting a written request for all extensions of Contract Time in accordance with the General Conditions. Requests not submitted in writing, without the required documentation and not submitted in a time consistent with the General Conditions will not be considered.

B. Include in the request documentation with written justification for the extension of time, supporting evidence and specific references to the current accepted schedule at the time the qualifying event occurred.

C. Also include with request an analysis of a calendar time-scaled CPM network schedule (FRAGNET) and reports depicting the time impact basis of the request with the affected areas prominently highlighted. Use only the current and accepted monthly CPM schedule at the time the qualifying event occurred when determining time extension request.

D. If Sound Transit finds that the Contractor is entitled to an extension of time of any completion date under the General Provisions of the Contract, Sound Transit's determination of the total number of Days extension will be based upon the analysis of the current schedule and upon data relevant to the extension. Extensions of time for performance under all of the General Provisions of the Contract will be granted only to the extent that equitable time adjustments for the activity or activities affected exceed the total float along the paths involved of the accepted and current schedule.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

EXHIBIT 1
<table>
<thead>
<tr>
<th>Room #</th>
<th>Room Name</th>
<th>Room Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>N5-5G01</td>
<td>Electrical Room</td>
<td>STATION ROOF LEVEL</td>
</tr>
<tr>
<td>N5-5G02</td>
<td>Elevator Machine Room</td>
<td>STATION ROOF LEVEL</td>
</tr>
<tr>
<td>N5-5G03</td>
<td>Fire Command Center</td>
<td>STATION ROOF LEVEL</td>
</tr>
<tr>
<td>N5-5R01</td>
<td>Electrical Room</td>
<td>STATION ROOF LEVEL</td>
</tr>
<tr>
<td>N5-5R02</td>
<td>Elevator Machine Room</td>
<td>STATION ROOF LEVEL</td>
</tr>
<tr>
<td>N5-5M01</td>
<td>Tunnel Ventilation Plenum</td>
<td>MEZZANINE LEVEL</td>
</tr>
<tr>
<td>N5-5M02</td>
<td>Tunnel Ventilation Plenum</td>
<td>MEZZANINE LEVEL</td>
</tr>
<tr>
<td>N5-5M03</td>
<td>Smoke Exhaust Plenum</td>
<td>MEZZANINE LEVEL</td>
</tr>
<tr>
<td>N5-5M04</td>
<td>Electrical Room</td>
<td>MEZZANINE LEVEL</td>
</tr>
<tr>
<td>N5-5M05</td>
<td>Tunnel Ventilation Fan Room</td>
<td>MEZZANINE LEVEL</td>
</tr>
<tr>
<td>N5-5M06</td>
<td>Mechanical Room</td>
<td>MEZZANINE LEVEL</td>
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<tr>
<td>N5-5M07</td>
<td>Electrical Room</td>
<td>MEZZANINE LEVEL</td>
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<tr>
<td>N5-5M08</td>
<td>Comm Closet</td>
<td>MEZZANINE LEVEL</td>
</tr>
<tr>
<td>N5-5M09</td>
<td>Corridor</td>
<td>MEZZANINE LEVEL</td>
</tr>
<tr>
<td>N5-5M10</td>
<td>Janitor/Storage</td>
<td>MEZZANINE LEVEL</td>
</tr>
<tr>
<td>N5-5M11</td>
<td>Upper Mezzanine</td>
<td>MEZZANINE LEVEL</td>
</tr>
<tr>
<td>N5-5M12</td>
<td>Storage</td>
<td>MEZZANINE LEVEL</td>
</tr>
<tr>
<td>N5-5M13</td>
<td>Vestibule</td>
<td>MEZZANINE LEVEL</td>
</tr>
<tr>
<td>N5-5M14</td>
<td>SCL Meter Room</td>
<td>MEZZANINE LEVEL</td>
</tr>
<tr>
<td>N5-5M15</td>
<td>Corridor</td>
<td>MEZZANINE LEVEL</td>
</tr>
<tr>
<td>N5-5M16</td>
<td>Smoke Exhaust Plenum</td>
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**BASEMENT LEVEL 1**

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**BASEMENT LEVEL 2**

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**BASEMENT LEVEL 3**

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CONTRACT SPECIFICATIONS

SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION

This section is optional. Include requirements as appropriate per the project.

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for photographic documentation, including digital images, video recordings, and photographic prints.

1.02 SUBMITTALS

A. Key Plan: Submit initial key plan(s) within 30 Days of Notice to Proceed. Submit key plan updates with each photographic documentation submittal.

B. Digital Still Photographs (Still Photos): Submit one (1) photographic print of each digital photograph. Submit an inventory of photographs included in the submittal, in both hard copy and on the CD or DVD, indicating date of photo, photographer, and electronic file name. Submit image files and thumbnails electronically on CD or DVD. Provide two (2) sets of CDs or DVDs for each submission. Provide the following types of still photos:

1. Pre-Construction Photographs: Submit prior to start of construction.

2. Construction Photographs: Submit every 30 Days.

[Include the following, if noteworthy items requiring specific documentation is needed.]

3. Subject-specific construction photographs (such as, but not limited to: potential change, non-conformance, quality, and property damage): Submit within three (3) Days of date photo is taken.

4. Final Completion Construction Photographs: Submit within 30 Days of Notice of Substantial Completion.

C. Digital Video Recordings: Submit recordings electronically on DVD. Provide two sets of DVDs. Submit a record of the contents of each DVD via a sheet identifying each segment on the DVD by location. Include the following with the time of day: Street name, viewing direction, traveling direction, and starting and ending points.

D. Digital Web-Based Photographic and Videographic Documentation:

1. Web-based photo service provider's name and background.

2. Submit time-lapse sequence video recordings on DVD every 30 Days. Provide two (2) sets of DVDs.

E. Usage Rights Documentation: Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

F. Photographer and Videographer Qualifications

1. Photographer: Dated list of work performed on government and private construction projects during the last three (3) years.
2. Videographer: Dated list of work performed on government and private construction projects during at least the last three (3) years.

G. Photographer Information: Provide a complete list of photographer names, initials, and contact information within 30 Days of Notice to Proceed, with periodic updates as necessary.

1. QUALITY ASSURANCE

A. Qualifications:

1. Photographer Qualifications: Professional Photographer which has been actively engaged as a professional photographer of construction projects for not less than three (3) years.

2. Videographer Qualification: A professional firm, which has been actively engaged in audio-video documentation for various construction projects similar to the work included in this contract for not less than three (3) years.

3. Sound Transit may perform reference verifications of qualifications as it deems necessary to determine the ability of the documentation firm to perform the work. The Contractor shall furnish to Sound Transit all such information and data for this purpose as Sound Transit may request. Sound Transit reserves the right to reject any photographic or videographic documentation firm, if the investigation of such firm fails to satisfy Sound Transit that it is properly qualified to carry out the work specified herein.

1.04 JOB CONDITIONS

A. All documentation shall be done during times of good visibility. No documentation shall be done during periods of visible precipitation or when more than 10% of the ground area is covered with snow, unless otherwise authorized by the Resident Engineer.

B. Provide sufficient lighting for photographs and video recordings to clearly show the subject matter.

PART 2 - PRODUCTS

2.01 KEY PLAN

A. Indicate project site with notation of vantage points marked for location and direction of each still photograph [and video] recording.

B. Include same information as corresponding still [and video] photographic documentation.

C. Include location and type and model of still [and video] camera(s).

2.02 STILL PHOTOS:

A. Camera Specifications: Provide digital camera(s) meeting the following requirements:


1. Capable of producing a digital stamp of current date and time on each image.

C. Still Photo Format:

1. Set camera to produce a digital stamp of the current date and time on each image.
2. Provide required images in JPG format.

3. Provide 4 by 6-inch prints of each required exposure, in clear plastic photographic records sleeves.

D. Identification:

1. Identify each digital image in accordance with the Photo Naming Convention for Contractor digital photos in Specification 01 31 25, Document Control.

2. Identify each print with the following information on a label affixed to the back of the print:
   a. Name of Project.
   b. Name of photographer.
   c. Date photograph was taken.
   d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
   d. Unique sequential identifier keyed to accompanying key plan.

3. Name of Contractor
   a. Name of photographer.
   b. Date photograph was taken.
   c. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
   d. Unique sequential identifier keyed to accompanying key plan.

4. Identify each CD or DVD with the following:
   a. Name of Project.
   b. Name of Contractor.
   c. Submittal Number and Description.
   d. Date of Submittal.

2.03 DIGITAL VIDEO RECORDINGS (VIDEO)

A. Camera Specifications: Provide digital video camera(s) meeting the following requirements:


2. Capable of producing NTSC-1080 lines/60 fields.

3. Resolution in the Y channel must contain a minimum of 500 TV lines at center, utilizing no less than three (3) charge-coupled-device (CCD) chips, each containing no less than 5,000,000 picture elements (5 megapixels) for optimum picture clarity.

4. Capable of producing a digital stamp of current date and time on each recording.

B. Video Format:

1. Provide high-resolution, DVD in [agreed upon] NTSC format that is interchangeable with the DVD player/recorder furnished by the Contractor for review.

2. Set camera to produce a digital stamp of the current date and time on each image. The date information shall contain the month, day and year (for example 5/13/95) and shall be placed directly below the time information. The time
information shall consist of hours, minutes and seconds, separated by colons (for example 12:34:08).

C. Identification: Identify all DVDs by number, location, project name and municipality. With each submittal, provide the following information:

1. Name of Project.
2. Name of Contractor.
3. Date of Submittal.
4. Submittal Number and Description.
5. Name and address of photographer.
6. Date video recording was recorded.
7. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

[Develop the following article as needed to suit specific project requirements]

2.04 WEB-BASED PHOTOGRAPHIC DOCUMENTATION

A. Camera Specifications: Provide and install project digital camera meeting the following requirements:

1. Provide [one (1)] fixed-location camera(s), with the following characteristics:
   b. [Static view] [Pan/tilt/zoom controlled].

[Insert requirements below for time-lapse photography or continuous video stream recording]

c. Timer: Provide camera with timer to automatically start and stop video recorder so recording occurs only during daylight construction work hours.

d. Provide power supply, active high-speed data connection to service provider's network, and static public IP address for each camera.

2. Provide exterior camera installation, mounted to provide unobstructed view of construction site at location approved by Resident Engineer.

3. Web-Based Image Access: Administer access. Provide password-protected access for project team, providing current image access and archival image access by date and time, with images downloadable to viewer's device.

4. [Provide public viewer open access to most recent project camera image.]

B. Video Format: Post [images] [time-lapsed video recording] to an approved Web-based photo service provider's Web site. Provide high-resolution DVD of all recordings.

C. Identification: Identify all DVDs by number, location, project name and municipality. With each submittal, provide the following information:

1. Name of Project.
2. Name of Contractor.
PART 3 - EXECUTION

3.01 GENERAL

A. Digital Images: All photographic documentation will be captured digitally. Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software. Set camera to stamp the date and time on each digital image.

B. [Contractor’s Field Office Images: Maintain one (1) set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted.]

C. At each location identified to receive digital exposures and video, document all structures, sidewalks, curbs, vegetated areas, and paved areas.

D. Do not access private property unless a right of entry permit has been obtained [by whom] or a temporary construction easement is granted the Contractor through the terms of the Contract.

3.02 STILL PHOTO REQUIREMENTS

A. Take exposures of interior and exterior locations, with lenses ranging from wide-angle (28mm) to telephoto (200 mm).

B. Preconstruction Photographs

1. Provide pre-construction still photos prior to commencement of work at each Site.

2. Take sufficient overlapping still photos to show existing conditions of adjacent properties before starting the Work.

3. [Take a minimum number of photos to accurately document the conditions and provide complete coverage of the site.]

C. Periodic Construction Photographs

1. No construction shall begin prior to Resident Engineer review and approval of the pre-construction photographs of the construction area. Any coverage not acceptable to the engineer shall be re-documented at no additional charge to Sound Transit.

2. Take still photos at locations disturbed or likely to be affected by construction and at locations designated by the Resident Engineer.

3. Unless otherwise indicated, take still photos of construction during the progress of the work.
4. **Take a minimum of [20]** still construction photos at each site every 30 Days starting 30 Days after the date of the pre-construction digital survey and continuing until Substantial Completion is achieved.

D. **Subject-specific Construction Photographs**

1. If there are any evident changes in conditions, non-conformance in the work, or signs of potential property damage, e.g., if there are any signs of cracking or structural separation in concrete foundations or other materials, take a minimum of [10] still photos.

2. The photographer (at the direction of an inspector) should show a tape measure next to the area/condition being photographed in order to provide scale and to substantiate any cracking or separation. This would include dimensions and a close up picture of the measurement. It is important that this photographic documentation of pre-existing conditions is within the zone of influence, since it may be necessary if conditions change to place crack meters to monitor any future movements.

E. **Final Completion Construction Photographs**

1. Take a minimum of [20] still photos at each site at Substantial Completion.

3.03 **VIDEO RECORDING REQUIREMENTS**

A. **General:**

1. **Audio:**
   a. Begin each recording with the current date, project name, name of videographer, street location, viewing side, and direction of progress.
   b. Confirm date and time at beginning and end of recording.
   c. Narration: Describe scenes on video recording by audio narration by microphone or dubbing audio narration off-site after video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.

2. **Video:**
   a. Set to continuously record, transparent digital information to include the date and time of recording.

3. **Audio-video tracks:**
   a. Record audio-video with one (1) audio and one (1) video track. Recorded all tracks simultaneously, as original live recordings. Audio track shall contain the narrative commentary of the videographer, recorded simultaneously with his fixed-elevation video record of the construction’s zone of influence.

4. **When using a conventional wheeled vehicle:**
   a. Do not exceed the rate of speed of 80 (eighty) feet per minute. Control panning and zoom rates to the extent that, during playback, the objects viewed will be reproduced with complete clarity.
b. Ensure the distance from the camera lens to the ground is not less than twelve feet (12') to insure proper perspective.

c. In some instances, audio-video coverage will be required in areas not accessible by conventional wheeled vehicles. Obtain such coverage by walking or special conveyance approved by the Engineer.

B. Preconstruction Video Recordings:

1. Document the entire project site.
   a. Include all surface features located within 300 feet of the construction site, and accompany with appropriate audio description. Include all existing curbs, sidewalks, driveways, ditches, paved areas, landscaping, trees, culverts, headwalls, retaining walls and buildings.
   b. Identify houses and buildings visually by house number, when visible.

2. Duration: approximately 120 minutes.

3. Include time stamp and narrative giving location of the items being shown.

4. Provide at all of the following locations and time periods:

C. Periodic Construction Video Recordings: Record video recording [monthly, coinciding] with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last video recordings were recorded. Minimum recording time shall be 30 minutes(s).

3.04 WEB-BASED PHOTOGRAPHIC DOCUMENTATION REQUIREMENTS

A. Live Streaming Construction Site Images: Provide Web-accessible image of current site image from [fixed] [viewer-controlled] location camera(s), updated at 15 minute intervals during daytime operation.

B. Time-Lapse Sequence Construction Site Recordings: Provide video recording from a fixed-location camera to show status of construction and progress.

1. Frequency: Record one (1) frame of video recording every 15 minutes, from same vantage point each time, to create a time-lapse sequence of construction activities.

C. Maintain cameras and Web-based access in good working order in accordance with Web-based construction photographic documentation service provider's written instructions until final completion. Provide for service of cameras and related networking devices and software.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies the general requirements and procedures for preparing and submitting construction information, including: Shop drawings, product data, samples for information and review, and other submittals.

B. [Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.]

1. Section 01 31 23.10, Internet-Based Document Management System.

2. Section 01 31 25, Document Control.

1.02 DEFINITIONS

A. Sound Transit Safety Certifiable Items Report – A Sound Transit list of safety-critical and safety-related items in the Specifications, which have safety significance to the public or transit system.

1.03 SUBMITTAL SCHEDULE

A. [Provide an initial submittal schedule within 14 Days after the effective date of Notice to Proceed (NTP), for the Resident Engineer’s review.] Submit a [final] submittal schedule within 60 Days after the effective date of Notice to Proceed, for the Resident Engineer’s review, and add to CPM schedule. Submittal schedule shall be arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, delivery, and readiness review when establishing dates. Include additional time required for making corrections or revisions to submittals noted by the Resident Engineer and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

2. [Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 10 Days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.]

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

   a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:
a. Scheduled date for first submittal.
b. Specification section number and title.
c. Name of subcontractor.
d. Type of submittal (Shop drawings, product data, samples, or other). Include description of the item and name of manufacturer, trade name, and model number.
e. Contractor’s “need” date for submittal acceptance by ST.
f. Highlight submittals that are on the critical path and requiring expedited review to meet the Contract schedule. Indicate lead time to the following date(s):
   1) Scheduled date of fabrication.
   2) Scheduled dates for purchasing.
   3) Scheduled dates for installation.
   4) Activity or event number.
g. Safety Item: If a submittal is a safety critical item based on Sound Transit’s Certifiable Items Report (provided by Sound Transit), include the:
   1) “Item” number and “Section” (paragraph) number, as shown on the Sound Transit Certifiable Items Report.
h. Whether submittal is a safety critical item. Based on the information in the provided Sound Transit’s “Certifiable Items Report”, include the:
   1) Item and paragraph number.
5. Present in a form that is readily reproducible.
6. Update and resubmit on a monthly basis.

1.04 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Submit [_____] paper copies of each submittal, unless otherwise indicated. Resident Engineer will return [two] copies.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with ordering, manufacturing, fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Package submittal items for each specification section paragraph by paragraph, with each paragraph’s submittal requirements being submitted as separate submittals.
3. Provide all submittal items required for each specification section concurrently unless partial submittals for portions of the Work are indicated on the approved submittal schedule.

4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
   a. Resident Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmissions, as follows. Time for review shall commence on Resident Engineer’s receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing, including resubmissions.
   1. Initial Review: Allow 30 Days for initial review of each submittal, unless noted otherwise. Allow additional time if coordination with subsequent submittals is required. Resident Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

1.05 PAPER SUBMITTALS

A. Place a permanent label or title block on each submittal item for identification.

B. Indicate name of firm or entity that prepared each submittal on label or title block.

C. Provide a space approximately 5 by 5 inches on label or beside title block to record Contractor's review and approval markings, and action taken by Resident Engineer.

D. Include the following information for processing and recording action taken:
   1. Project name.
   2. Contract number.
   3. Date.
   4. Name of Contractor, subcontractor, supplier and manufacturer.
   5. Submittal numbering.
   6. Number and title of appropriate specification section.
   7. Drawing number and detail references, as appropriate.
   8. Location(s) where product is to be installed, as appropriate.
   9. Notation that submittal is a safety critical item, if identified on the provided Sound Transit “Certifiable Items Report”.

5. Provide all submittal items required for each specification section concurrently unless partial submittals for portions of the Work are indicated on the approved submittal schedule.

6. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
   a. Resident Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

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   7. Drawing number and detail references, as appropriate.
   8. Location(s) where product is to be installed, as appropriate.
   9. Notation that submittal is a safety critical item, if identified on the provided Sound Transit “Certifiable Items Report”.

5. Provide all submittal items required for each specification section concurrently unless partial submittals for portions of the Work are indicated on the approved submittal schedule.

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   a. Resident Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmissions, as follows. Time for review shall commence on Resident Engineer’s receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing, including resubmissions.
   1. Initial Review: Allow 30 Days for initial review of each submittal, unless noted otherwise. Allow additional time if coordination with subsequent submittals is required. Resident Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
E. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Resident Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

F. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Resident Engineer will discard submittals received from sources other than Contractor.

1. Transmittal Form for Paper Submittals: Provide locations on form for the following information:
   a. Project name.
   b. Date.
   c. Destination (To:).
   d. Source (From:).
   e. Name and address of Engineer/Architect.
   f. Name of Contractor.
   g. Name of firm or entity that prepared submittal.
   h. Names of subcontractor, manufacturer, and supplier.
   i. Submittal purpose and description.
   j. Specification section number and title.
   k. Specification paragraph number or drawing designation and generic name for each of multiple items.
   l. Drawing number and detail references, as appropriate.
   m. Transmittal number.
   n. Submittal and transmittal distribution record.
   o. Remarks.
   p. Signature of transmitter.

1.06 ELECTRONIC SUBMITTALS

A. [See Section 01 31 23.10, Internet-Based Document Management System.]

B. See Section 01 31 25, Document Control.

PART 2 - PRODUCTS

2.01 SHOP DRAWINGS

A. General:

1. If specified, shop drawings and calculations as submitted shall be certified by a professional engineer registered in the State of Washington or where the Work
will be performed and shall convey, or be accompanied by, information sufficient to completely explain the structure, machine or system described and its intended manner of use.

2. Sample Drawings: The first drawings submitted by Contractor, Subcontractor, or vendor will be reviewed for conformance. Once acceptance is given, use this accepted drawing format as the standard and prepare subsequent drawings to a quality equal to or better than this standard.

3. To the following standard sizes (in inches), except as otherwise permitted by the Resident Engineer:

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5. Submit Shop Drawings in the following format:
   a. **[Seven]** opaque (bond) copies of each submittal. Resident Engineer will return **[two]** copies.

B. Dimensioning: ASME AY-14.5 Dimensioning and Tolerances

1. Prepare project-specific information, drawn accurately to scale. Do not base shop drawings on reproductions of the Contract Documents or standard printed data.

2. Provide sufficient dimensions on drawings so that size, shape, and location may be determined without calculation.

3. Show each dimension clearly so that only one interpretation is possible.

4. Show dimensions between points, lines, or surfaces having a necessary and specific relationship to each other or which control the location of mating parts or components.

5. Select dimensions and arrange to avoid accumulation of tolerances that might ultimately permit more than one interpretation resulting in unsatisfactory mating of parts and failure in use.

6. Show each dimension for a feature once.

7. When possible, dimension each feature in the view where it appears in profile or the one depicting its true profile.

8. Follow applicable dimensioning and tolerance practices as specified in ANSI Y14.5.

9. Include on the shop drawings details necessary for the installation, maintenance, and repair of all equipment provided.
2.02 PRODUCT DATA

A. Collect information into a single submittal for each element of construction and type of product or equipment.

B. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.

C. Modify manufacturers' standard drawings, catalog cuts, brochures, diagrams, schedules, performance charts, illustrations, calculations, printed installation, erection, application, and placing instructions, and other descriptive data to delete information that is not applicable to the Contract. Indicate dimensions, clearances, performance characteristics, capacities, wiring and piping diagrams, and controls. Supplement standard information with additional information applicable to this Contract.

D. Include the following:
   1. Contract title and number.
   3. Applicable Contract Specifications section numbers.
   4. Applicable standards, such as ASTM or Federal Specification numbers.
   6. Contractor's stamp, initialed or signed, certifying:
      a. Dimensional compatibility of the product with the space in which it is intended to be used.
      b. Review of submittals for compliance with the specified requirements.
      c. Compatibility of the product with other products with which it is to perform or with which it will be contiguous.

E. Submit product data before or concurrent with samples.

F. Submit product data in the following format:
   1. [Seven (7)] paper copies of Product Data unless otherwise indicated. Resident Engineer will return [two (2)] copies.

2.03 SAMPLES

A. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

B. Submit samples without charge, with shipping charges prepaid. Materials for which samples are required shall not be used in the Work until samples are reviewed.
   1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

C. Identification: Attach label on unexposed side of Samples that includes the following:
1. Name, number, and location of project.

2. Name of Contractor.

3. Number and title of applicable Specification Section.

4. Specification paragraph number and generic name of each item.

5. Material or equipment represented, and location in the project.

6. Name of producer, brand, trade name if applicable, and place of origin.

7. Date of submittal.

D. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

E. Disposition: Maintain sets of accepted Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

1. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.

2. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

F. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

1. Number of Samples: Submit [five (5)] sets of Samples. Resident Engineer will retain three (3) Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.

   a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

G. If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a sample, submit at least three (3) sets of paired units that show approximate limits of variations.

OTHER SUBMITTALS

H. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
I. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

J. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

K. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

L. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

M. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

N. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

O. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

P. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

Q. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

R. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
S. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

T. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

PART 3 - EXECUTION

3.01 CONTRACTOR’S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Resident Engineer.

B. Do not start work for which submittals are required until submittal review forms have been completed by the Resident Engineer, and said forms indicating review and acceptance have been received.

C. Stamp and sign submittals, including subcontractor submittals, as reviewed and approved by the Contractor before submitting.

D. Coordinate each submittal with the requirements of the Work, placing particular emphasis on ensuring that each submittal of one trade is compatible with other submittals of that trade and with the submittals of other trades. Submit complete with all relevant data required for review.

E. Be responsible for the correctness of the drawings, for shop fits and field connections, and for the results obtained by the use of such drawings.

F. Review documents or other approval methods of the various designated approving authorities may not be the same as those of Sound Transit. Work with the various designated approving authorities and obtain their approvals in the clearest and most straightforward manner possible.

G. Attend meetings as requested by the Resident Engineer to address issues related to the review of submittals.

3.02 RESIDENT ENGINEER’S REVIEW

A. The Resident Engineer will be responsible for determining whether certain governmental entities require longer review periods. Where longer review periods are required, schedule the Work accordingly, so that the Work and construction schedules are not adversely impacted.

B. The Resident Engineer will indicate its reviews of submittals and the action taken by means of his/her submittal review document. The submittal document will be posted electronically by the Resident Engineer, and the submittal review document will be recorded automatically by the software with the time and date of posting.

C. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmission without review.
D. Submittals not required by the Contract Documents may be returned by the Resident Engineer without action.

E. The submittal review document will be filled out with the following statements and have the following meanings:

1. The mark NO EXCEPTIONS TAKEN means that every illustration and description appears to conform to the respective requirements of the Contract Documents; that fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may proceed; and that the submittal need not be resubmitted.

2. The mark EXCEPTIONS AS NOTED - RESUBMISSION NOT REQUIRED means that every illustration and description appears to conform to the respective requirements of the Contract Documents upon incorporation of the reviewer's corrections, and that fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may proceed. Submittals so marked need not be resubmitted unless the Contractor challenges the reviewer's exception.

3. The mark EXCEPTIONS AS NOTED - RESUBMISSION REQUIRED means that every illustration and description appears to conform to the respective requirements of the Contract Documents upon incorporation of the reviewer's corrections, and that fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may proceed after incorporation of the reviewer's corrections and verification by the Resident Engineer that the reviewer's corrections have been properly incorporated in the submittal. Resubmission is also required if the Contractor challenges the reviewer's corrections.

4. The mark REJECTED means that the submittal is deficient to the degree that the reviewer cannot correct the submittal with a reasonable degree of effort, has not made a thorough review of the submittal, and that the submittal needs revision and is to be corrected and resubmitted.

F. The Contractor may proceed at its own risk with work on all submittal review forms with the following disposition: "NO EXCEPTIONS TAKEN", or "EXCEPTIONS AS NOTED – RESUBMISSION NOT REQUIRED."

G. The Resident Engineer will post the disposition of the Contractor's submittal in accordance to Section 01 31 23.10, Internet Based Document Management System.

3.03 RESUBMISSIONS, DISTRIBUTION, AND USE

A. Resubmissions: Make resubmissions in same form and number of copies as initial submittal. Partial submittals will be returned.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmit submittals until they are marked with “NO EXCEPTIONS TAKEN” or “EXCEPTIONS AS NOTED – RESUBMISSION NOT REQUIRED” notation from Resident Engineer’s action stamp.
B. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

C. Use for Construction: Retain complete copies of submittals on Project site. Use only final submittals that are marked with “NO EXCEPTIONS TAKEN” or “EXCEPTIONS AS NOTED – RESUBMISSION NOT REQUIRED” notation from Resident Engineer's action stamp.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for complying with applicable laws and regulations related to health, safety, security and emergency response procedures. It is not the intent of Sound Transit to develop or manage the safety, security and health programs of the Contractor, its Subcontractors, or Suppliers, or in any way assume the responsibility for the safety and health of their personnel.

B. Failure to comply with these specifications or observed safety or security deficiencies will require immediate corrective actions with written response to the Resident Engineer within 24 hours of verbal or written notice. Lack of corrective action or sufficient response may result in a Stop-Work Order as described in General Conditions, Section 000200, Stop Work Order. In the event of a Stop-Work Order, in accordance with the General Conditions, the Contractor shall be responsible for any impact to Contract Price and/or Contract Time.

C. Comply with the provisions of this section and the minimum standards set forth under the Fed/OSHA 29 Code of Federal Regulations, Parts 1910 and 1926; the Washington Administrative Codes cited in Article 1.02A.4; and other applicable municipal, State, and federal safety and security, health, or environmental regulations. Comply with all federal, State and local laws and regulations as well as requirements outlined in this document. In the event of conflict, the most stringent safety and security requirement shall apply.

D. All safety and security related records must be accessible to Sound Transit upon request whether the records are specifically mentioned as available for Sound Transit review upon request within this specification.

1.02 REFERENCES

A. Acronyms and Abbreviations

1. AED: Automated External Defibrillator
2. AHJ: Authority Having Jurisdiction
3. ANSI: American National Standards Institute
4. ConSM: Contractor Safety Manager
5. CPR: Cardio-Pulmonary Resuscitation
6. CSM: Sound Transit Construction Safety Manager
7. CSSP: Construction Safety and Security Plan
8. CWP: Construction Work Plan refer to Section 01 45 00, Quality Control
9. DOSH: Washington State Labor and Industries Division of Occupational Safety and Health (Washington State OSHA)
10. EPA: Environmental Protection Agency
11. ITCP: Internal Traffic Control Plan
12. JHA: Job Hazard Analysis refer to 1.04 G. herein
13. LEL: Lower Explosive Limit
14. Link: Link Light Rail Project
15. LNTP: Limited Notice to Proceed
16. MSDS: Material Safety Data Sheet
17. MSHA: Mine Safety and Health Administration
18. MUTCD: Manual of Uniform Traffic Control Devices
19. NCR: Non Conformance Report
20. NEC: National Electric Code
22. NIOSH: National Institute of Occupational Safety and Health
23. NTP: Notice to Proceed
24. OCIP: Owner Controlled Insurance Program
25. OSHA: Occupational Safety & Health Act
26. PEL: Permissible Exposure Limits
27. PPE: Personal Protective Equipment
28. PSAPCA: Puget Sound Air Pollution Control Agency
29. PTA: Pre-Task Analysis
30. SCSR: Self-Contained Self Rescuer
31. SQA: Sound Transit Safety, Security and Quality Assurance Department
32. SSSR: Contractor’s Site Safety and Security Representative
33. STMT: Sound Transit Management Team
34. **TBM: Tunnel Boring Machine**
35. WAC: Washington Administrative Code
36. WTA: Worksite Threat Analysis

B. Reference Standards: This Section incorporates by reference the latest editions and revisions of the following documents.
1. United States Code (USC)
   a. USC 651 et seq. Federal Occupational Safety and Health Act

2. Code of Federal Regulations (CFR)
   a. 29 CFR 1910 OSHA General Health and Safety Standards
   b. 29 CFR 1926 OSHA Construction Safety and Health Standards
   c. 40 CFR 300 Emergency Planning and Community Right-to-Know
   d. 49 CFR 659 DOT Rail Fixed Guideway Systems (Traffic Safety)

3. Revised Code of Washington (RCW)
   a. RCW 49.17 Washington Industrial Safety and Health Act

4. Washington Administrative Code (WAC)
   a. WAC Chapter 173-802 SEPA Procedures
   b. WAC Chapter 296-24 General Safety and Health Standards
   c. WAC Chapter 296-27 Recordkeeping and Reporting
   d. WAC Chapter 296-36 Safety Standards – Compressed Air Work
   e. WAC Chapter 296-45 Safety Standards for Electrical Workers
   f. WAC Chapter 296-46A Safety Standards -- Installing Electric Wires and Equipment -- Administrative Rules
   g. WAC Chapter 296-62 General Occupational Health Standards
   h. WAC Chapter 296-155 Safety Standards for Construction Work
   i. WAC 296-350, DOSH Administrative Rules
   j. WAC 296-800, Safety and Health Core Rules
   k. WAC 296-803, Lockout/Tagout
   l. WAC 296-806, Machine Safety and Conveyors
   m. WAC 296-809, Confined Spaces
   n. WAC 296-818, Abrasive Blasting
   o. WAC 296-800 to 296-878 Specific DOSH Safety Rules
   p. WAC 173-370, Model Toxic Control Act Cleanup (Hazardous Materials)

5. National Fire Protection Association (NFPA) Standards
   b. All NFPA regulations for standpipe installation and testing
   c. NFPA 130, Standard for Fixed Guideway Transit and Passenger
d. NFPA 241, Standard for Safeguarding Construction, Alteration or Demolition

6. Federal Highway Administration (FHA)
   a. FTA Guidance Circular 5800.1, Safety and Security Management for Major Capital Projects
   b. Manual on Uniform Traffic Control Devices (MUTCD), U.S. Department of Transportation, Federal Highway Administration

7. Washington Department of Transportation
   a. Standard Specifications for Road, Bridge and Municipal Construction, Washington State Department of Transportation
   b. Traffic Manual M51-02, Washington State Department of Transportation
   c. Work Zones Traffic Control Guidelines M54-44, Washington State Department of Transportation

8. Municipal Codes
   a. Requirements as stated by authorities having jurisdiction or permit requirements, including, but not limited to fire departments, municipalities, utility entities, or police departments.

9. Sound Transit
   a. Emergency Management Plan

1.03 DEFINITIONS

A. Certified Industrial Hygienist (CIH) – A trained specialist with at least 5 years experience in hazardous material processing and working knowledge of selection and use of PPE, air monitoring, regulation, and other health and safety issues.

B. Contractor’s Site Safety and Security Representative (SSSR): A Contractor’s safety and security professional who shall be responsible for the implementation and compliance of the Contractor’s Construction Safety and Security Plan, and who shall be assigned full time to the job site whenever work is in progress. The Contractor’s safety and security representative cannot be assigned a non-safety or security related task.

C. Competent Person: An individual identified as having the necessary experience and training to evaluate the presence and control of specific hazards on the site. Different activities require specific training and expertise. WACs reference a Competent Person for different technical activities.

D. Gas Tester: Individual who works directly for the Contractor’s Safety and Security Representative and has been certified as a Gas Tester in gassy or hazardous classified tunnels.

E. Hot work: Any work involving a flame or sparks, such as a torch, grinder, or electric arc welder.

F. Incident:
   1. Injury to an employee of the Contractor or any Subcontractor.
2. Any injury to persons not directly connected with the project (including all alleged injuries reported by a member of the general public.)

3. Incidents resulting in damage to public, private, or commercial property (including all alleged property damages).

4. "Near misses" that could have resulted in any of the above.

G. Moused: When a crane hook is secured with heavy wire or the latch is locked with a bolt or equal.

H. Personal Protective Equipment (PPE) – Includes all clothing and other work accessories designed to create a barrier against workplace hazards. Examples include safety goggles, blast shields, hard hats, hearing protectors, gloves, respirators, aprons, and work boots.

I. Resident Engineer: The individual responsible for administration of the construction contract.

J. Security: Refers to the protection of both Sound Transit property and the personnel and property of the Contractor from theft, vandalism, pilfering, or other destructive activities.

K. Threat: A potential action or situation that may cause harm to people or property.

L. Toolbox Safety and Security Meeting: Weekly safety and security meeting held by the foremen for their crews which, at a minimum, comply with the WAC 296-800-130 and include the following activities:

1. Review reports of walk-around safety and security inspections conducted since the last safety and security meeting.

2. Review citations received so that hazards can be corrected and prevented.

3. Evaluate incident investigations conducted since the last meeting to determine if the causes of the unsafe situation were properly identified and corrected.

4. Document attendance and the subjects discussed at the meeting.

5. Prepare minutes of each meeting.

M. Track Access Permit: a form signed, approved, and issued by Sound Transit rail operations for accessing and conducting ANY activity within 10 feet of the active track, on any platform, or at any active station. Permits are only issued weekly and at the discretion of the Light Rail Operations Chief.

N. Volatile Organic Compounds (VOCs): Are a very broad category of carbon-based compounds, which includes both polar and non-polar VOCs, ranging from those that evaporate easily (e.g., hexane) to those which may be only semi-volatile (e.g., chlorinated hydrocarbons). VOCs most commonly encountered on construction sites include solvents used in adhesives, coatings, sealants, thinners, caulking, fuels, material treatments, and preservatives. They may have a strong odor (e.g., aromatic hydrocarbons in gasoline) or they may be nearly odorless (e.g., odorless mineral spirits).

O. Vulnerability: A weakness in the design, implementation, or operation of an asset, system, or network, that can be exploited by an adversary, or disrupted by a natural hazard or technological failure.
1.04 SUBMITTALS

A. Any review of safety and security documents, plans, or submittals by the Resident Engineer, and Sound Transit, or their designees, shall not constitute approval of the safety or security elements, mitigations, or hazard/threat precautions employed by the Contractor during construction, or constitute approval of Contractor’s means or methods of construction.

B. Construction Site Safety and Security Plan (CSSP): Within 30 Days of NTP and prior to start of any work. Refer to Article 1.05, herein.

C. Qualifications of the ConSM and SSSR: Within 15 Days of NTP.

1. A resume of the qualifications and work experience of the ConSM and any SSSR proposed for assignment to the Contract. The ConSM and SSSRs shall be required to provide references from three (3) previous projects and they may be requested to appear for a personal interview prior to their receiving an acceptable disposition by the Resident Engineer and their deployment on the project. References shall include contact information of owners and construction management team members from projects listed.

2. All ConSMs and SSSRs shall be on a 90 Day probation period starting from the initial date of project field mobilization. Evaluations will be conducted by the Sound Transit Construction Safety Manager, Resident Engineer, and SQA. If any of these parties are not reasonably satisfied with performance, they may request the Contractor remove and replace an individual within 30 Days of written notification from the Resident Engineer.

D. Emergency procedures.

1. Reconcile all procedures with any comments provided by the Resident Engineer.

2. No physical work may occur on-site before the document is returned with acceptable disposition.

E. Job Hazard Analysis (JHA)

1. JHA(s) correspond with a specific work activity and meet the requirements of these Specifications and the CSSP.

2. Submit a JHA within 24 Days of NTP, or a minimum of [five (5)] Business Days before beginning on-site activity (including mobilization activities).

3. The JHA shall identify:
   a. Foreseeable hazards and threats, planned protective measures, provide drawings or other documentation of protective measures prepared, signed and stamped by a Professional Engineer or other Competent Person. The Competent Person shall be clearly identified and present on-site and available for random workplace inspections.

   b. Log and submit all location request numbers provided by the utility locator service (One Call Center) or utility companies concerning underground utilities and submit with the JHA. Make this log available to the Resident Engineer upon request. A template of the utility request log is presented in Exhibit O.

4. The JHA shall emphasize safety considerations for the following hazard events:
a. Activities involving electrical, elevated heights, pressure, confined spaces, and excessive noises;
b. Danger of striking against or being struck by;
c. Potential injury from burns, either chemical or thermal;
d. Potential for oxygen-deficient environments;
e. Limited access or exit conditions;
f. Potential of crushing or pinch point between objects;
g. Potential injury from strain by pushing, pulling, or lifting; and
h. Potential for property damage or loss of function (i.e., critical lifts, power, or outages.

F. General Safety Submittals

1. Complete Crane Inspection Record and the Wire Rope Inspection Record on schedule and maintain on-site. Submit these certification prior to use of the crane. Crane Inspection Record and the Wire Rope Inspection Record are shown in attached Exhibits E and F.

2. An appropriate schedule for testing physical or environmental exposures that may impact the health and safety or security of workers

3. Submit Worksite Threat Analyses (WTA) to the Resident Engineer that meet the requirements of this specification, no later than 14 Days after the structure is accessible.
   a. Reconcile all WTA(s) with comments provided by the Resident Engineer.
   b. Before beginning the stated work, ensure WTA(s) have been returned with acceptable disposition.

4. [Tunnel equipment training records with annual refresher trainings required for all underground equipment operators.]

5. [A Tunnel Rescue Plan (TRP) before tunnel work may begin.]
   a. Reconcile the TRP with comments provided by the Resident Engineer.
   b. Before beginning the stated work, ensure the TRP has been returned with acceptable disposition by Sound Transit SQA.

6. A copy of all crane certifications and annual inspections

7. [Safety and security training for tunnel classified as gassy]
   a. A written list of personnel completing this training. The list shall include employee names, crafts, and dates of completion.

8. A Confined Space Program in accordance with requirements of WAC 296-809-300.

G. Weekly Submittals
1. Submit a weekly safety and security report detailing issues and inspections of the job site(s) and adjacent public areas to document activities, site controls, and conditions. Provide detail of the corrective action(s) taken to eliminate unsafe acts and conditions.

2. Submit a weekly safety and security inspections report of the fall protection systems and job site(s) procedures related to fall protection or fall arrest systems. Include documented activities, site controls, and conditions. Provide details of the corrective action(s) taken to eliminate unsafe acts and conditions.

3. Incident Report: Submit a detailed written incident report with photographs, witness statements, and a Root Cause Analysis within 24 hours of a security or safety incident, property damage, or possible third-party claim.

H. Monthly Submittals

1. Submit as part of the monthly pay application, a Monthly Injury/Illness Report, and a Monthly Safety and Security Tracking Form (for the prior month) on forms provided by Sound Transit herein (Exhibit B and Exhibit M).

I. Event Triggered Submittals

1. Submit a written incident report within 24 hours of a security or safety incident, property damage, or possible third-party claim.
   a. Include in the report full information, including testimony of witnesses regarding all incidents.

2. Requests for use of a crane-suspended work platform.

3. Request for use of VOCs.
   a. Prior to using VOC-containing products inside a [tunnel] or underground work area, submit a product specification sheet or label and an MSDS for the product.
   b. All submittals are subject to review by the Resident Engineer. Sound Transit reserves the right for final approval in approving VOC-containing products.
   c. Detail necessity prior to using any VOC-containing product inside a [tunnel] or underground work area. List Contractors and Subcontractors in a Construction Work Plan (CWP) and outline the means and methods by which worker exposure and chemical emissions will be controlled.
   d. Provide documentation of calibration tests and procedures for exposure measurement equipment in the CWP and update as needed according to the calibration schedule.

4. Copies of PTA cards may be requested as a formal submittal from the Resident Engineer at any time.

1.05 CONSTRUCTION SITE SAFETY AND SECURITY PLAN (CSSP)

A. Provide a written security procedure for review and comment by Sound Transit. This CSSP shall detail the methods of protecting and securing the Contractor's construction site. The CSSP shall address both active and passive security measures that will be implemented by the Contractor.
B. Reconcile comments such that the document can receive an acceptable disposition by the SQA.

C. Submit a site-specific security plan for each worksite.

D. Prepare monthly written reports to summarize security related issues, problems, or concerns, to document and assess the effectiveness of the CSSP.

E. Establish a trespassing agreement with the local law enforcement agency. Submit a copy of the agreement as part of the CSSP submittal.

F. The Contractor’s CSSP shall describe and include procedures for documentation of:

1. Organizational Chart;

2. List of key personnel, resumes, and time of employment with their current employer;

3. Contractor’s full-time Site Safety and Security Representative (SSSR) priorities description. This position is required staffing on-site at all times and shifts that physical work is occurring. A description of the individuals, organizational reporting, and staffing plan across shifts is required;

4. Contractor’s competent person for completing JHAs and WTAs. The competent person for performing these safety and security analyses shall be identified;

5. Minimum requirements, forms, and procedures for both JHAs and WTAs;

6. List and description of both JHAs and WTAs;

7. Schedule and budget for safety and security personnel and equipment;

8. Safety and Security Incident Plan;

9. Safety and security requirement analysis of applicable codes, requirements and industry standards;

10. Schedule of safety and security related meetings and holdpoints;

11. Safety and security procedures and forms;

12. Employee indoctrination, including safety and security orientation sessions;

13. Pre-task safety and security meetings and hazard analyses, threat assessments, safety and security communications, and lessons learned;

14. Investigations and documentation of all safety and/ or security incidents and to determine root cause and necessary corrective actions;

15. Training sessions for the use of proper work procedures, equipment, personal protective equipment, mechanical guards, and security devices,

16. Safety inspection plan including daily, weekly, and monthly inspections. Procedures shall be outlined for closeout of deficiencies found during inspections;

17. Weekly safety and security meetings with related topics and instructions for individual personnel and group safety and security training programs to be documented using forms equivalent to those shown in Exhibit A;
18. Maintenance of records of safety and security incidents, and development of safety, security, and loss experience summaries;

19. Monthly Safety and Security Committee meetings with representatives from all trades and crafts on the site during the month;

20. Safety and Security incentive program that corresponds with the Award Fee shown in Section 01 12 16, Work Sequence, to reward personnel and crews for working safely and securely;

21. Employee involvement and input through several different means, which includes readily accessible means for anonymous input related to safety and security issues;

22. Quarterly corporate management review and report by the Contractor regarding safety and security program effectiveness;

23. Quarterly meetings between the Resident Engineer, Sound Transit SQA management, ConSM, Contractor corporate management, and the Sound Transit Link Program Executive Director;

24. Quarterly meetings with Sound Transit SQA management and ConSM to review safety program, reports, documentation and status;

25. Monthly meetings between the Contractor Site Safety and Security Representative (SSSR), the Resident Engineer, ConSM, Sound Transit CSM, Sound Transit Chief SQA Officer and, Sound Transit Chief Security Officer;

26. Emergency Action Plan;
   a. Provide a written Emergency Action Plan as part of the CSSP, including, but not be limited to, actions to be taken for the following:
      1) Injuries to personnel;
      2) Injuries to the general public on or adjacent to the work site;
      3) Property damage with particular emphasis on utilities;
      4) Fire;
      5) Natural disasters such as earthquakes;
      6) Public demonstrations such as mobs, or riots;
      7) Bombs or other destructive threats;
      8) Other exposures or potential hazards that may occur at the work site; and
      9) An Underground incident.
      10) Obtain concurrence from Seattle Fire Department.
   b. The Emergency Action Plan shall identify levels of incident with appropriate actions to be taken.
   c. Refer to “Emergency Procedures” article in this section for additional description of Emergency Action Plan content
27. Fire Prevention and Safety Plan;
   a. Provide a written Fire Prevention and Safety Plan as part of the CSSP, which:
      1) Complies with the recommendations of the National Fire Protection Association and applicable local rules, ordinances, and regulations of Seattle Fire Department, DOSH and Fed/OSHA regulations. The Contractor’s attention is particularly directed to the requirements of WAC 296-155-265, WAC 296-155-400, WAC 296-155-405, WAC 296-155-404, and WAC 296-155-410.

28. Control of Hazardous Substances and Hazard Communication Plan; and

29. Maintenance and testing regime for plant and tools.

G. Provide Security Elements of the CSSP

1. The Contractor’s Security performance against the CSSP will be assessed by the Resident Engineer.

2. Site Security is the responsibility of the Contractor regardless of project completion status until care and custody has been formally given to another Contractor entity or Sound Transit. The Contractor’s CSSP shall define the duties and responsibilities of Contractor and Subcontractor personnel. In addition to safety requirements, the CSSP will require that each Contractor perform the following security duties:
   a. Document Subcontractor safety/security practices;
   b. Assign a Security lead (may be the ConSM or SSSR);
   c. Describe site characteristics and access points;
   d. Provide site and traffic control maps;
   e. Include the on-site emergency procedures (such as fire, earthquake, chemical spills, social disturbances, and vandalism);
   f. Include local emergency and medical addresses/numbers (e.g., fire/police and hospital);
   g. Describe the means and methods for site security (e.g., fencing, guards, and visitor control);
   h. Provide for hazard and threat and Vulnerability identification and response;
   i. Investigate security incidents and issue reports;
   j. Include procedures for adequate daily and emergency site communications;
   k. Develop a site security audit program;
   l. Ensure prompt reporting of security incidents to Sound Transit Security Dispatch; and
m. Evaluate, review and modify security practices to adjust to the changing nature of the work site.

3. Construction Site Security Guidelines

a. Organization

1) The Contractor shall have a designated SSSR or ConSM who is responsible as the security supervisor.

2) The CSSP shall detail the chain of command and communications from the Contractor’s security representative up through the Resident Engineer and Construction Manager to the CSM and finally to the Sound Transit Security Officer.

3) The Contractor is responsible for security after working hours and on weekends. Work site access points shall be manned or secured 24 hours a Day, 7 Days a week.

4) Ensure contracted security personnel are licensed and have received Washington State Department of Licensing minimum security training as specified by guidelines for security personnel selection and training guidelines are available for the American Society of Industrial Security (ASIS) and Washington State. Department of Licensing minimum security training can be found at its website: http://www.dol.wa.gov/business/securityguards/sggetunarmed.html.

b. Access Control

1) Control access to the construction site.

2) Staff or lock all gates after work hours or when unguarded.

3) Staff or secure all access points to Underground Construction areas or tunnel access points 24 hours a Day, 7 Days a week.

4) Minimize workers’ personal vehicle parking and access to the construction site. Designate a separate parking location.

5) Clearly post No Trespassing signage with applicable RCW and City Municipal Codes at all entrance points and space at reasonable intervals along the entire fenced perimeter.

6) Designate a point of contact that is responsible for controlling access to the site.

c. Identification Badges

1) Issue identification badges to all personnel and Subcontractors.

2) Photo identification is required. Badges shall be readily available on the person for inspection. When possible, the badges shall be visible on the outer most garments. Wearing enforcement shall take place at all levels.
3) Badge recipients shall sign an acknowledgement that they will report lost, stolen, or damaged badges.

4. On-site Vehicles
   a. Clearly post the personnel- and vehicle-search policy at all entrances.
   b. All persons and vehicles on the project sites are subject to inspection at any time while on site. An approved vehicle access roster shall be kept by the security officers at the access gates. Register all approved vehicles needing access to the site and issue a vehicle placard or a parking pass. Parking passes shall be easily recognizable and shall be prominently displayed at all times while the vehicle is on site.
   c. Vehicle policies and procedures shall include requirements for:
      1) Personnel;
      2) Visitors; and
      3) Deliveries.

5. Contractor Physical Security
   a. Barriers
      1) Place a continuous fence around the entire construction site.
      2) Provide a sturdy fence. At a minimum the fence shall be 6 feet high, 2 inch square mesh, 11-gauge wire or heavier, unless otherwise specified.
      3) Maintain the fence in good repair.
      4) Protect all fence connectors, bands, bolts and other fasteners to prevent access from the outside of the fence.
      5) Allow no gaps in the fence greater than 2-inches, including the gap between the bottom of the fence and the ground, and each side.
      6) Bolt continuous rails to the top and bottom of the fence fabric.
      7) Construct top and bottom rails of the same material, with the same diameter and same fastener parts.
   b. Gates
      1) Construct gates the same height and manner as the fence.
      2) Maintain gates in good repair.
      3) Open gates only when required for operations.
      4) Lock gates when closed.
      5) Directly supervise gates when open.
      6) Install alternate access gates for:
a) Emergency egress;
b) Organized Demonstrations blocking main access;
c) Labor Disputes; and
d) Protest Rallies.

c. Posts
1) Continuously connect to fence fabric.
2) Where multiple posts are adjacent, band together and bolt to provide continuous fencing.
3) Allow no gaps between posts and fabric, between posts and gates, or between two gates to be greater than 2 inches.

d. Lighting
1) Contract Specifications may dictate varying lighting requirements.
2) Illuminate the entire perimeter to a minimum of 10-foot candles at any point within 25 feet from the fence. Equip lighting with shrouds or diffusers. Provide two levels of illumination. Illuminate for safety purposes when the site is active and illuminate for securing purposes when the site is inactive.
3) Illuminate both sides of fence in accordance with Contract Drawings.
4) Provide additional lighting at access points:
   a) Eliminating shadows and blind spots
   b) Providing for vehicle inspection
5) Check lights daily, prior to darkness, so that deficiencies may be corrected prior to their use.
6) Report intentional damage to light fixtures and equipment immediately to the ConSM and repair within 8-hours.
7) Report repeat damage to the Resident Engineer.
8) Power source for perimeter lighting shall be secured for limited access and be tamper proof.
9) Switches and controls shall be inaccessible from outside perimeter.
10) Adequately light materials and equipment in shipping, receiving, and storage areas.

e. Lock and Key Control
1) Establish a lock and key control policy.
2) Define and designate in the CSSP who is responsible for lock and key control.

3) The ConSM shall have overall authority for the issue and replacement of all locks and keys for the construction site.

4) Audits of construction site security can occur with no prior notification.

5) Develop a key control register.

6) All key recipients shall sign a key control register.

7) Do not allow non-personnel to sign for keys.

8) Key recipients shall sign an acknowledgment that they will report lost keys and that they may not duplicate keys.

9) Master keys shall not be identifiable as such.

10) Double lock spare locks and keys (i.e. locate in a locked container within a locked room).

11) Lock padlocks to a hasp or staple when door or gate is open to prevent substitution.

12) Check locks on active and inactive doors and gates regularly for evidence of tampering.

f. Alarms

1) The Contractor may decide what, if any, alarm devices are to be used on site for intrusion and fire. The Contractor shall also decide if used, how alarms will be monitored. Alarms shall be monitored either by a central monitoring center or local annunciation only.

g. Communications

1) Provide separate communications for security and emergency use.

2) Define what type of communication devices are to be used for security and emergency.

3) Telephone shall be Caller ID capable.

4) If radios are shared with other users, security shall have a separate frequency or the ability to override other users in an emergency situation.

5) Define how emergencies are reported to:

   a) Communicate and coordinate with local Police and Fire, and
b) Work with emergency services to establish central locations or special access routes to the various construction sites.

6) Contact local emergency responders to determine if there is a direct number to contact emergency dispatchers in case of 911 system failure or is overwhelmed during a catastrophic event.

6. Notify the Resident Engineer and Sound Transit Security Dispatch [(206) 398-5268] of all security incidents immediately upon discovery or occurrence by the Contractor.

1.06 QUALITY ASSURANCE

A. Projects with less than 20 field workers on-site during any shift may designate one individual to assume the duties of the ConSM and SSSR. In this case, the SSSR must be at a supervisory-level position, but may have job duties in addition to specification 01 35 29 requirements.

B. Contractor Safety and Security Manager (ConSM)

1. Appoint a designated Contractor Safety and Security Manager. The ConSM shall report directly to the Contractor’s corporate safety director (or the Contractor’s equivalent) with a dotted-line responsibility to the Contractor’s Project Manager.

2. The ConSM, or SSSR, shall be onsite whenever work is in progress.

3. Qualifications:

   a. A minimum of 5 years progressive experience and demonstrated work experience on projects similar in scope and nature to the work to be done on this Contract.

   b. Be knowledgeable concerning all federal and State regulations applicable to safety.

   c. Provide proof of current OSHA 30-hour Construction Safety Training (OSHA 510).

   d. Competent Person designation in construction safety disciplines related to the work to be performed and be able to identify Competent Persons required by State and federal safety standards.

   e. Current certification for CPR and First Aid.

   f. Possess training and be capable of performing incident investigations and developing a concise report.

   g. Possess training in the development and presentation of safety training meetings.

   h. [For contracts involving tunneling operations, the ConSM shall meet the requirements contained elsewhere in the Contract Specifications]

C. Contractor’s Site Safety and Security Representative (SSSR)
1. The Site Safety and Security Representative (SSSR) shall be responsible for on-site safety and security coordination with the full support and cooperation of the Contractor's project manager. The SSSR shall be assigned to a contract and shall not be utilized on any other concurrent Sound Transit contracts or other Contractor projects. If necessary, employ additional full-time SSSRs to ensure adequate coverage of all on-going work sections.

2. The SSSR shall have full support from corporate management and the authority to immediately correct unsafe conditions and unsafe practices. The SSSR shall be responsible for managing the safety and security program for the project during their shifts as the sole Contractor safety and security representative. The SSSR shall have the authority to stop Work until unsafe conditions or practices are corrected.

3. Qualifications:
   a. A minimum of 5 years progressive safety experience and demonstrated work experience on projects similar in scope and nature to the work to be done on this Contract.
   b. Be knowledgeable concerning all federal and State regulations applicable to safety.
   c. Provide proof of current certification as an OSHA Construction Safety Outreach Instructor (OSHA 500).
   d. Competent Person designation in construction safety disciplines related to the work to be performed and be able to identify Competent Persons required by State and federal safety standards.
   e. Current certification for CPR and First Aid.
   f. Possess training and be capable of performing incident investigations and developing a concise report.
   g. Possess training in the development and presentation of safety training meetings.
   h. [For contracts involving tunneling operations, the SSSR shall meet the requirements contained elsewhere in the Contract Specifications]

D. Gas Tester

1. When the contract involves Underground Construction activities as defined by WAC 296-155 – Part Q, have a Competent Person present on each work shift to perform the required air and noise testing. The Competent Person shall have the authority to shut down the [tunnel] or any work area when gas concentrations reach a potentially dangerous level. This Competent Person shall be under the direct supervision of the ConSM or SSSR.

E. Subcontractor Safety and Security Representative

1. Each Subcontractor shall assign a safety and security representative for each shift.

2. Assign a full-time safety and security representative if the Subcontractor employs more than twenty people on a work shift.
3. Assign a foreman or lead worker if the Subcontractor employs less than twenty people on a work shift.

4. Develop and submit to the Contactor all Job Hazard and Vulnerability Analyses for tasks assigned to and under direct control of the Subcontractor.

5. Conduct, document, and submit to the ConSM a weekly inspection of the Subcontractor’s work site.

6. Notify the ConSM of the weekly surveys so the ConSM and Resident Engineer may participate in the walkthroughs.

7. In relation to the Subcontractor’s activities, the Subcontractor’s safety and security representative shall have the same duties and reporting requirements as the SSSR and ConSM.

1.07 TRAINING

A. Conduct training classes on a monthly basis, or more often if needed, on safety and security related topics, that may include first aid, fire prevention, site security, or other areas or topics the Contractor deems appropriate. [The Contract Specifications have additional training that is required for tunnel construction.] All such training shall be reviewed by the Resident Engineer.

B. Indoctrination

1. Newly employed, promoted, or transferred personnel shall be fully instructed by audio/visual means in the safety and security practices required for their assignments. Initial indoctrination for all personnel shall include, but not be limited to, instruction on the following:

   a. For each individual, the hazards present in the work assignment and in the general area in which he/she will be working;

   b. Personal protective equipment required;

   c. Instructions on the proper procedure for reporting unsafe job conditions that he/she may encounter;

   d. Reporting of all injuries, incidents, and damage, no matter how slight;

   e. Contractor’s job rules;

   f. Location of first-aid and medical facilities;

   g. Tool box safety and security meeting requirements;

   h. Emergency service notification procedure for fire, medical emergencies, police problems, or other emergency situations;

   i. An orientation by the foreman or superintendent of the new employee work area; and

   j. All personnel shall sign the form shown as Exhibit G to acknowledge receiving and understanding safety and security indoctrination.

C. Subcontractor Indoctrination
1. The Contractor is responsible for indoctrinating Subcontractor personnel before they begin work. All personnel shall sign the form shown as Exhibit G to acknowledge receiving and understanding safety and security indoctrination.

D. Site Orientation

1. This orientation program shall introduce the worker to the project and to the project specific safety requirements. Emphasis shall be placed on site specific hazards and procedures. This orientation shall be provided within 1 week of arrival on the project.

2. The Contractor shall also provide site orientation training to all Sound Transit, Construction Management Consultant and third party personnel who need to access the site for job duties including owner site visits.

E. Hazard Communication

1. All personnel shall be required to complete Hazard Communication training during indoctrination and refresher training annually.

F. [Tunnel Safety Training]

1. Coordinate the requirements of this Article with Section 31 71 19, Tunnel Excavation by Tunnel Boring Machine.

2. All personnel who will be required to work, supervise, or inspect in an underground environment shall be required to complete Tunnel Safety Training. This class shall introduce the worker to the underground work environment, unique hazards associated with underground construction, emergency procedures, and those safety requirements enumerated by 20 CFR 1926 Subpart S and WAC 296-155, Part Q. Personnel who have been trained in an underground environment shall be identified by issuance of differing color passes or other unique and visible identification for access control and check-in/check-out purposes.

3. Minimum tunnel safety training shall include at least 4 hours of classroom instruction covering the following topics:
   a. Air monitoring;
   b. Ventilation;
   c. Confined space entry procedures;
   d. Permit-required confined space entry procedures;
   e. Illumination;
   f. Communications;
   g. Flood control;
   h. Mechanical equipment, including haulage equipment and conveyor systems as appropriate;
   i. Personal protective equipment;
   j. Explosives;
k. Fire prevention and protection; and
l. Emergency procedures, including evacuation plans and check-in/check-out systems.

G. **Safety and Security Training Requirements for Gassy Classified Tunnels**

1. For all personnel working in a tunnel classified as "gassy" by DOSH/Fed OSHA standards, provide not less than 6 hours of tunnel safety and security training. This training shall be completed within 10 Days after the employee starts work. A Certificate of Completion issued by the Contractor and a special numbered hard hat decal provided by Sound Transit shall be issued to those successfully completing this course. This program shall be acceptable by U.S. Department of Labor, Mine Safety and Health Administration, or DOSH/Fed OSHA.

2. A person who holds a Certificate of Completion of an approved safety course in gassy tunnel operations within the prior 12 months shall not be required to take this training program, but shall be required to take a 4-hour refresher course within 24 months of the certificate date and every 24 months thereafter. The 6-hour tunnel safety and security training program shall include, but not be limited to, the following subjects:

   a. Mine Gases - Explosive and toxic effects, means of detection, identification, analysis, and legal requirements of each gas found in the tunnel atmosphere and methods used to control tunnel gases;
   b. PPE - Various devices used, why they are needed, where they are needed, and how to use and care for the equipment;
   c. Construction methods and equipment for the specific project;
   d. Fire Safety - Procedures to prevent fires and protect life and property when fires do occur. Location of fire extinguishers and how to use;
   e. First-Aid - Specific measures to control a variety of injuries and disorders. Basic CPR and methods to stop bleeding and control shock;
   f. Tunnel Incident Prevention -Introduction to the causes and prevention of tunnel incidents;
   g. Tunnel Rescue and Emergency Training - Show in a step-by-step manner, the proper use of breathing apparatus;
   h. Site-Specific Emergency Evacuation Procedures;
   i. Check-in/Check-out Procedures; and
   j. Use of Self-Rescuer.

3. Use of Self-Rescue Devices

   a. Personnel who enter the underground construction environment shall be trained in the proper use of Self-Rescue Devices. This training shall be accomplished before they enter the tunnel and every 90 Days thereafter.

H. OSHA Construction Safety (OSHA 30-Hour)
a. All supervisor-level personnel and above for Contractor are required to complete the OSHA 30-Hour Construction Safety class.

1.08 SAFETY PRECAUTIONS

A. Immediately notify the Resident Engineer if, during the course of the Work, there is a discovery of any undetermined substance.

B. Take responsibility for the health and safety of the Contractor's personnel, Subcontractors, vendors, and other individuals on the Site of Work or who may be impacted by the Work.

1.09 REPORTING REQUIREMENTS

1. Forms and Record Keeping

   a. Sound Transit's recordkeeping forms are presented in the Exhibits herein and provide administrative instruction and report forms to be used by the Contractor and Subcontractors for all required reports: In addition, specific records are required by DOSH and Fed/OSHA

2. Photographs

   a. Take photographs in conjunction with investigations of incidents involving serious personal injury, third-party personnel injuries, substantial property damage (including motor vehicle), equipment or material failure, and incidents that may, even remotely, involve third-party action.

   b. Photographs shall be sufficient in number to show the general area as well as pertinent details from a variety of angles. It is better to take too many photographs than not enough. Take photographs as soon as possible following the incident.

   c. Photographs used in reports shall be identified as follows: name of injured (if equipment damage, type; if property damage, location); date of incident; photographer's initials, and time photographs taken (date if different from occurrence); direction facing; and a brief description of photo.

3. Telephone Reports

   a. Should a serious incident occur resulting in damage to public or Sound Transit property; or bodily injury to the public or personnel of Sound Transit, its consultants, Contractors, or their Subcontractors, it shall be reported (after calling 911) immediately by phone to the Resident Engineer, and Sound Transit Security Dispatch.

1.10 EMERGENCY PROCEDURES

A. Elements of the Emergency Action Plan shall be compatible with local police and fire department procedures, Fed/OSHA and DOSH standards, and Sound Transit's Emergency Response Plan. Ensure that the Contractor has a well developed emergency contact, a defined notification procedure, and that an identified Incident Coordinator in their plan that will be charged with coordinating emergency situations with emergency services.

B. Emergency procedures shall be reviewed frequently to ensure that Contractor personnel are familiar with the proper actions to take and that emergency telephone numbers are
current. The emergency procedures shall be tested using tabletop exercises. The emergency procedures shall be posted on the Contractor’s bulletin board at each work site and office.

C. Emergency procedures and actions required shall be discussed regularly with the Contractor’s supervisory personnel and regularly at Toolbox Safety and Security Meetings. Emergency rescue plans shall at a minimum be in compliance with all applicable local, State and federal regulations for the work being performed.

D. Periodically conduct evacuation drills for underground construction to assess the adequacy of the emergency escape plans and familiarize the work force with changes in the nature of the site that impact evacuation.

1.11 FIRST-AID FACILITY AND STAFFING REQUIREMENTS

A. Refer to Section 01 50 00, Temporary Facilities and Controls.

B. Provide appropriate first-aid facilities for the treatment of on-the-job injuries. The first-aid facilities and staffing, as a minimum, will comply with the applicable safety and security regulations and with Contract Specifications.

C. Provide first-aid kit(s) adequate to serve the crew(s) immediately available onsite at all times. Discuss the locations of the first-aid kits at the daily Toolbox Safety and Security Meetings.

1.12 INCIDENTS

A. Provide such equipment and facilities as are necessary or required, in the case of incident, in order to provide for first aid service to anyone whom may be injured in the progress of the work. Have a standing arrangement for the transportation and hospital treatment of any person who may be injured or become ill.

B. Contractor shall notify the Resident Engineer, the Resident Engineer designee or Sound Transit Security Dispatch [(206) 398-5628] of all safety or security incidents immediately upon discovery. For all types of incidents or potential third-party claims, a Supervisor’s Incident Investigation Report, (Exhibit J), shall be completed and submitted within 24 hours to the Resident Engineer.

C. All safety and security incidents shall be reported immediately to the Resident Engineer.

D. Issue standing orders to all supervisors directly in charge of operations that the scene of the incident shall not be disturbed, except for rescue or other emergency measures, until otherwise directed. Personnel, either witnessing or party to the incident, shall complete an independent incident report to provide detailed accounting of facts.

E. Designate responsible personnel to make emergency calls to 911 and have standing communication with first responders for coordinating site response and designated work site access points. All personnel on-site shall be trained to call 911 in an emergency if a designated caller is not immediately present.

1.13 PROTECTION OF THE PUBLIC

A. Take all reasonable precautions to prevent injury to the public and damage to, or theft of the property of others. The public is defined as all persons not employed by or under contract or subcontract to Sound Transit. Temporary barriers and fencing designated to protect the public shall be installed immediately when a hazard or exposure is present. Precautions shall include, but not be limited to, the following:
1. Do not perform work in any area occupied by the public unless specifically permitted by the Contract or approved in writing by the Resident Engineer.

2. When necessary to maintain public use of work areas involving sidewalks, entrances to buildings, lobbies, corridors, aisles, stairways, and vehicular roadways, protect the public in accordance with all applicable laws and regulations.

3. Keep sidewalks, entrances to buildings, lobbies, corridors, aisles, doors, or exits clear of obstructions, holes, materials, water, and other conditions to permit safe ingress and egress of the public at all times.

4. Post appropriate warnings, signs, and instructional safety and security signs where necessary. Control of the movement of motorized equipment where the public might be endangered to be carried out by a Certified Traffic Control Specialist. Signs, signals, or other control devices used to regulate vehicular traffic shall meet the requirements of MUTCD, University of Washington Safety for work on University property, and the applicable work zone traffic control handbook, City of Seattle In-Street Use requirements, and other pertinent rules and regulations.

5. Provide sidewalks, sheds, canopies, catch platforms, and appropriate fences, when necessary, to maintain public pedestrian traffic adjacent to the erection, demolition, or structural alteration of outside walls on any structure is underway.

6. Temporary fencing shall be properly secured, anchored, and provided around the perimeter of aboveground operations adjacent to public areas, except where a sidewalk, shed, or fence is provided by the Contractor as required by Article 1.13A.5, above. Perimeter fences shall be at least 6 feet high. Fencing may be constructed of wood or metal and sheathing, chain link, or a combination of both, or as otherwise required in the Contract Documents.

7. Supervise all gates and work zone entrances when opened or keep closed and locked when unattended, and closed and latched during all non-working hours.

8. Provide guardrails on both sides of vehicular and pedestrian bridges, ramps, runways, and platforms. Protect pedestrian walkways elevated above adjoining surfaces, or walkways within 4 feet of the top of excavated slopes or vertical banks by guardrails, except where sidewalk, sheds, or fences are provided as required by Article 1.13A.5, above. Construct guardrails in accordance with DOSH, Fed/OSHA standards, and other applicable laws and regulations.

9. Provide barricades when a permanent sidewalk, shed, fence, or guardrail, as referenced above, is not required between work areas and pedestrian walkways, roadways, or occupied buildings. When a barricade is removed temporarily for the purpose of work, place a designated safety and security watch at the opening. Attach reflector tabs or attenuators to K-rail or barricades adjacent to public roadways.

10. Provide temporary sidewalks when a permanent sidewalk is obstructed by the Contractor’s operations. If appropriate provide necessary, guardrails on both sides of temporary sidewalks.

11. Maintain warning signs and lights along guardrails, barricades, temporary sidewalks, and at every obstruction to the public. Place lights at both ends of such protection or obstructions and not over 20 feet apart alongside of such protection or obstruction.
12. Maintain adequate traffic control measure when activities or project associated trucks or vehicles impact the public roadway or traffic flows. Maintain traffic barriers ballast, anchors, and proper functioning lighting.

1.14 CONTRACTOR SECURITY DURING CONSTRUCTION AND SITE SECURITY

A. Provide protection for all property (including equipment and supplies) under the Contractor’s care, custody, and control, Security measures shall include, but not be limited to, the following:

1. Physical barriers such as fencing and barricades. Snow or plastic fencing is not permitted;
2. On-site security guard service;
3. Lighting;
4. Alarm systems;
5. Cameras and recorders
6. Video surveillance;
7. Perimeter detection system
8. Law enforcement surveillance;
9. Inventory control and materials marking; and
10. Community involvement.

B. Once the CSSP has received an acceptable disposition, the CSSP shall be implemented by the Contractor. Physical security of the construction site is the responsibility of the Contractor subject to the concurrence of the Seattle Police Department and any other law enforcement agencies that may have jurisdiction over all or part of a work site.

1.15 SUBSTANCE ABUSE

A. Sound Transit prohibits on the worksite, the use, possession, concealment, transportation, promotion, or sale of the following:

1. Alcoholic beverages;
2. Marijuana and other illegal drugs, look-alikes, and designer drugs;
3. Drug paraphernalia; or
4. Controlled substances such as medications when usage is abused or when the substance is possessed without proper prescription labeling.

B. To be under the influence of any of the above substances while working on the site or to use, possess, conceal, transport, promote, or sell any of the above substances will be grounds for disciplinary action, up to and including termination of employment.

C. Maintain an effective employee substance abuse program. Be responsible for reporting to the Resident Engineer all incidents in violation of the substance abuse program and the disposition of the violation. The Labor Compliance Manual contains Substance Abuse and Prevention Program requirements. Ensure that the employee substance abuse
program complies with all elements of the employee substance abuse program contained in the Labor Compliance Manual.

D. Maintain required records and submit to periodic audits of the substance abuse program by the Resident Engineer or the CSM. If required, use a third-party designated by Sound Transit for all random, for cause, and post-incident testing.

1.16 OTHER CONTROLLED ITEMS

A. Sound Transit prohibits the use, possession, concealment, transportation, promotion, or sale of the following controlled items:

1. Firearms, weapons, and ammunition – except when authorized for security reasons;

2. Switchblades;

3. Unauthorized explosives, including fireworks; or

4. Stolen property or contraband.

PART 2 - PRODUCTS

2.01 PERSONAL PROTECTIVE EQUIPMENT (PPE)

A. Only equipment complying with DOSH Safety Orders and Fed/OSHA Safety Standards shall be used. All Contractors shall be responsible for compliance by their personnel. The SSSR shall make regular field inspections to ensure compliance.

B. Head Protection

1. Hard hat use is mandatory and meets the requirements of ANSI Z89.1 or ANSI Z89.2, as appropriate, as specified by DOSH and Fed/OSHA. Metallic (metal) hard hats shall not be worn on any work under a Sound Transit contract. Both the employee’s name and the Contractor’s name shall clearly appear on the hard hat.

C. High Visibility Apparel

1. General

a. Require all personnel under their control (including service providers, Subcontractors, and lower tier Subcontractors) that are on foot in the work zone and are exposed to vehicle traffic or construction equipment to wear high visibility clothing described in this Section.

b. Ensure that a Competent Person selects the appropriate high-visibility apparel suitable for the job-site conditions.

c. High visibility garments shall always be the outermost garments.

d. High visibility garments shall be in condition compliant with ANSI 107-2004 and shall be used in accordance with the manufacturer recommendations.

2. Traffic Control Personnel
a. All personnel directing traffic, either inside or outside the project fence, shall comply with the following:

1) During daylight hours with clear visibility, workers shall wear a high-visibility ANSI/ISEA 107-2004 Class 2 or 3 vest or jacket, and head protection meeting the high visibility headwear requirements of WAC 296-155-305; and

2) During hours of darkness (1/2-hour before sunset to 1/2-hour after sunrise) or other low visibility conditions (snow, fog, and rain), workers shall wear a high-visibility visibility ANSI/ISEA 107-2004 Class 2 or 3 vest or jacket, high visibility lower garment meeting visibility ANSI/ISEA 107-2004 Class E, and head protection meeting the high visibility headwear requirements of WAC 296-155-305.

b. Non-Traffic Control Personnel

1) All personnel, except those performing Traffic Control duties, shall wear high visibility apparel meeting the ANSI/ISEA 107-2004 Class 2 or 3 standard.

D. Eye/Face Protection

1. Contractor personnel shall be provided with, and be required to wear, eye protection when the tools or operations involved create potential eye hazards resulting from physical, chemical, or radiation agents. Eye and face protection shall meet the requirements of ANSI Z87.1 as specified by DOSH and Fed/OSHA.

E. Respiratory Protection

1. Respiratory protection devices approved by the National Institute of Occupational Safety and Health (NIOSH) shall be supplied by the Contractor and worn by all personnel (as required by DOSH and OSHA regulations) when exposed to hazardous concentrations of toxic or noxious dust, fumes, or mists.

2. Where respiratory protection is required, have a written respiratory protection program in accordance with applicable DOSH and Fed/OSHA standards.

F. Hearing Protection

1. Make approved hearing protection available and such protection shall be worn by all personnel exposed to sound levels in excess of DOSH's and Fed/OSHA's permissible exposure limits (PEL).

G. Fall Restraint Protection

1. Provide Class III Full Body Harness meeting DOSH and Fed/OSHA safety standards to be worn by all personnel exposed to falls from an unprotected height of 4 feet or more. The use of the fall restraint protection shall conform to the requirements of the applicable safety standards.

2. A fall protection work plan shall be completed when rules apply, and available for inspection by the Resident Engineer.

H. Safety Shoes
1. All personnel shall wear hard-toed foot wear conforming to ASTM F2413-05.

I. Suitable Clothing

1. All Contractor personnel shall be required to wear full-length pants, free of holes, and made of durable material. An employee shall not be permitted to wear clothing that has been saturated by gasoline, diesel fuel, oil, or any other flammable or combustible substance. Polyester clothing is not allowed.

2. An employee's shirt shall completely cover his/her shoulders as well as his/her entire mid-section to the waist. Tank tops and fish-net-type shirts are not allowed. The minimum shirt allowed shall be a standard T-shirt.

J. Gloves

1. Sound Transit has instituted a mandatory glove policy for all construction sites. All site personnel and visitors shall wear appropriate gloves when on site.

2. Gloves appropriate to the hazard/task shall be worn.

3. Tasks are only to be performed without gloves where safety is compromised by glove-use or fine finger manipulation is needed to accomplish the activity.

K. Other PPE

1. Other PPE to be used under unusual circumstances, such as high-temperature work, handling corrosive liquids, or other activities not specifically covered in this Section shall be reviewed with the Resident Engineer.

L. Maintenance of PPE

1. PPE that has been altered in any manner so as to reduce its effectiveness shall be repossessed and then repaired or destroyed. PPE, which has been worn or used previously, shall not be reissued to another employee until the article has been cleaned and sterilized.

M. The Contractor, for underground construction and surface work, shall have onsite at all times, certified to applicable requirements, calibrated equipment for testing that includes, but is not limited to, the following:

1. Noise;

2. Gases;

3. Air flow;

4. Lighting; and

5. Air quality.

N. The Contractor is responsible for submitting to the Resident Engineer an appropriate schedule for testing of these and any other physical or environmental exposures that may impact the health and safety or security of workers. Testing may be necessary on a continuous, task, or daily basis depending on the activity and conditions.
PART 3 - EXECUTION

3.01 RESPONSIBILITY

A. Be solely and completely responsible for conditions of the site and the safety and security of all persons and property, 24 hours per day, beginning with the LNTP and ending with Final Acceptance.

B. Comply with all safety and security directives and corrective actions required for safety/security issues or violations identified to remedy safety/security deficiencies. These deficiencies may be related to means, methods, work plans, hazards analyses, or threat and vulnerability analyses.

3.02 DUTIES OF CONTRACTOR STAFF

A. The ConSM, SSSR, or a member of his/her safety and security staff shall at a minimum:

1. Prepare a weekly safety and security report for submission to the Resident Engineer detailing issues and inspections of the job site(s) and adjacent public areas to document activities, site controls, and conditions. The reports shall also provide detail of the corrective action(s) taken to eliminate unsafe acts and conditions.

2. Prepare the Monthly Injury/Illness Report shown in Exhibit B.

3. Establish and maintain an appropriate and comprehensive orientation program for all new personnel

4. Assure timely submission to the Resident Engineer safety incident and investigation reports and root cause analysis summaries to initiate corrective action(s) to prevent recurrence.

5. Provide superintendents and foremen with suitable material and topics for weekly Toolbox Safety and Security Meetings, document weekly Toolbox Safety and Security Meetings, and attend or assign a designee to attend all such meetings.

6. Review Toolbox Safety and Security meeting reports submitted by superintendents and foremen to ensure adequacy of training as well as subject matter and the conduct of the safety and security meetings.

7. Notify and assist in incident investigations with Sound Transit to preserve the incident site. Prepare required reports and complete root cause analysis to identify contributing factors.

8. Establish and implement a monthly safety and security training program for supervisors and field managers as applicable to their specific jobs.

9. Manage and distribute a project safety and security award program to recognize and reward individual personnel or work crews for their safety and security efforts and contributions towards improved safety and security in conjunction with the Award Fee program in Section 01 12 16, Work Sequence.

10. Attend the Monthly Safety and Security Committee meetings held by the Sound Transit CSM.

11. Ensure that all required safety equipment is available and that a written log for worker training is maintained.
12. Ensure that all Subcontractor personnel comply with job-site safety and security rules and regulations, and that the Subcontractors’ reports are completed according to the rules and regulations stated in these Contract Specifications and the requirements of the relevant regulatory agencies.

13. Perform safety and security audits monthly on each work site location.

14. Perform safety and security surveillances weekly on each crew.

15. Respond to Corrective Action Requests and Non-Conformance Reports issued by the Resident Engineer.

16. Conduct, at a minimum, quarterly review of the CSSP effectiveness with the Corporate Safety Manager, which includes identification of corrective actions to improve the implementation of safety and security on the project.

17. [For tunneling operations, the ConSM shall have the following added responsibilities:]
   a. Provide for control, availability, and use of safety equipment, including employee Personal Protective Equipment (PPE), emergency respirator units, and adequate means of communication. The ConSM shall ensure that all safety equipment used in tunnels or underground work is approved by the U.S. Bureau of Mines and acceptable by DOSH and OSHA.
   b. Designate and enforce “No Smoking” restrictions in all underground areas, and within 25 feet of any work task, window, ventilation, doorway or other means of exposure to employees. The Contractor will assure and verify site compliance with Washington State smoking regulations with L&I.
   c. Maintain timely and accurate safety and security and daily monitoring records onsite at all times by a designated Competent Person. These records shall be readily available upon request.
   d. Ensure all tunnel access points are secure so that unauthorized persons may not gain entry.
   e. Perform atmospheric and environmental testing as required, but at a minimum of four times for each shift or when conditions change to document noise levels, air flow, and air quality in underground areas. Keep written records of such tests and make available upon request. The ConSM shall monitor and enforce Contractor compliance with all worker safety, security, and health regulations for underground operations.

18. Provide copies to the Resident Engineer of all Contractor safety and security reports listed in the Exhibit C, Summary of Construction Safety and Security Reports.

19. Attend progress and relevant project meetings with the Contractor and the Resident Engineer.

20. Supervise all subordinate safety or security personnel, Competent Persons, traffic control supervisor, and all other safety or security personnel.

B. Contractor Site Safety and Security Representative
1. The SSSR reports to the ConSM, and the ConSM may act in place of the SSSR on a temporary basis. At any time the ConSM acts in place of the SSSR, the ConSM shall be physically on-site and shall have no other responsibilities in addition to those required of the SSSR.

C. Gas Tester

1. Maintain a hand-written log of all gas tests and measurements taken. At a minimum, the log shall identify the date, time, and location of each test or measurement. Additionally, the log shall identify air velocities and the observed gas readings by date, time, and location [in the tunnel]. Make the log available to the Resident Engineer upon request.

2. Gas Tester may be a SSSR.

D. Superintendents and Field Managers

1. Include at a minimum:
   a. Field supervisors and field managers must promote, implement, maintain, and sustain an effective safety and security program and safety culture.
   b. Daily and documented inspections of the assigned job area to ensure that deficiencies in procedures or unsafe acts or site conditions are identified and corrected.
   c. Document that daily pre-task analysis (tailgate safety and security meetings) discussions are conducted and that workers under their supervision attend and participate to ensure site personnel are aware of the safety and security requirements and are reminded that safety and security policies shall be adhered to and enforced.
   d. Demonstrate knowledge of safety and security requirements and keep up to date on changes and refresher trainings. OSHA 30-hour training is required at a minimum for personnel at the supervisory level or above.
   e. Provide and require the use of proper personal protective equipment, request or provide proper training, and have available suitable tools for the job.
   f. Set a good example for the crews by working safely and making safety and security a priority over production.
   g. Ensure that good housekeeping is enforced by maintaining orderly work sites.
   h. Note that assigned work crews are properly instructed in safe work practices and physically and mentally prepared for assigned job tasks.
   i. With the Resident Engineer and ConSM, investigate all incidents that occur in areas under their direct control to determine facts necessary for corrective action.
   j. Complete a written incident report within 24 hours of a security or safety incident, property damage, or possible third-party claim.
k. The project Superintendent shall conduct and document a formal weekly safety and security meeting of at least 20 minutes, with all project personnel to:

1) Present a 10 – 15 minute safety education topic and discuss how it relates to the work at hand;
2) Plan weekly safety meetings in conjunction with the Resident Engineer;
3) Review the CWPs, list of tools needed, and PPE needed for the upcoming week and discuss potential hazards;
4) Discuss unsafe work practices and conditions noted;
5) Review incident experience with crews and discuss corrective action(s);
6) Encourage personnel to make safety and security suggestions and to pass these on to the SSSR for evaluation and possible implementation; and
7) Ensure that fire extinguishers, first aid kits, and other safety equipment are available for each crew and kept in usable condition.

l. All the above, at a minimum, shall be included and documented in the Contractor's orientation for superintendents and field managers.

3.03 INSPECTIONS, MONITORING AND AUDITING

A. ConSm/SSSR Inspections

1. In addition to the other inspection responsibilities in these Specifications, ensure that the ConSM or SSSR makes a weekly and a comprehensive monthly inspection of each of the work areas (including storage, office, and shop facilities) to ensure compliance with Sound Transit, Federal/OSHA, and DOSH requirements. Notify the Resident Engineer of these inspections prior to completion of the inspections to allow the Resident Engineer to participate. The SSSR shall complete the Construction Safety and Security Inspection Checklist, shown as Exhibit D, for each monthly inspection, or a customized form that, at a minimum, includes the elements contained in the form shown in Exhibit D.

2. Record Safety or Security deficiencies that are noted during the inspection on the form, and correct those deficient items immediately. Communicate all deficiencies to the Contractor's project management in a timely manner. The Contractor's project management shall be responsible for documenting the corrective action(s) and submit that documentation to the Resident Engineer. The ConSM or SSSR shall follow up and note the status of each safety or security deficiency and record the deficiencies on the Construction Safety and Security Inspection Checklist. Review the issues or safety and security items noted during each subsequent site inspection to ensure the concerns have been adequately addressed.

B. Crane Inspections

1. Perform crane inspections and maintain daily, monthly, quarterly, and annual logs. These requirements may change with updates to DOSH standards and
疏散程序

2. 所有起重机都应按照WAC Chapter 296-155, Part L的规定进行认证并操作。

C. DOSH和Fed/OSHA合规官员和西雅图消防局检查

1. 立即通知现场工程师进行由Washington State Department of Labor and Industries Division of Occupational Safety and Health (DOSH), Seattle Fire Department (SFD),或其他联邦、州或县的安全、安全、健康或环保组织/机构的检查。在收到所有安全或安全违规行为的罚单和警告后的24小时内，将罚单和警告的副本提供给现场工程师。

2. ConSM应为每一张安全违规罚单或警告写一份NCR，并在24小时内对现场进行安全检查。

3. 在3天内，对现场工程师的回应对NCR的纠正行动计划和根本原因分析报告作出回应。

D. 联络安全/安全工作人员的检查

1. 预期对施工单位的安全和安全做法进行持续的监测和审计。现场工程师应根据Sound Transit CSM和其/其工作人员以及SQA工作人员，对安全或安全的不足进行合作并作出纠正。这些监测和审计不会免除施工单位的控制现场安全、报告、记录或安全和安全义务的责任。Sound Transit CSM和SQA工作人员有权在观察到可能造成伤害的危险时向施工单位发出停工令，或者在 Correction Failure或未能满足安全和安全要求时。

2. 现场工程师和SQA可能在其自由裁量权下聘请外部顾问或要求Washington State Department of Labor & Industries或其他外部组织对任何位置进行检查。提供适当的通知和介绍。

3.04 海报

1. 在工作现场靠近现场办公室或其他显眼的位置提供海报。海报上应包括但不限于以下内容：

   a. 紧急程序；

   b. 紧急电话号码；

   c. 州劳工要求的海报 – 工作安全和健康保护（Form F416-081-000）；

   d. 通知 – 背景信息的声明。

   Right to Know – Statement of the results of a hazardous chemical survey;
3.05 INCIDENTS

A. General:

1. **Report immediately to the Resident Engineer every incident to persons or damage to property, and furnish the required reports in writing within the specified times.** An incident, injury, or illness is any occurrence that results in a bruise, breaking the skin, or loss of time of more than 15 minutes of work time related to such incident, injury or illness; an impairment of vision or mobility; or that adversely affects job performance as a result of equipment, material, vapors, lighting, liquid, or solid materials.

B. Investigation and Corrective Action

1. Contractor shall notify the Resident Engineer immediately, who will notify the CSM, of all occupational injuries or illnesses and, within 24 hours, submit a copy of the Employers First Report, supervisor’s incident investigation, medical release form, and physician report.

2. Investigate all incidents thoroughly without delay. Coordinate the investigation with emergency services, the Resident Engineer, as well as insurance personnel, to ensure a comprehensive approach. Complete a root cause analysis to determine the causes or contributing factors of incidents. The investigation shall generate appropriate recommendations for corrective actions to prevent recurrence of similar incidents.

3. Take corrective actions when specific factors of an incident have been accurately determined and the resulting recommendations have been disseminated to the responsible persons.

4. In the event of a serious incident, prompt oral reporting of the preliminary details is mandatory. Serious injuries are defined as those injuries that are immediately life threatening, those that require hospitalization for any period of time, or those injuries that result in time lost from work as prescribed by a physician. Perform a root cause analysis on all incidents.

5. In preparing written reports of an incident, statements and comments shall be confined to objective finding of facts.

6. The Contractor's incident report, project records, progress reports and daily time reports may become important evidential material in any ensuing legal action. Accordingly, for the date on which a potential third-party incident has occurred, it is important to be specific and accurate in describing work being performed, crew and equipment being utilized, and their exact location.
3.06 EMERGENCY ACTION PLAN IMPLEMENTATION

A. Should an emergency occur:

1. Immediately secure the area and implement the Emergency Action Plan;
2. Notify the Resident Engineer; and
3. Provide information regarding the emergency to authorized Sound Transit representatives only. Refer questions from the press to Sound Transit Media Relations. Personnel or any other project personnel shall not speak to the press.

3.07 WORK PLANNING

A. Job Hazard Analyses

1. Prepare a JHA for each work activity for review and disposition by the Resident Engineer, before beginning the stated work.
2. Reconcile all JHA(s) with comments provided by the Resident Engineer.
3. Before beginning the stated work, ensure the JHA(s) have been returned with an acceptable disposition.
4. Posting of JHAs and Training
   a. The JHA serves as an operating procedure to be reviewed and discussed with each individual performing the work. A copy of the JHA shall be at the jobsite, shall be retained by the SSSR in the reference file, and a copy provided to the Resident Engineer.
   b. Personnel involved with the operation shall be instructed as to the hazards involved, be provided with required PPE and adequate training, and be instructed in proper methods required to eliminate the hazards, including emergency action to be taken in the event of an incident. Document during weekly safety and security tailgate meetings that crew members have reviewed and understand the JHA before work begins.

B. Daily Pre Task Analysis (PTA) Safety/Security Briefings:

1. General:
   a. The foreman or superintendent for each crew (Contractor and Subcontractors) shall conduct a daily safety and security “tailgate” briefing for a minimum of 15-minutes, to discuss the work activities, potential hazards, and preventive measures to each crew performing any work at the beginning of each shift and when conditions change. The PTA card (Exhibit L) is the suggested form used to document these meetings. The cards used must, at a minimum, include the elements on the suggested form. Make completed PTA cards (or equivalent) available for review by any of the Contractor’s personnel and management staff.

2. Procedures for the PTA meeting are:
   a. Work crews are expected to complete a PTA for each new task undertaken.
b. The PTA is developed by the crew assigned to perform the work with guidance from their Supervisor. The Supervisor identifies the work area and task to be performed and then leads the crew in developing a PTA.

c. Creating the PTA requires the Supervisor to solicit crew participation in identifying hazards and hazard control measures such as PPE, training requirement, permits, and procedures.

d. Members of the team are required to sign the PTA document to indicate their participation, their understanding of the plan, and their agreement to follow the plan.

e. The completed PTA shall remain on site with the work crew performing the task.

3. If conditions, equipment, material, or personnel have changed, the PTA shall be updated.

4. Work crews shall participate in review of the task:
   a. Before resumption of a task;
   b. After a lunch break;
   c. Before resumption of the task at the start of shift; and
   d. Resumption of a task after a significant event.

C. Worksite Threat Analyses (WTA):

1. Prepare a Worksite Threat Analysis (WTA) for each construction site under the Contractor’s control before physical work may begin. The WTA shall identify specific personnel security hazards, property security hazards, third-party liability hazards, and planned protective measures designed to minimize exposure to threats.

2. Include the WTA as part of the CSSP.

D. Worker Hazard Awareness

1. General:
   a. Conduct a documented review and discussion of the approved JHA and the WTA prior to field activities. Inform workers of foreseeable hazards and threats, and the required protective measures described within the approved hazard analysis before starting work on the affected construction operation. All required PPE and security measures shall be present and workers trained in proper use prior to beginning JHA-related work.

3.08 WORKPLACE INSPECTIONS AND HAZARD/THREAT ABATEMENT

A. The SSSR shall conduct and document daily inspections of the construction activities and job sites to identify and correct hazards, Vulnerabilities, and instances of noncompliance with safety, security, health, and security requirements. All items of noncompliance shall be corrected immediately.
B. If immediate corrective action is not possible or the hazard/threat falls outside of Contract scope:

1. Immediately notify affected workers;
2. Post appropriate warning signs;
3. Implement needed interim control measures; and
4. Notify the Resident Engineer both verbally and in writing of the issue and the actions taken.

3.09 CONTRACTOR COMPLIANCE

A. Designate one person for each work crew at each work site that, in addition to their other duties or responsibilities, is responsible for safety and security of the work crew or work site. Identify this designated person clearly in the JHA, the WTA or CWP. The designated person shall be present at each work site whenever the ConSm, SSSR, or an alternate project safety/security officer is not immediately present. The designated person shall be a foreman, superintendent, or other person having job site authority.

B. Any safety or security deficiency identified by the Resident Engineer shall be corrected immediately. Deficiencies may be transmitted by either verbal or written notification to the ConSm, SSSR or superintendent. Corrected immediately, deficiencies that put workers in imminent danger of injury or property loss. Correct other safety or security deficiencies within 24 hours of discovery. Failure to correct deficiencies may result in stoppage of those work activities.

3.10 CONSTRUCTION SAFETY AND SECURITY PLAN (CSSP)

A. Designate the individual(s) responsible for on-site implementation of the plan, specify qualifications for those individuals, and provide a comprehensive list of those activities for which a JHA and WTA has been submitted. Refer to the Contract Specifications, and to Exhibit C, Summary of Reports for additional details.

B. Coordinate with the Resident Engineer in maintaining, enforcing, and documenting a safety and security program that is effective in practice.

C. Coordination among contractors

1. Daily meetings between contractors are required when both are performing activities in the same work area. Each contractor shall detail work schedules and locations to coordinate activities. If a contractor is working in an area controlled by another contractor, additional training may be required to comply with procedures on the site under the other contractor’s control. Requirements shall be coordinated among contractors and reported to the Resident Engineer at the weekly meeting.

3.11 VISITORS

A. Develop a written site visitor policy stating access procedures, physical requirements for participants, and who the approving authority is for tours. In addition, the policy shall:

1. Comply with all provisions of the Sound Transit Site Visitor and Group Tour policy.
2. Develop a written visitor registration procedure, which includes a briefing and signing the Visitor’s Release and Hold Harmless Agreement (Exhibit N)
3. Designate an area where visitors report.
4. Escort visitors at all times while on the construction site.
5. Develop a vehicle admittance policy.

3.12 LOCATING UTILITIES
A. Before the start of underground work, locate all utilities in accordance with RCW 19.122.
B. Contact the underground utility locator service One Call Center of the Washington Utility Coordination Council at 811 or 1-800-424-5555 and have all utilities within the area of work located. Communicate a request to have utilities located to the underground utility locator service not less than two Business Days or more than 10 Business Days before the scheduled date to begin excavation. Periodic re-notification may be required.
C. The Contract Drawings and Contract Specifications for notations of utility companies that may not be members of an underground service alert group. Directly contact those who are not members of an underground service alert group.
D. All location request numbers provided by the utility locator service (One Call Center) or utility companies concerning underground utilities shall be logged and submitted with the JHA. Make this log available to the Resident Engineer upon request. A template of the utility request log is presented in Exhibit O.
E. Visually check the area and confirm the surface marking of locating services and check for recent underground relocation work by an outside entity. Expose utilities in proximity to underground work to confirm alignment.
F. Notify the Resident Engineer at the weekly Resident Engineer meeting and at least 48 hours prior to the start of underground work. Verify that all utility arrangements have been made to allow underground work to proceed.
G. Take necessary steps to protect utilities from damage including identification of utilities with signage.
H. Do not use motorized equipment to dig, uncover, or excavate within 2 feet of utility until such utility has been physically uncovered and identified.

3.13 TRAFFIC SAFETY MANAGEMENT
A. Requirements
1. Contractual requirements are provided in the Contract Specification, 01 55 26, Traffic Control.
2. Plan, document and submit changes from normal traffic patterns well in advance of the actual construction to the Resident Engineer and the local jurisdiction. The Contractor making the traffic changes shall warn the motoring public what changes are to be made and when the changes will take place.
3. Provide notification to emergency services providers, METRO, school districts, and solid waste collection services if streets are closed or major traffic revisions are required for construction activities. Use a combination of mechanical light signage, posted warning signs, public radio broadcast, direct notifications to businesses and residents, and community outreach briefings to accomplish this notification process.
4. Adequate warnings and notifications shall begin at least 1 week in advance of the actual traffic pattern change and continue for the duration of that temporary change, or throughout the establishment of a permanent change in accordance with the Contract Drawings and Contract Specifications.

B. Internal Job-site Traffic Control

C. Develop an internal traffic control plan (ITCP) for the jobsite that details movement of vehicles, communication, and control of hazards such as vehicle backing and protection of workers on foot. Use warning broadband backup alarms on all equipment in operation at the site, at all times.

3.14 OFFICE SAFETY AND SECURITY

A. Address in CSSP office safety and security for project administrative and field office personnel.

B. Familiarize all project personnel, including office staff, with the CSSP and the included emergency procedures. Provide training for procedures when threats, fire, or medical emergency arise. Provide at least one CPR-certified office employee, a first aid kit, and fire extinguisher present in each project office. Install AEDs to be installed in Contractor field project offices.

C. Office safety and security elements shall address ergonomics, emergency procedures, and office safety and security rules that may include these office safety and security hints:

1. Do not run in corridors or on stairs.
2. Use hand rails where provided.
3. Do not stand in front of closed doors as they may open suddenly.
4. Do not read correspondence including text messages on handheld electronic devices or other material while walking.
5. Do not push or crowd at elevators, entrances, exits, or on stairways.
6. Be careful of swivel chairs. Do not lean back in them without testing your weight gradually.
7. Electrical or telephone cords shall not be placed across aisles or doorways unless properly protected.
8. Use handles when closing files, desk drawers, and safe or vault doors.
9. Keep file drawers, desk drawers, and locker doors closed when not in use. Open only one file or desk drawer at a time. File cabinets and bookcases shall be properly secured to prevent overturning.
10. Check the office furniture regularly to assess safe conditions.
11. Be familiar with emergency office procedures for fire, earthquakes, and bomb threats.
12. Conduct periodic ergonomic assessments of work stations and spaces.
13. Provide workplace violence and anti-bullying training for personnel.
14. Provide confidential means for reporting potential domestic violence, which may impact the workplace and other workplace violence issues.

15. Immediately implement controls to protect personnel from any suspected threat.

16. Provide secure working facilities and ensure safe access to transportation during all shifts.

3.15 HOUSEKEEPING, JOB ORDERLINESS AND WORK SITE CONDITIONS

A. Maintain good housekeeping on work sites and adjacent public roadways.

B. Orderliness and housekeeping mean specifically that, at any time, each and every piece of equipment, tool, material, facility, or apparatus shall be stored, stacked, located, placed, temporarily spotted, or set up for manipulation in such a manner as will render an incident highly improbable. This applies to excavations, station structures, [tunnels], elevated guideways, platforms, maintenance facilities, yards, parking lots, interiors of bins, tool boxes, cabinets, rooms, cubicles, whole floors, buildings, and all other work areas.

C. Some tasks where good housekeeping is a major safety and security consideration are:
   1. Working surfaces;
   2. Hoses and supply lines;
   3. Tight or restricted work spaces; and
   4. [Tunnel boring operations.]

D. The Contractor is solely responsible for maintaining good site conditions and housekeeping policies. When issues or deficiencies are identified, the Resident Engineer will provide the Contractor verbal notification with a follow-up in writing.

E. Address housekeeping concerns immediately and provide to the Resident Engineer a signed Construction Safety/Security Survey Form (Exhibit 1) to acknowledge the items have been corrected.

F. Keep [tunnel walks] and working surfaces free of mud, water, and debris anytime personnel are present. Conveyance systems for debris shall minimize dropping of debris on walkways or rails. [Keep tunneling locomotive rails free of mud, water, and debris at all times.] To prevent slips, trips, and falls, keep walking and working surfaces level and free of holes, gaps, or edges. Maintain all walking and working surfaces so that they are, at a minimum, compliant with DOSH and other applicable standards.

G. Orderliness Responsibility
   1. Responsibility for material or equipment placement belongs to those who will use or install it.
   2. Store or park material and equipment in an orderly manner, in keeping with the character of the material or equipment.
   3. Propose designated storage areas in the CWPs.
   4. When a Contractor begins work in an area, that Contractor is responsible for the orderliness and housekeeping of that area, regardless whether the area was left disorderly by a previous contractor.
H. Orderliness and Housekeeping in the Work Areas

1. The following basic requirements shall be expected of Contractors, Subcontractors, and personnel:
   a. Do not block accessways;
   b. Clean work areas daily as work progresses;
   c. Do not leave cables, cords, or loose objects in passageways, stairways, walkways, or underfoot;
   d. Remove all materials, tools, and equipment such as shackles, slings, ladders, and safety equipment from work areas and return them to storage areas when not needed;
   e. Return all tools, supplies, materials, and equipment to their proper storage area after completion of job;
   f. Keep welding rod, nuts, bolts, and round stock in proper containers and not piled on floors, ground, or deck;
   g. Place trash containers at appropriate locations for disposal of all rubbish, trash, and debris;
   h. Remove rubbish, trash, and debris from the work area daily;
   i. Check the work area daily for the removal of rags, boxes, paper, and other debris for housekeeping and fire prevention; and
   j. Store dunnage in neat storage piles or remove it from the job site daily.

3.16 FIRE PREVENTION

A. The SSSR shall make fire hazard inspections of the entire site on a regular basis. Immediate correction of substandard conditions is mandatory.

B. Do not block access to fire extinguishers, exits, hydrants, or other fire-fighting equipment.

C. Keep all flammable liquids and combustible material away from open flame or spark. Do not store trash, rubbish, or debris in proximity to flammable liquid or combustible material.

D. Plan all burning and welding operations carefully, and remove all combustible or flammable material from the area before starting the job.

3.17 EQUIPMENT STANDARDS

A. To prevent personal injury and property damage incidents, adhere to the following standards:

1. Motor Vehicles

   a. Each operator is responsible for the site operation of his/her vehicle. Drivers shall make daily inspections of the following: steering, brakes, mirrors, lights, horn, seat belts, backup alarm, tires, windshield wipers, and fire extinguishers. Report noted defects for prompt repair.
b. Schedule preventive maintenance regularly for all vehicles to ensure their safe operating condition. Maintain all vehicles in compliance with federal and State requirements.

c. Never load trucks beyond their rated capacities or in a manner that will obscure the driver's vision. Secure all loads to prevent shifting or loss of material.

d. Fuel motor vehicles only by approved methods. Do not smoke or permit open flames near a vehicle being fueled.

e. Do not refuel gasoline-powered equipment while engine is running. Do not smoke or permit open flames near a vehicle being fueled.

f. Equip all mobile construction equipment with broadband back-up alarms that can be heard for a distance of 200 feet, unless otherwise directed by the Resident Engineer. Hub-bells are not permitted on Sound Transit projects.

g. All occupants of motor vehicles shall wear seat belts. Transportation of personnel in the back of any truck is prohibited.

h. Drivers shall hold current licenses of the appropriate class to operate the vehicle, and be named on the Contractor's (or Subcontractors) insurance roster.

2. Cranes

a. Crane standards and other standards may change prior to the start of construction or during the construction work. Comply with the most stringent current local, State or federal standards and be responsible for compliance under the Contract.

b. Operators shall be responsible for the exercise of caution necessary for the safe operation of their equipment. Operators shall immediately report unsafe conditions, including defects in the machine, to their supervisor.

c. Operators shall not permit anyone to ride the hook, headache ball, or load.

d. When the operator leaves the machine or repairs are being made, it is the responsibility of the operator to set the brakes, secure the boom, take the machine out of gear, and turn off the engine.

e. Use a standardized set of hand signals while directing crane operations.

f. When making any lift, the operator shall take operational signals only from the authorized signal person. The only exception is that the operator shall accept an emergency stop signal given by anyone.

g. It is the joint responsibility of the operator and the riggers to see that all hitches are secure and that all loose material is removed before the loads are lifted.

h. Use safety hooks, or properly Moused hooks, on all operations where loads are being handled. Control all suspended loads with tag lines.
i. Equip booms with a boom angle indicator and approved boom stops. Paint boom heads, load blocks, and hooks with high visibility paint.

j. Equip all cranes, except crawler cranes and boom type excavators, with outriggers of a design and strength suitable for the work being performed. Use outriggers in accordance with the manufacturer's instructions. Review the positioning of the crane to verify adequate ground conditions for crane support.

k. Inspect hooks, wire rope, bearings, gears, friction clutches, chain drives, and other parts subject to wear at regular intervals, and repair or replace as required. Following inspections the color code crane elements mentioned above allowing visual confirmation of the inspection. Records of such inspections shall be maintained by the Contractor.

l. Provide certification for all cranes over 3 tons manufacturer's rated capacity annually in accordance with DOSH.

m. Consider all overhead electrical lines as high-voltage lines. Do not permit a crane or any part of a crane to work within 10 feet of an energized or ungrounded overhead electrical line.

n. Do not allow any vehicular or pedestrian traffic to pass beneath the boom of any crane. When the boom of a crane must be placed over a street or pedestrian walkway, stop or reroute all traffic, vehicular and pedestrian.

o. Do not suspend boatswain's chairs from any crane.

p. All crane operators shall comply with the requirements of DOSH or Fed/OSHA as applicable.

q. All crane operators shall have current certification on file with the Contractor and available to Sound Transit upon request.

r. Train riggers, toplander, bottomlander, and lifting (crane) supervisors and identify them with unique color hard hats and vests.

s. Implement a planned maintenance schedule for all cranes on site. Engage the manufacturer or an independent maintenance provider for the maintenance of gantry cranes and hoists.

t. Prior to any lifting, hold a tailgate meeting to define roles of authorized signal person and to define the work that is to be done.

3. Construction Equipment

a. Thoroughly check the equipment at the beginning of each shift.

b. Operators shall not start or operate any equipment while other personnel are oiling or adjusting the equipment.

c. The glass in the cabs of cranes, loaders, and other equipment shall be approved safety glass.

d. Provide runways, stairways, or platforms whenever required for the safe operation of the equipment.
e. No more than one person (the operator) shall ride any equipment unless the equipment is equipped with seats to accommodate such riders.

f. Back-up alarms are required on all motorized vehicles operating in construction zones.

g. All operators shall have proof of qualifications to operate their equipment on file with the Contractor and available to Sound Transit upon request.

3.18 ELECTRICAL

A. All electrical work, installation, and wire capacities shall be in accordance with the pertinent provisions of the National Electrical Code (NEC), DOSH, Fed/OSHA, and other applicable codes or regulations.

B. Enclose and ground all switches. Panel boards shall have provisions for closing and locking the main switch and fuse box compartment.

C. Cover, elevate, or string cables or cords passing through work areas so as to protect them from damage and eliminate tripping hazards.

D. Cover cables or cords crossing roadways to prevent damage from vehicles and equipment.

E. Do not allow cords to lie in water.

F. Extension cords used with portable electric tools and appliances shall be heavy duty, of the three-wire grounding type, and shall conform to the type and configuration required by the applicable DOSH and Fed/OSHA regulations and the NFPA.

G. Provide suitable means for identifying all electrical equipment and circuits, especially when two or more voltages are used on the same job. Mark all circuits for the voltage and the area of service they provide.

H. All electrical work shall be performed by qualified electricians who are familiar with the codes. Inspect all electrical work by Subcontractors.

I. Ground-fault circuit interrupters or an assured grounding program shall be used. Should an assured grounding program be used, submit copies to the Resident Engineer.

J. Effectively guard live parts of wiring or equipment to prevent contact with personnel or objects.

K. De-energize all electrical circuits and equipment prior to any work being performed on the circuits and equipment. Exception: When electrical circuits and equipment cannot be de-energized and must be worked hot, then adequate voltage-rated insulated gloves, mats, aprons, and other protective equipment shall be used as required and shall be tested for leaks and insulating capabilities.

3.19 LOCK-OUT/TAG-OUT CLEARANCE PROCEDURE

A. The following procedure is intended to provide a controlled method for rendering electrical equipment or operating systems inactive (including mechanical or piped) when equipment is down for any reason, such as repair, removal, or replacement of equipment and installation of new equipment, DOSH and Fed/OSHA requirements shall be followed.
B. Regardless of the operation and the phase or phases involved, observe lock-out/ tag-out clearance procedure to ensure the safety and security of the operation even if all three phases are not required.

C. Although this procedure generally provides for locking and tagging of equipment, the danger tag alone is to be considered a lock-out device. Do not operate any equipment bearing such a tag under any circumstances.

D. Before starting any major operation that involves locking and tagging procedures, hold a meeting involving the SSSR and the Resident Engineer. Adopt and review specific procedures with all parties concerned before work begins.

E. Shutdown of Equipment or System

1. The craft supervisor shall cause equipment to be shut down in a manner consistent with good operating practice.

2. The main disconnect shall be open in addition to any remote control switches. On electrical work, it is advisable, as a further precaution, that the electrician remove all of the supply fuses. On piped systems, the main valves shall be closed and pressures relieved.

3. After assurance that the equipment has been properly shut down in accordance with prescribed procedures, the craft supervisor shall positively determine that the equipment or system has been locked and tagged.

F. Repair or Installation

1. Each individual craftsperson assigned to the job shall attach to the equipment or system a separate standard danger tag. Date and sign the tag, and provide a short explanation for the reason for the tag in the provided spaces.

2. The craft supervisor responsible for the work shall ensure that the equipment has been deactivated and properly tagged before permitting his/her personnel to perform any work.

G. Starting Up Equipment or System

1. As soon as the work is completed, the tags shall be removed only by the individuals installing them.

2. In the event the shift ends before the work is completed, report the status of the work in detail to the oncoming shift personnel and change the names on the tags.

3. Upon completion of the work, the supervisor shall make certain all workers’ tags have been removed and that everyone is clear of the equipment or system. The supervisor shall return the equipment to normal operating conditions.

H. General

1. In an emergency, the Contractor's project manager or superintendent shall have the authority to remove the tags and locks only after positively determining whether or not the equipment or system is safe for operation and that all personnel are in the clear.

2. Personnel that are deviating from these instructions or unauthorized persons removing danger tags shall be subject to disciplinary action.
3.20 TOOLS

A. General:

1. All hand tools, power tools and similar equipment, whether furnished by the Contractor or the employee, shall be maintained in a safe condition. Tools shall be inspected upon arrival at the site and tagged as fit for service for a defined period of time. Supervisors and craft personnel shall be responsible for the inspection and repair of tools under their control. The use of many tools requires the use of a variety of PPE.

B. Hand Tools

1. Use insulated or non-conducting tools when working near energized electrical circuits.

2. Tool handles shall be tightly fitted. Carefully check wooden handles: tightened with wedges, if necessary, or replaced if split or splintered.

3. All impact tools, such as chisels, punches, and wedges shall be regularly dressed to eliminate mushrooming or flaring of the point of impact.

C. Power Tools

1. The following shall apply to all types of power tools:
   a. Only authorized personnel shall be permitted to operate or repair power tools.
   b. Maintenance of power tools shall be systematic. Promptly repair or replace all worn or damaged tools. Clean, test, and inspect all tools regularly.
   c. Do not use power tools if permanent safety equipment, such as shields, tool rests, hoods, and guards have been removed the tool has otherwise been rendered inoperative.
   d. Provide personnel using tools under conditions that expose them to the hazards of flying objects or harmful dust with the required personal protective equipment.
   e. Properly ground or bond all electrically powered tools.
   f. Do not use gasoline-powered tools in unventilated areas. Dispense gasoline only in U.S. approved safety cans. Plastic gas cans are not allowed on Sound Transit projects. (Special requirements apply to the use of gasoline and other similar products on underground construction projects.)
   g. Provide portable grinders with hood-type guards with side enclosures that cover the spindle and at least 50 percent of the wheel. Inspect all wheels regularly for signs of fractures.
   h. Equip bench grinders with deflector shields and side cover guards. Tool rests and tongue guards shall have a maximum clearance of 1/8 inch from the wheel.
i. Hoses supplying pneumatic tools shall have coupling, whip checks, and tie-wires secured to prevent incidental disconnection.

j. Protect air-supply lines from damage, inspected regularly, and maintained in good condition.

k. Protect air sources supplying hoses exceeding 1/2-inch inside diameter by excess flow valves to prevent whipping in the event of hose separation or failure.

l. The pressure of compressed air used for cleaning purposes shall be 30 psi or less (does not apply for cleaning forms).

m. Equip all hand-held power drills; tapes; fastener drivers; horizontal, vertical, and angle grinders; disc sanders; belt sanders; reciprocating saws; saber saws; and all other similarly operating powered tools equipped with a momentary contact on-off control switch/trigger.

n. Train all personnel who operate pneumatic, electric, or gasoline-powered chain saws in the safe operation of a chain saw. Maintain documentation attesting to this training on file in the Contractor's office and make available upon request.

o. Equip all chain saws with at least the following:

1) safety tip;

2) hand guard/chain brake;

3) spark arrester (gasoline only);

4) chain catcher; and

5) bumper spikes.

p. Personnel whose duties require them to operate a power chain saw shall wear chaps, leggings, or other equivalent protection that will protect the vulnerable areas of the legs. In addition they will wear eye and face protection and appropriate gloves.

q. For repetitive tasks overhead or at foot-level, use tool extensions, where feasible.

r. Implement control of hand-arm vibration from power tool use through provision of PPE, handle-wraps, or low-vibration tools.

D. Powder-Actuated Tools

1. Only personnel who have furnished evidence of having been trained in its use shall be allowed to operate a powder-actuated tool.

2. Eye and hearing protection shall be worn by all personnel using powder-actuated tools.

3. Do not load tools until just prior to use. Do not leave loaded tools unattended.

4. Do not use tools in an explosive or flammable atmosphere. Keep cartridges (power source) separated from all other material.
5. Powder-actuated tools used on this Contract shall meet all applicable requirements of DOSH and Fed/OSHA.

6. Cleaned up unspent cartages. Do not leave unspent cartages lying on the floor.

7. Do not dispose of misfires or unspent cartages in trash cans.

E. Pneumatic Nailers/Staplers

1. To prevent incidental discharge, all pneumatically driven nailers and staplers shall have a safety device on the tool, which shall prevent the tool from being operated unless the muzzle of the tool is in contact with the work surface.

2. When not in use, disconnect the nailer or stapler from the air supply.

3. All personnel who operate pneumatic nailers or staplers shall be trained in their safe operation. Maintain documentation attesting to the training on file in the Contractor's office and make available upon request.

3.21 WELDING AND CUTTING

A. General

1. The Fire Prevention and Safety Plan in the CSSP shall identify the risks and mitigation plans for all work activities involving welding, burning, or cutting including, but not limited to, roles and responsibilities, precautions, detection warning systems, fire fighting equipment, fire drills, material storage and inspections.

2. Provide a monitoring and exposure control program for lead and chromium VI.

3. Develop and operate a Hot Works Permit System. Permits shall be issued by the Contractor's ConSM, or his/her nominated representative, who is competent to identify the hazards posed by the specific works to be performed and the appropriate safety measures to be implemented. Three copies of the Permit shall be generated. One copy shall be retained by the ConSM, one copy shall be transmitted to the Resident Engineer and one copy shall be displayed at the location of the Hot Works.

B. Welding

1. Provide a suitable, approved fire extinguisher for instant use in locations where welding is carried out. Provide screens, shields, or other safeguards for the protection of personnel or materials below or otherwise exposed to sparks, slag, falling objects, or the direct rays of the arc.

2. The welder shall wear approved eye and head protection. Persons assisting the welder shall wear protective glasses.

3. The welder shall have suitable protective gear including appropriate gloves and protective clothing.

4. Electric welding equipment, including cable, shall meet the requirements of the National Electric Code. Welding practices shall comply with all applicable regulations.

C. Burning or Cutting
1. When gas cylinders are stored, moved, or transported, the valve protection cap shall be in place. Stored gas cylinders above ground in enclosures and secured with chains.

2. Secure cylinders in an approved upright cage or basket before hoisting.

3. Store, transport and use all cylinders in an upright position. If the cylinder is not equipped with a valve wheel, keep a key on the valve stem while in use.

4. Provide an approved fire extinguisher readily available in the event of fire.

5. Use appropriate personal protective equipment, such as burning glasses, shields, and appropriate gloves.

D. Fire Watch/Guard

1. Post a fire watch to the area for at least 1 hour after welding and cutting has been completed.

3.22 LADDERS

A. Provide a safe means of access to all work areas. These accessways shall consist of ladders, stairways, elevators, and other approved methods of access, and shall not be blocked by materials or debris.

B. Manufactured Ladders


2. Do not use ladders with broken or missing rungs, broken or split side rails, or other damage. Immediately removed damaged ladders from the site.

3. All portable ladders shall be equipped with nonskid safety feet and shall be placed on a stable base. The access areas at the top and bottom of ladders shall be kept clear.

4. The side rails shall extend 36 inches above the landing. When this is not practical, grab rails shall be installed. All ladders in use shall be tied, blocked, or otherwise secured to prevent incidental displacement.

5. Do not use stepladders as straight ladders.

6. Do not stand on the top two steps of a stepladder.

7. Extension ladders are not be dismantled and used as straight ladders.

8. At no time shall any employee work from any ladder above 4 feet unless fall protection is used.

9. At no time shall more than one employee work from a single ladder at a given time.

C. Job-Made Ladders

1. Job-made ladders shall be fabricated in compliance with DOSH, Fed/OSHA, and appropriate ANSI standards.
2. The general rules applying to the use of manufactured ladders also apply to the use of job-made ladders.

D. Fixed Ladders

1. All fixed ladders on worksites shall meet ANSI A14.3, American National Standard for Ladders-Fixed-Safety Requirements, in effect at the time they are installed.

3.23 SCAFFOLDING, RAILINGS, STAIRWAYS AND ELEVATORS

A. Scaffolds

1. Scaffolds shall be designed, built, and inspected by competent persons. To avoid the use of makeshift platforms and scaffolding, carefully plan each job to ensure that scaffolding is used where required and that such scaffolding conforms to DOSH and Fed/OSHA Standards.

2. Scaffolds and stair towers shall be inspected daily by a Competent Person. Clearly mark scaffolds and stair towers with inspection tag certifying “fit for use” visible to those who will be using any scaffolding or stair towers.

3. Install guardrails and toe boards all open sides and ends of scaffolds. Guardrails shall be 2 x 4 inch stock, midrail 2 x 4 inch stock, or equivalent. The top rail shall be approximately 42 inches high and the midrail placed halfway between top rail and the platform.

4. Securely fasten toe boards, 4-inch minimum height, in place.

5. Other forms of employee protection may be used as in accordance with DOSH or Fed/OSHA regulations.

6. Wooden railing posts (verticals) shall be made of at least 2 x 4 inch stock or its equivalent, and be spaced so as not to exceed 8 feet on center.

7. Use a fall arrest system when working from a scaffold, which is not completely decked, or where guardrails are not installed.

B. Railings

1. Other types, sizes, and arrangements of railing construction are acceptable, provided they meet the following requirements:

   a. A smooth-surfaced top rail approximately 42 inches above the floor.

   b. Strength to withstand the minimum of 200 lb top rail pressure with a minimum of deflection.

   c. For specific material requirements, refer to DOSH and Fed/OSHA.

C. Stair Railings

1. Constructed stair railings similar to a standard railing, except vertical height shall be not more than 34 inches or less than 30 inches from the top rail to the surface of the tread in line with the face of the riser at the forward edge of the riser. Provide all handrails with a clearance of at least 3 inches between the handrail and any other surface or object.
D. Stairways

1. Provide stairway or ladder at all personnel points of access where there is a break in elevation of 19 inches or more, and no ramp, runway, sloped embankment, or personnel hoist provided.

2. Place permanent stairways as soon as practical.

3. Keep all parts of stairways free of hazardous projections. Do not allow debris and other loose material to accumulate on stairways.

4. If using permanent steel stairways having hollow-pan-type treads and landings that are to be used prior to concrete placement, temporarily fill pans filled with a solid material to the level of the nosing.

5. Provide temporary stairs with a landing no less than 30 inches wide, in the direction of travel, for every 12 feet or less of vertical rise. Wooden treads for temporary service shall be full width.

6. Riser height and tread width shall be uniform throughout any flight of stairs.

7. Evacuation routes from underground construction shall include steel stairways sized and located to ensure workforce evacuation in accordance with the evacuation plan.

E. Elevators

1. Refer to DOSH and Fed/OSHA for construction elevators in buildings, basements, excavations, and tunnels.

3.24 CONCRETE AND CONCRETE FORMS

A. All equipment and materials used in concrete construction and masonry work shall meet the applicable requirements as prescribed in ANSI standard on "Safety Requirements for Concrete Construction and Masonry Work."

B. Provided personnel working more than 4 feet above any adjacent working surface, placing reinforcing steel, with fall protection such as a Class III Full Body Harness or equivalent device, or a standard railing.

C. Personnel shall not be permitted to work above vertically protruding reinforcing steel unless such steel has been protected to eliminate the impalement hazard.

D. Do not allow the riding of concrete buckets for any purpose

E. Equip rotating-blade type concrete troweling machines (electrical or otherwise) with a control switch that shall automatically shuts off the power whenever the operator’s hand is removed from the equipment handle.

3.25 FLOOR, ROOF, WALL OPENINGS, AND OPEN-SIDED PLATFORMS

A. To control conditions where there is a danger of personnel or materials falling through floor, roof, or wall openings, such openings shall be protected in accordance with DOSH and Fed/OSHA.

B. Guard all floor holes greater than 2 inches in the least dimension.
3.26 STEEL ERECTION

A. General Requirements
   1. Secure bundles of sheets or small material so as to prevent their falling.
   2. When setting structural steel, secure each piece with not fewer than two bolts at each connection and drawn up wrench tight before the load is released.
   3. Avoid walking on the top flange of beams. Use class III Full Body Harness (fall arrest system) at all times.
   4. Avoid walking under the lift or permit an employee to be exposed to the swing of the lift.
   5. Use a tag line to control all loads.
   6. For the protection of other crafts on the site, post signs in the erection area, "Danger Men Working Overhead."

B. Install permanent floors as soon as practical following the erection of structural members. At no time shall there be more than four floors or 48 feet of unfinished bolting or welding above the foundation or uppermost secured floor.

C. Temporary Flooring
   1. The erection floor shall be solidly planked over its entire surface except for access openings. Planking shall be not less than 2 inches thick, full-size, undressed, and shall be laid tight and secured against movement.
   2. Guard floor openings by a standard railing and toe boards or cover. In general, provide the railing on all exposed sides, except at entrances to stairways.
   3. On structures not adaptable to temporary floors, install safety nets and maintain whenever the potential fall distance exceeds two stories or 25 feet.

3.27 EXCAVATIONS, TRENCHING, AND SHORING

A. Perform all work in accordance with DOSH and Fed/OSHA.

B. An inspection shall be conducted by the Competent Person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard-increasing occurrence.

C. Located stairways, ladders, ramps, or other safe means of egress in trench excavations that are 4 feet or more in depth so no more than 25 feet of lateral travel is required for personnel egress.

D. Determine the design of the supporting system based on careful consideration of the following: depth of the cut; anticipated changes in the soil due to air, sun, and water; and ground movement caused by vehicle vibration or blasting; and earth pressures.

E. Provide positive barriers or plating when a trench is placed adjacent to any roadway.

F. Perform a detailed JHA and develop and implement safety precautions and procedures to address the hazards associated with deep excavation works. The analysis shall include, but not be limited to, measures to address lifting and hauling activities, ventilation, lighting, communications, access control, access/egress provisions,
audio/visual warning system for evacuation, demarking of lifting areas, provision of dedicated walkways, plant selection, and shoring installation/removal.

3.28 HAZARDOUS SUBSTANCES

A. Comply with the requirements of the Contract Documents and WAC 296-62, General Occupational Health Standard, and other applicable rules and regulations.

B. Provide the Resident Engineer with a register of hazardous substances and copies of the MSDS that will be using in work-site operations. Provide a copy of the Contractor’s training program to the Resident Engineer for review.

C. Ensure that all employee training required by applicable laws and regulations is conducted, including requirements contained in DOSH WAC 296-24 and WAC 296-62 and Fed OSHA Safety and Health standards 1926.59.

D. Develop and implement procedures to monitor the purchase, receipt, storage, training, usage, PPE selection, and ultimately the removal from site or disposal of all hazardous substances.

E. QA procedures shall ensure that products received match the products specified and ordered. If a product does not match the product specified, removed it from the Site.

F. Hazard Communication

1. Contractors and Subcontractors shall comply with all requirements of WAC 296-800-170, Hazard Communication, including a written chemical hazard communication program, identification and listing of all hazardous chemicals present at the construction site, obtaining and maintaining MSDSs for each hazardous chemical used, the labeling of containers, and training of personnel.

2. Hazard communication to personnel, Subcontractors, and visitors may occur individually, at scheduled training sessions, or at pre-construction meetings. Verify training and program requirements through completion of checklists or other documentation records.

3.29 PROCEDURE FOR CONTROLLING EXPOSURE TO VOLATILE ORGANIC COMPOUNDS

A. This procedure sets forth requirements, which Contractor and Subcontractors must follow when using VOC-containing products during construction of [tunnels], underground stations, and underground chambers. All airborne VOC concentrations shall be kept as low as reasonably achievable.

B. Records of material safety data sheets (MSDSs), exposure monitoring results, VOC measurements, and other tests or VOC-related inspections shall be maintained on the surface by the SSSR and the monitoring team member, and shall be made available on request to the Resident Engineer, CSM, DOSH, and Fed/OSHA.

C. Substitution

1. Products and processes shall be specified, which minimize odors and chemical emissions while maintaining safety and efficacy. Contractor shall review the general information provided by product labels and MSDSs and request information from suppliers about chemical emissions of products being considered for purchase.

2. Contractor and Subcontractors shall endeavor to the greatest extent possible to substitute volatile or otherwise hazardous VOC-containing products with those
which are non-volatile (low vapor pressure), low-VOC, water-based, low-odor, or less hazardous.

3. Contractor and Subcontractor shall pay special attention to those products marked as “use adequate ventilation” or “use only outdoors or in a well-ventilated space.”

D. Controls for Anticipated Work with VOCs

1. Contractors and Subcontractors shall determine the severity of potential VOC exposure by analyzing the toxicity of product constituents, their likely volatility, volume and rate of anticipated product use, and the anticipated space and ventilation configurations. To appropriately categorize exposure severity, Contractors shall consult their safety personnel, a board-Certified Industrial Hygienist, or the classification system used in IAQ Guidelines for Occupied Buildings Under Construction – 2007, published by the Sheet Metal and Air-conditioning Contractors’ National Association (SMACNA).

2. The CWP shall establish means for controlling worker exposure. This shall include historical exposure monitoring data, real-time measurements, anticipated industrial hygiene data collection strategy, ventilation, or respiratory protection measures.

3. The CWP shall identify critical pathways through which VOCs could move through the work space. The work plan shall establish means for controlling migration of fugitive emissions to adjacent work areas. Such controls may include:
   a. Relocating VOC sources or VOC usage;
   b. Protection of air conveyance systems (e.g., heating, ventilating, and air-conditioning (HVAC) equipment);
   c. Use of barriers (e.g., polyethylene containments);
   d. Negative pressurization;
   e. Air cleaning;
   f. Local exhaust ventilation; and
   g. Dilution ventilation.

4. The SSSR and other Contractor and Subcontractor safety personnel, superintendents, and crew leaders shall continuously survey and monitor the worksite for unapproved chemical use, unusual odors, worker signs of overexposure to volatile organic chemicals, or concerns from co-workers regarding VOCs.

5. The CWP shall also include a list emergency response measures the Contractor or Subcontractor plan on following to respond to exposure incidents involving VOCs.

E. Responding to Incidents Involving VOCs

1. In the event that concern is raised among construction personnel regarding VOC exposure, Contractor and Subcontractors shall immediately respond (within 2
hours) by identifying the source and potential exposures to affected personnel and work areas.

2. In responding to exposure concerns, Contractor and Subcontractors shall identify and evaluate the source of VOC exposure, including identifying the source product or process and reviewing product constituents.

3. Contractors and Subcontractors shall estimate the severity of exposure by analyzing the toxicity of product constituents, their likely volatility, volume and rate of product use, and the known space and ventilation configurations. To appropriately estimate exposure severity, the Contractor may need to consult their safety personnel or a Certified Industrial Hygienist.

4. Contractor and Subcontractors shall estimate likely worker exposures to VOCs by reviewing past industrial hygiene exposure data. Where no exposure data exists, Contractor and Subcontractors shall collect industrial hygiene exposure data using approved methods.

5. Where industrial hygiene exposure data is not available or monitoring results are not immediately available, Contractor and Subcontractors shall collect or utilize a Certified Industrial Hygienist (CIH) to collect real-time direct-reading breathing zone measurements using a calibrated photo-ionization detector (PID) or flame ionization detector (FID). Equipment readings above background concentrations may need interpretation by a CIH and may require respiratory protection, ventilation, or a suspension of work activities.

6. PID or FID readings shall be used in combination with known instrument response factors to determine likely airborne VOC concentrations. Measured VOC concentrations shall be compared to applicable DOSH and Fed/OSHA permissible exposure limits to determine whether overexposures have occurred or may occur.

7. Where instrument response factors are not known and the presence of acutely toxic or carcinogenic VOCs (e.g., benzene, phosgene, methylene chloride, or isocyanates) can be ruled out, general PID/FID measurement rules-of-thumb below may apply:
   a. Less than 5 ppm – Continue to monitor, respiratory protection not required
   b. 5 - 10 ppm – Ventilate area, continue to monitor, respiratory protection not required
   c. 10 - 25 ppm – Half-face respirators with organic vapor cartridges shall be worn, in addition to above requirements
   d. 25 - 100 ppm – Full-face respirators with organic vapor cartridges shall be worn with additional dermal protection, in addition to above requirements
   e. More than 100 ppm – Stop work and evaluate exposures and engineering controls

8. The Contractor or Subcontractor shall immediately (within 24 hours) report all incident data, including affected personnel, employers, product information, exposure data, PPE, and engineering controls used during an incident response to the Resident Engineer.
3.30 CRANE-SUSPENDED WORK PLATFORMS

A. The use of crane-suspended work platforms shall be permitted only when permitted by the applicable safety and security regulations. Comply with WAC 296-155 Part L. Request and receive permission from Sound Transit prior to use of a crane-suspended work platform.

B. Request Procedure:

1. Submit requests for use of a crane-suspended work platform to the Resident Engineer for review and comment with the following:
   a. A statement of why conditions, methods, or operations require the use of a crane-suspended work platform;
   b. A description of the crane to be used and the manufacturer's requirements in the use of the crane to suspend a personnel work platform;
   c. Certification, by letter, that the work platform and other components, including hardware, have been designed and reviewed by a qualified registered civil, mechanical, or structural engineer; and
   d. Documented emergency plan in the event of a crane failure.

C. Notify the Resident Engineer in writing prior to putting the crane and work platform into service, stating that it has complied with the entire crane and work platform requirements.

D. Indicate the crane to be used and ensure the latest crane inspection report has been submitted to the Resident Engineer.

E. Ensure that daily inspections of the crane are made and that the Resident Engineer receives copies of the daily crane inspection reports.

F. When a crane and work platform is to be used, be responsible for ensuring compliance with the most stringent regulations governing the use of a crane-suspended work platform.

G. Comply with the crane manufacturer's recommendations and requirements in the selection and use of a crane for suspending personnel on a work platform.

3.31 POLE-CLIMBING SPIKES

A. Pole-climbing spikes are not considered a normal tool of the trade in the construction industry. The use of pole climbing spikes shall be reviewed with the Resident Engineer.

3.32 RAIL SAFETY

A. Inactive Rail / On-Track Equipment

1. Ensure the safe operation of all on-track equipment during construction operations.

2. Submit to the Resident Engineer for review the type of equipment to be used on the tracks (i.e., axle load, wheel base, and wheel profile).

3. Coordinate the movement of on-track equipment with the Resident Engineer, inspectors, and other concerned individuals as to the following:
a. Limits of work area;

b. Interface with other contracts; and

c. Inspection hi-rail trips.

4. The supervisor or foreman shall make sure the travel route is clear prior to authorizing the movement of on-track equipment.

5. The supervisor or foreman shall contact other supervisors or foremen in the vicinity of the proposed work regarding the track outage prior to rendering a section of track impassable. Flaggers shall be posted.

6. Do not operate on-track equipment without the authorization of the supervisor or foreman.

7. No employee shall ascend or descend equipment, which is in motion.

8. Operate on-track equipment at a safe speed - not to exceed 25 miles per hour and be able to stop safely within half the distance of the operator's line of sight.

9. Do not exceed a speed of 4 miles per hour for on-track equipment at switches and crossings.

10. When approaching individuals on or near the track, slow on-track equipment to 5 miles per hour. The operator shall sound a warning bell/horn as he/she approaches individuals on or near the track. The speed of the equipment shall not exceed 5 miles per hour until it is safely past the individuals.

11. Before starting work on or near the rail tracks, post a flagger at least 100 feet in each direction of the Contractor performing work along the track to warn oncoming equipment to slow down.

12. The foreman shall make sure that each flagger has been instructed in proper flagging procedures, and is reliable and competent.

13. Stationed the flagger in such a manner so that he/she is visible to oncoming equipment.

14. The flagger shall be equipped with the following:

   a. A paddle with "slow" on one side and "stop" on the other side;

   b. A horn;

   c. High Visibility Vest;

   d. A radio; and

   e. An orange flag.

15. When approaching a flagger waving an orange flag in a horizontal (side to side) motion, the equipment operator shall stop the equipment and receive instructions from the flagger prior to proceeding.

16. A flagger shall be stationed at all intersections where vehicular and pedestrian traffic might cross. The flagger shall ensure a clear crossing.
17. When working in the vicinity of any rail tracks, personnel shall be alert at all times to the movement of the on-track equipment. This equipment may be located on either track and be moving in either direction. Treat all rail tracks as active.

B. Active Rail Line Safety & Security

1. Ensure safe operations and construction procedures are followed during construction activities on or near active rail lines. At a minimum, ensure that:
   a. All personnel who may be within 15 feet of any rail system shall receive Sound Transit Roadway Worker Protection Class and possess a special identification badge and a hard hat decal;
   b. All personnel shall not cross tracks immediately after a rail vehicle or train has passed, but wait until adjacent tracks can be observed for a safe distance in both directions before crossing;
   c. All personnel shall not cross tracks directly in front of or behind rail equipment or a train that has just stopped, but cross at least 10 feet in front of or behind the standing train or rail equipment; and
   d. All personnel shall not step, stand, sit, or walk on any part of the track way unless it is necessary in the performance of their work. When required to perform duties in the track areas, walking on or crossing the tracks shall be on the cross-ties and ballast only.

2. Rail vehicle and train movement shall be anticipated at any time from any direction. Train personnel to look in each direction prior to entering trackway area.

3. When working at a stationary location, a flagger shall be posted to warn on-coming rail equipment, trains, or other vehicles to slow down or stop.

4. Before permitting personnel to be on the track, the foreman in charge of the work crew shall instruct all crew members as to where each person will go when it is necessary to clear the track for rail vehicle or train movement. All personnel shall clear the track on the same side.

5. Walking or stepping on rails, switches, guardrails, interlocking machinery, or movable connections is prohibited.

6. Personnel working on or near the tracks shall wear orange reflective traffic vests.

7. Keep all air hoses, electrical cords, and other similar equipment clear of the track(s). If such equipment must be placed across any track, run them under the rail.

8. Keep vehicles at least 15 feet away from any active track.

9. Do not work within 10 feet of any active track without authorization.

10. Do not touch dangling wires or foreign objects hanging from such wires or attempt to move them by any means. Report their location immediately to the supervisor and, if possible, leave someone to protect such wires or foreign objects until removal by a qualified employee. Other persons in danger shall be warned.
11. Regard loose or broken impedance bond connections in the tracks as energized and report them immediately to the supervisor in charge.

12. Notify the immediate supervisor when an overhead wire failure occurs that may obstruct tracks. All personnel in the area shall be protected from the potential danger.

13. Do not walk along track with back to trains, but always face traffic if possible and take an occasional look back. Check the work area for safe locations to go to when tracks must be cleared. Supervisors shall inform all workers as to these locations.

14. Avoid crossing tracks near or at switch points or crossovers. Never step on moving parts of switch points, turnouts, or crossovers, but always walk on ties, invert, or walkways.

15. Do not jump off platforms to gain access to tracks. Use ladders or platform stairs.

16. Adequately insulate all tools used on work on or near electrical equipment or circuits. Use fuse pullers for removing and replacing fuses. De-energized electrical equipment and circuits shall be before any work is done.

17. Only dry cloth or fiberglass measuring tapes may be used in the vicinity of electric lights/power wires in the proximity of operating tracks. Dry cloth tapes shall not contain metallic threads.

18. Carry tools in a non-metallic canvas bags or carryall wooden boxes.

19. The overhead wire is charged with 1500 volts, and shall be treated as hot at all times.

20. A Sound Transit Rail-qualified employee in charge, having completed the Sound Transit right of way workers training program, shall be posted to monitor and announce oncoming rail traffic and who shall have no other duties. The employee in charge shall establish and monitor adequate warning devices for train operators entering the work zone and be responsible to observe for approaching trains and provide sufficient warning of any oncoming rail vehicles to workers on or within 10 feet of the active rail right of way so they can clear to an area of safety not less than 1 minute prior to arrival of oncoming rail vehicles. The employee in charge shall maintain adequate communication, by either radio or hand signals with train or rail equipment operators, any time work is occurring within 10 feet of the active rail.

21. Any work to be performed where men or equipment could get within 10 feet of the overhead wire shall require the Contractor to schedule with Sound Transit removal of power from the line. It will be the Contractor’s responsibility to verify the removal of power and to ground the overhead line prior to beginning work.

3.33 AERIAL LIFTS

A. Aerial lifts mounted on the beds of trucks shall be installed by an authorized manufacturer.

B. Personnel who operate the aerial lifts shall be trained by the manufacturer in the safe operation of the lift.
C. Wear and use personal fall arrest systems in accordance with the applicable safety regulations while on the lift.

D. Use aerial lifts only within the guidelines of the manufacturer.

3.34 LASERS

A. Only qualified and trained personnel shall be assigned to install, adjust, and operate laser equipment.

B. Personnel shall wear proper eye protection where there is a potential exposure to laser light greater than 0.005 watt.

C. Locate lasers and targets at levels above the workers’ sight, when possible.

D. Use beam shutters or caps or turn off the laser when laser transmission is not actually required.

E. Turn off laser when the laser is left unattended for a substantial period of time, such as during lunch, overnight, or at changes of shifts.

F. Post signs warning all personnel of laser hazards in the area(s) where lasers are being used.

3.35 RADIOACTIVE MATERIAL

A. In the use, handling, or possession of radioactive material, abide by regulations governing the use of radioactive material. The Contractor's attention is particularly directed to WAC 246-220 through WAC 246-254.

3.36 ENVIRONMENTAL PROTECTION

A. Do not emit or discharge any substance into the environment in violation of the Environmental Protection Agency (EPA), Puget Sound Air Pollution Control Agency (PSAPCA), and Regional Water Quality Control Board, DOSH, or other regulatory agencies.

3.37 FUEL TRUCKS AND FUELING OPERATIONS

A. Fuel trucks and fueling operations shall conform to all applicable rules, regulations, and permit requirements.

3.38 STREET DECKING

A. Size all street decking as required by the application.

B. All wooden street decking timbers shall be appropriate wood type, but in no case shall they be less than 12 by 12-inch timbers.

C. Fit decking mats closely together to prevent cracks between the mats.

D. Hooks for lifting and placing the deck mats and other rigging hardware shall have a factor of safety in accordance with the industry standard and be capable of lifting at least five times the deck mat weight.

E. When deck mats must be removed for any reason, place standard guardrail with toe boards around the mat(s) to be removed prior to removal. If guardrails cannot be
installed, then all personnel working within 5 feet of the deck opening shall wear and be securely tied off with a Class III Full Body Harness and lanyard.

F. Cover all deck mat lifting eye holes and cracks with a suitable material, such as, but not limited to, thin sheet metal to prevent objects from falling through and to prevent pedestrians from stepping into the holes or cracks. In pedestrian walkways, keep material used to cover the holes and cracks flush to prevent tripping.

G. Coat the wooden street decking with a non-skid material and maintain as required.

3.39 FALSEWORK AND VERTICAL SHORING

A. Prior to demolition or stripping of false work, a CWP and JHA shall be submitted to the Resident Engineer describing how the Contractor intends to perform the work safely and in compliance with the Contract Specifications.

B. Where wood shores are bun-spliced, they will be made with square joints and secured on four sides with not less than 2-inch material or 5/8-inch plywood of the same width as the post. The scabs shall extend at lease 2 feet beyond the joint.

C. If metal shore clamps are used, they shall be installed according to manufacturer’s specifications.

D. Standard railing shall be installed and maintained at all perimeters, floor openings, and sides of bridge decking at all times.

E. Falsework design and erection shall conform to DOSH and Federal OSHA rules and regulations and the Contract Specifications.

F. Protective sheeting or netting to prevent debris from falling shall be installed along railing where falsework spans a public street or pedestrian walkway.

G. Material and debris shall not be allowed to accumulate along the soffit walls or the wing walls. At no time shall material or debris be stored at any ladder or stair lower landing.

H. Proper walkways shall be constructed across wing walls.

3.40 SAFE ACCESS

A. Provide a safe means of access to all work areas. These accessways consist of ladders, scaffolds, doorways, aisle-ways, and elevators, and shall not be blocked by materials or debris.

3.41 CONFINED SPACE ENTRY PROCEDURE

A. Comply with the requirements stated in DOSH Rule 296-809, and all applicable Fed/OSHA and local rules and regulations.

B. Develop and operate a Confined Space Permit System. The Permits shall be issued by the ConSM, or his/her nominated representative, who is competent to identify the hazards posed by the specific works to be performed and the appropriate safety measures to be implemented. Three copies of the Permit shall be generated. One copy shall be retained by the ConSM, one copy shall be transmitted to the Resident Engineer and one copy shall be displayed at the location of the Confined Space Work.

C. Confined space hazards shall be evaluated before a permit is issued.
D. Only trained personnel may enter permit-required confined spaces, serve as attendants, or issue permits.

E. Rescue equipment shall be available for all confined space entries. Rescue equipment shall be maintained in accordance with manufacturers specifications, and all personnel shall be trained and practice use of the equipment at least annually.

F. Rescue plans shall be developed for all confined space entries in which self-rescue (or retrieval by the attendant using rescue equipment) is not possible. This includes coordination with outside rescue services or agencies.

3.42 [TUNNELS AND UNDERGROUND STATION CONSTRUCTION]

A. All Contractors and Subcontractors constructing tunnels, underground stations, and underground chambers shall comply with all applicable legal requirements, including the DOSH and Federal/OSHA Tunnel Safety Standards and the requirements manual and the Contract Documents. Underground station construction and excavation, including those using top-down building methods and not involving tunnel boring operations, are considered underground work and are confined spaces but are not classified as tunneling.

B. WAC 296-155-730 (1) states that all tunnels, shafts, chambers, and passageways, which are physically connected to ongoing underground construction, are covered by Subpart Q. Therefore, until all construction is completed and the system is declared ready for revenue operations, the University Link section of the Sound Transit Light Rail System will be considered to be an Underground Construction zone and subject to all the provisions of WAC 296-155 Part Q.

C. Maintain a job site that is organized, free of debris, and kept free of standing water and mud.

D. Maintain records of gas tests and airflow measurements and other tests or inspections on the surface by the SSSR or the Gas Tester, and make available on request to the Resident Engineer, Sound Transit, DOSH, and Fed/OSHA.

E. The results of the most recent gas testing and velocity measurements shall be posted at the portal in clear view of all entrants.

F. Transportation and Haulage

1. All locomotives shall be equipped with lights, front and rear; an audible warning device (horn, bell or siren); a fire extinguisher; and self-rescuers sufficient for the number of personnel anticipated to ride on, or in the train.

2. Mobile diesel-powered equipment used underground shall be either approved by MSHA in accordance with the provisions of 30 CFR Part 36, or shall be demonstrated by the employer to be fully equivalent to such MSHA-approved equipment, and shall be operated in accordance with 30 CFR Part 36.

3. Do not operate trains at a speed that will endanger any employee.

4. Equip locomotives and cars with automatic couplings and safety chains. Fasten and check these devices before cars are moved.

5. Slow all trains, or other haulage equipment, to 3 miles per hour or less when anyone is alongside the track or when passing over switches.

6. Keep rails free of mud, water, and debris at all times.
7. Tunneling locomotive operators shall be specifically identified and trained before work begins.

8. Locomotive operators who operate personnel trips shall possess a minimum of 1 year experience operating locomotives/haulage equipment underground.

9. Provide personnel-trips consisting of a locomotive/haulage vehicle/tow vehicle and the man-car only. The mixing of equipment, muck, segments, and supplies on the train while carrying personnel for shift change is prohibited. The carrying of small hand tools inside the personnel car is acceptable.

G. Rail Track
1. Inspect rail track at least once weekly and maintain in good repair at all times.
2. Document weekly track inspections and keep records available for inspection.

H. [Conveyor Systems]
1. When conveyors are used for debris removal for tunneling operations, a person shall be identified, with limited additional responsibilities, as responsible for maintenance. Failure to properly maintain conveyors for debris removal, resulting in debris spillage, may result in stopping of work related to the conveyor systems.
2. Conveyor maintenance records that include work performed and parts replaced shall be kept and available for audit and inspection at the request of the Resident Engineer.

I. Hoisting and Shafts
1. Do not hoist personnel by crane in or out of the shafts except in the case of an emergency and then only in an approved man-cage or basket stretcher. This also applies to cut-and-cover work.
2. The toplander shall warn personnel in the shaft, by the use of an air horn, of loads to be lowered into the shaft prior to the load being placed over the shaft.
3. Material hoisting, into and out of a shaft, shall be done by using appropriate hand signals or other approved communications systems such as voice communication with radios and voice-activated headset.
4. The toplander shall stand at the top of the shaft where he/she can see all vertical movement of the line and material being hoisted.
5. Provide a dedicated personnel hoist/elevator, in addition to access/egress stairs, for station excavations and TBM staging excavations where the depth of the excavation exceeds 60 feet.

J. Check-In/Check-Out System or "Brass board"
1. Establish a check-in/check-out system for personnel entering the underground work area to identify all personnel who have entered the work zone.
2. All personnel entering the underground work environment shall check-in/check-out via the Contractor brass in/brass out board.
3. Brass board system shall consist of a double brass system or equivalent. One brass shall be placed on the board and one on the worker underground. Unless the individual brass pieces include the name of the worker, a list of names assigned to individual brass numbers shall be posted at the brass board.

K. **[Tunnel-Driving Equipment]**

1. Only qualified and properly trained personnel shall be authorized or permitted to operate tunnel-driving equipment.

2. Provide a training program specific to each piece of equipment that is approved or presented by the manufacturer.

3. Tunneling locomotive operators shall be specifically identified and trained before work begins.

4. The tunnel-driving equipment/tunnel-boring machine shall be equipped with a gas detection system in accordance with DOSH/Fed OSHA requirements. The gas detection system shall be in working order at all times and shall be tested at least twice each week. Test records shall be kept by the Contractor and be made available to Sound Transit upon request.

5. The TBM mounted gas detection system shall transmit to remote monitoring locations available to the ConSM offices.

6. The TBM gas detection system shall, at a minimum, monitor for oxygen, methane, carbon monoxide, hydrogen sulfide, nitrogen oxides, and aldehydes. No operations will be allowed to occur if any gas monitor is not calibrated and functioning. Spare monitors shall be on-hand and calibrated according to manufacturer instructions.

L. Ventilation and gas monitoring

1. Ventilation shall be provided through a duct system, with intermediate booster fans, if necessary, to provide fresh air into the Heading.

2. Include double mufflers on main ventilation fans to minimize noise.

3. Minimum air volumes through the tunnels shall be 200 cubic feet per minute per person underground and 100 cubic feet per minute per brake diesel horse power in the underground environment.

4. The preferred method of tunnel ventilation is through the vent line to the heading. Wherever possible, vent lines shall be equipped with automatic drains to release the build up of condensate in the line. Ventilation systems shall be reversible from the surface without the need for manual adjustment of diverter valves, and dampers.

5. Gas testing shall be conducted prior to workers entering the tunnel, at the start of shift and midway through the shift, and a minimum of four times per shift. Locations for testing shall be at least at the portal, midpoint of the tunnel, end of the trailing gear, mid point of trailing gear, and in the segment erection area on the TBM. A record of testing shall be maintained by the Contractor. The record shall show the following, at a minimum: name of the Gas Tester, date, time, location, air velocity and direction, O₂, LEL, CO, and H₂S.

M. Communications
1. Install an underground telephone communication system in accordance with DOSH/Fed OSHA requirements.

2. Locate underground phones at, but not be limited to, the following:
   a. Heading/working face;
   b. Bottom and top of shaft(s);
   c. First-aid station;
   d. Contractor's office; and
   e. [At intervals not to exceed 1000 feet in tunnels].

3. Provide for two means of communications at all areas at all times underground in accordance with NFPA 241.

N. Safety Walkways and Access

1. [Limit pedestrian access through the tunnels to authorized personnel only.]

2. A clear, unobstructed walkway with adequate lighting shall be maintained throughout [the tunnel] in accordance with the Contract Specifications.

3. Minimum safety walkway width is 24 inches.

4. Maintain all floors and walkways in good condition.
   a. Loose or broken components shall be repaired or replaced immediately.
   b. Secure footing shall be ensured on all floors and walkways.

O. Refuge Stations

1. Pedestrian safety walkways or refuge stations in the tunnel shall be kept clear to provide a safe area for personnel and visitors when a locomotive is present. Under no circumstance shall personnel climb up on [tunnel] utility lines, hoses, or pipes mounted on the sides of the [tunnel] to allow haulage equipment to pass.

2. Refuge stations (if required) shall be placed at no more than 200-foot intervals.

3. When haulage equipment is approaching, personnel shall proceed to the nearest refuge station (if provided) and await passage of the haulage equipment.

P. Self-Contained Self-Rescuer (SCSR)

1. All personnel entering the [tunnels] and underground construction areas shall have a Self-Contained Self-Rescuer (SCSR) available for use.

2. All personnel entering a [tunnel] shall be instructed in the use of, and provided, a self-contained self-rescuer, when hired and periodically thereafter.

3. The Contractor may cache SCSRs at work sites. There shall be an adequate number of SCSRs for the work crew members, plus at a minimum 10% extra SCSRs over the SCSRs required for the work crew.

4. SCSR caches may be located no more than 50 feet from the active work zone.
5. Have the SSR inspect all self-rescuers at least once each month to verify the operational status of these units. Any unsatisfactory unit shall be replaced. Record the results of the inspection, keep on file in the Contractor's office, and make available to the Resident Engineer upon request.

Q. Rescue Crew
   1. [Refer to Section 31 71 26, Tunnel Rescue Teams.]
   2. Monthly drills simulating [tunnel] rescue shall be conducted in coordination with the Resident Engineer. A report detailing findings from each drill shall be prepared for review and submitted to the Resident Engineer.
   3. The Resident Engineer may stop work at any time if the [tunnel] rescue teams cannot demonstrate proficiency. If the Contractor has three deficient drills or three deficient audits during the contract period, and if requested by the CSM, Contractor shall contract directly with the City of Seattle Fire Department for all remaining [tunnel] rescue operations at no additional cost to Sound Transit.

R. Compressed Air Work
   1. [Refer to 31 71 19, Tunnel Excavation By Tunnel Boring machine.]
   2. [Where tunnel work is carried out under air pressure in excess of normal atmospheric pressure, the DOSH Compressed Air Safety Requirements, WAC 296-155-745 and WAC 296-36 shall apply and take precedence over any tunnel safety requirements that are in conflict.]
   3. Contractor is responsible for developing procedures for compressed air work and obtaining necessary approval or variances from the Washington Department of Labor and Industries if WAC requirements are not specifically defined for encountered conditions.
   4. [Provide a dedicated decompression chamber for tunnel workers. Specific requirements of the project work may require multiple decompression chambers, including rescue chambers, mobile chambers, and on-site medical decompression facilities. Include all necessary chambers, equipment, and personnel, which include, but are not limited to a nurse or physician on-site when compressed air work occurs, a mobile decompression chamber immediately available to transport workers out of the tunnel, rescue chambers, and on-site medical decompression facilities.]

S. Readiness Review Meetings
   1. The Resident Engineer will conduct a readiness review Safety and Security Meeting before work may start on any [tunnel] or underground station. Attendees shall include the Resident Engineer, CSM, Sound Transit Chief Safety Officer, the OCIP, risk manager, the insurance company loss control consultant, the Contractor's Project Manager, the Contractor's superintendent, ConSM, and the SSSR.
   2. The meeting will address the following:
      a. General contractual safety, security, health, and environmental requirements and responsibilities.
      b. Roles of the Resident Engineer, the CSM, the OCIP administrator, insurance carriers, and other personnel at Sound Transit.
c. Incident reporting requirements.

T. Illumination

1. Offices, workrooms, stairways, corridors, passageways, construction roads, working areas, and tunnels shall be adequately lighted while work is in progress or when needed to protect the public and construction personnel from construction hazards. Minimum foot-candles required for lighting are 10 foot-candles for indoor work areas and 5 foot-candles for outdoor work areas. Average lighting required is 20 foot-candles for indoor work areas and 10 foot-candles for outdoor work areas.

2. All lighting in compressed air chambers shall comply with applicable codes and requirements, including Washington Administrative Code.

3. Each tunnel worker shall have portable, permissible hand or cap lamp wherever natural light is inadequate or no emergency lighting exists.

4. All wiring shall comply with the latest edition of the National Electrical Code, DOSH, federal, State, and local regulations and requirements, where applicable.

U. Additional Required Contractor Safety and Security Inspections

1. A daily inspection of all underground work areas shall be made by the SSSR. Inspection reports shall be prepared and be kept on file for review by the Resident Engineer’s staff, CSM, and other Sound Transit personnel, the OCIP administrator, DOSH, and Fed/OSHA.

2. Designate a Competent Person to perform weekly inspections of track fasteners, fish plates, switches, de-railers, and bumpers, to ensure that they are maintained in a condition to prevent incidents. All defects or deficiencies shall be corrected in a timely manner.

3. The crane, hoist, or elevator operator shall inspect and record the daily inspection of all hoisting machinery or equipment and related safety appliances. Hazard noted shall be corrected immediately and so documented.

4. The locomotive operator shall perform and document a pre-shift inspection of the locomotive and associated equipment. Hazard noted shall be corrected and documented immediately.

V. Gas Tester

1. In “gassy” classified tunnels, underground stations, or underground chambers, employ a Competent Person on each work shift whose sole duty is gas testing. The Gas Tester shall be under the direct supervision of the SSSR.

2. The Gas Tester shall have the authority to stop work and remove personnel from the work area when gas or toxic levels reach a dangerous level as defined by the applicable safety regulations.

3.43 EXHIBITS

A. REPORT OF SAFETY AND SECURITY MEETING

B. CONTRACTOR’S MONTHLY INJURY/ILLNESS REPORT FORM

C. SUMMARY OF CONSTRUCTION SAFETY AND SECURITY REPORTS
D. MONTHLY SAFETY AND SECURITY INSPECTION CHECKLIST
E. CRANE INSPECTION RECORD
F. MONTHLY WIRE ROPE INSPECTION RECORD
G. ACKNOWLEDGEMENT OF SAFETY/SECURITY INDOCTRINATION
H. SOUND TRANSIT RECORDKEEPING POLICY FOR OCCUPATIONAL INJURIES AND ILLNESSES
I. CONSTRUCTION SAFETY/SECURITY SURVEY FORM
J. SUPERVISOR’S INCIDENT INVESTIGATION REPORT
K. WORKSHEET FOR JOB HAZARD ANALYSIS
L. PRE-TASK ANALYSIS
M. SAFETY AND SECURITY TRACKING SUMMARY FORM
N. VISITOR’S RELEASE AND HOLD HARMLESS AGREEMENT
O. UNDERGROUND CONTACT LOG

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## Contractor's Monthly Injury/Illness Report Form for Year of 20_

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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Number of Personnel on Worksite</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor Hours Worked</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Contractor Company Name:**

**Contractor Site Safety and Security Representative Signature:**

**Date:** ___________________
## SUMMARY OF CONSTRUCTION SAFETY AND SECURITY REPORTS

<table>
<thead>
<tr>
<th>TITLE</th>
<th>EVENT(S) GENERATING REQUIRED REPORT</th>
<th>PREPARED BY</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report of Safety/Security Meeting</td>
<td>Recording safety/security meeting</td>
<td>Supervisor/ Foreman holding meeting</td>
<td>Subcontractors may hold separate tool box meetings or attend Contractor’s.</td>
</tr>
<tr>
<td>Construction Safety/Security Survey</td>
<td>Daily Report by Contractor. Random report by Sound Transit (likely weekly).</td>
<td>Contractor Daily. Sound Transit on a random basis (likely weekly).</td>
<td>Filled out daily and submitted weekly by the Contractor’s Site Safety and Security Representative or ConSM. Filled out by ST representative based on random site surveys (likely conducted weekly) Observed safety or security deficiencies will require immediate corrective actions with written response to the Resident Engineer within 24 hours of verbal or written notice.</td>
</tr>
<tr>
<td>Monthly Safety and Security Tracking Summary Form</td>
<td>Monthly report (s)</td>
<td>Contractor</td>
<td>Submitted each month, covering the previous month.</td>
</tr>
<tr>
<td>Job Hazard Analysis</td>
<td>Known safety hazards and all major construction operations</td>
<td>Contractor</td>
<td>Filled out and submitted based on nature of work before work is started.</td>
</tr>
<tr>
<td>Monthly Safety/Security Inspection Checklist</td>
<td>Monthly Safety/Security Inspection</td>
<td>Contractor</td>
<td>Filled out and submitted monthly by the Contractor’s Site Safety and Security Representative</td>
</tr>
<tr>
<td>Crane Inspection Record &amp; Wire Rope Inspection Record</td>
<td>Monthly report(s)</td>
<td>Contractor</td>
<td>Completed by Rigging Supervisor</td>
</tr>
<tr>
<td>Lock and Tag Form</td>
<td>Isolation of energy sources to protect personnel</td>
<td>Contractor</td>
<td>Accounts for all locks and tags issued for energy isolation.</td>
</tr>
<tr>
<td>Supervisor’s Incident Investigation Report</td>
<td>Any safety, security, property damage or 3rd party incident to Contractor/ Subcontractor employee or the general public</td>
<td>Contractor</td>
<td>Report must be submitted within 24 hours of the event</td>
</tr>
<tr>
<td>Monthly Injury/Illness Report</td>
<td>Monthly report(s)</td>
<td>Contractor</td>
<td>Submitted each month, covering previous month</td>
</tr>
<tr>
<td>Confined Space Entry Permit</td>
<td>Confined space work</td>
<td>Contractor</td>
<td>Posted at job site during confined space work</td>
</tr>
<tr>
<td>Log &amp; Summary of Occupational Injuries &amp; Illnesses</td>
<td>Employee occupation injury or illness</td>
<td>Contractor</td>
<td>Contractor required to retain Form 300 and related records for 5 years</td>
</tr>
</tbody>
</table>

**Distribution:** Resident Engineer, with copy to Link Construction Safety.
MONTHLY SAFETY & SECURITY INSPECTION CHECKLIST

<table>
<thead>
<tr>
<th>Contractor:</th>
<th>Date:</th>
<th>Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract No.</td>
<td>Job-site Location:</td>
<td></td>
</tr>
<tr>
<td>Person(s) making inspection:</td>
<td>Observers/Others on Inspection:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Column: A = Adequate B = Inadequate</th>
</tr>
</thead>
</table>

1. PROGRAM ADMINISTRATION:

| (a) | Posting job-site warning posters. |
| (b) | Do you have safety and security meetings? |
| (c) | Do you have job safety and security training, including first-aid training? |
| (d) | Are there medical service and first-aid equipment, stretchers, and emergency vehicles available? |
| (e) | Are job-site injury records being kept? |
| (f) | Are emergency telephone numbers, such as police department, fire department, doctor, hospital, and ambulance posted? |
| (g) | Can you provide records of pre-employment, for cause, post-incident and random drug testing? |

2. HOUSEKEEPING AND SANITATION:

| (a) | General neatness of working areas. |
| (b) | Regular disposal of waste and trash. |
| (c) | Passageways and walkways clear? |
| (d) | Adequate lighting. |
| (e) | Projecting nails removed. |
| (f) | Oil and grease removed. |
| (g) | Walking/working surfaces free of mud, water and debris |
| (h) | Walking/working surfaces free of holes, trip hazards and level changes |
| (i) | Waste containers provided and used. |
| (j) | Sanitary facilities adequate and clean. |
| (k) | Drinking water tested and approved. |
| (l) | Adequate supply of water. |
3. **FIRE PREVENTION**:  
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Fire instructions to personnel.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Fire extinguishers identified, checked, and lighted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Fire department phone number posted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Hydrants clear, access to public thoroughfare open.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e) Good housekeeping.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(f) “No Smoking” posted and enforced where needed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(g) Fire brigades.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. **ELECTRICAL INSTALLATIONS**:  
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Adequate and properly insulated wiring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Fuses provided.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Fire hazards checked.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Electrical dangers posted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e) Proper fire extinguishing provided.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(f) Are terminal boxes equipped with required covers? Are covers used?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(g) Electrical work is conducted de-energized.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(h) Only electricians are performing work on or near electrical equipment.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. **HAND TOOLS**:  
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Proper tool being used for each job.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Neat storage, safe carrying.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Inspection and maintenance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Damaged tools repaired or replaced promptly. Are employees’ tools inspected and repaired?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. **POWER TOOLS**:  
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Good housekeeping where tools used.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Tools and cords in good condition.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Proper grounding.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Proper instruction in use.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e) All mechanical safeguards in use.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(f) Tool extensions used for repetitive work overhead or at foot-level.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(g) Right tool being used for the job.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(h) Wiring properly installed.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(i) Hand-arm vibration dampening addressed for tools with high vibration levels.

7. **POWDER-ACTUATED TOOLS:**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Local law and ordinances complied with.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) All operators qualified.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Tools and charges protected from unauthorized use.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Competent instruction and supervision.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e) Tools checked and in good working order.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(f) Tools not used on any but recommended materials.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(g) Safety goggles or face shields.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(h) Flying hazard checked by backing up, removal of personnel, or use of captive stud tool.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. **LADDERS:**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Ladders inspected and in good condition?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Properly secured to prevent slipping, sliding or falling?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Do side rails extend above top of landing?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Stepladders fully open when in use.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e) Metal ladders not used around electrical hazards.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(f) Is the right ladder used for the job?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(g) Are ladders painted?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(h) Straight ladders at correct angle?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. **SCAFFOLDING:**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Is erection properly supervised? Designated Competent Person</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Will all structural members meet the safety factor?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Good housekeeping where scaffolds are used.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Are all connections secure?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e) Is scaffold tied into structure?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(f) Are working areas free of debris, snow, ice, and grease?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(g) Are foot sills and mud sills provided?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(h) Are workers protected from falling</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(i) Is the scaffold plumb and square with cross-bracing?
(j) Are guardrails, intermediate rails, and toe boards in place?
(k) Is scaffold equipment in good working order?
(l) Are ropes and cables in good condition?
(m) Can a personnel lift be used instead?

10. HOISTS, CRANES, AND DERRICKS:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>(a)</td>
<td>Inspect cables and sheaves.</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>Check slings and chains, hooks, and eyes.</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>Equipment firmly supported.</td>
<td></td>
</tr>
<tr>
<td>(d)</td>
<td>Outriggers used if needed.</td>
<td></td>
</tr>
<tr>
<td>(e)</td>
<td>Power line inactivated, removed, or at safe distance.</td>
<td></td>
</tr>
<tr>
<td>(f)</td>
<td>Proper loading for capacity at lifting radius.</td>
<td></td>
</tr>
<tr>
<td>(g)</td>
<td>All equipment properly lubricated and maintained.</td>
<td></td>
</tr>
<tr>
<td>(h)</td>
<td>Signalman where needed.</td>
<td></td>
</tr>
<tr>
<td>(i)</td>
<td>Signals understood and observed.</td>
<td></td>
</tr>
<tr>
<td>(j)</td>
<td>Are inspection and maintenance logs maintained?</td>
<td></td>
</tr>
</tbody>
</table>

11. HEAVY EQUIPMENT:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>(a)</td>
<td>Regular inspection and maintenance.</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>Lubrication and repair of moving parts.</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>Lights, brakes, warning signals operative.</td>
<td></td>
</tr>
<tr>
<td>(d)</td>
<td>Wheels chocked when necessary.</td>
<td></td>
</tr>
<tr>
<td>(e)</td>
<td>Haul roads well maintained and laid out properly.</td>
<td></td>
</tr>
<tr>
<td>(f)</td>
<td>Protection when equipment is not in use.</td>
<td></td>
</tr>
<tr>
<td>(g)</td>
<td>Are shut-off device on hose lines in case of hose failures?</td>
<td></td>
</tr>
<tr>
<td>(h)</td>
<td>Are noise arresters in use?</td>
<td></td>
</tr>
</tbody>
</table>

12. MOTOR VEHICLES:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>(a)</td>
<td>Regular inspection and maintenance.</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>Qualified operators.</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>Local and state vehicle laws and regulations observed.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(d) Brakes, lights, warning devices operative.</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>(e) Weight limits and load sizes controlled.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(f) Personnel carried in a safe manner - seated.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(g) Personnel carried in a safe manner – non-seated.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(h) Are back-up signals provided?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(i) Are fire extinguishers installed where required?</td>
<td></td>
</tr>
</tbody>
</table>

**13. GARAGES AND REPAIR SHOPS:**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(a) Fire hazards.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) Dispensing of fuels and lubricants.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(c) Good housekeeping.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(d) Lighting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(e) Carbon monoxide dangers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(f) Are all fuels and lubricants in proper containers?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(g) Proper ventilation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(h) Proper grounding and bonding.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(i) Chemical hazards posted correctly?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**14. BARRICADES:**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(a) Floor openings planked over or barricaded.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) Roadways and sidewalks effectively protected.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(c) Adequate lighting provided.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(d) Traffic controlled.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(e) Access to site and all entrances controlled and secured at all hours</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**15. HANDLING & STORAGE OF MATERIALS:**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(a) Are materials properly stored or stacked?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) Are passageways clear?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(c) Stacks on firm footings, not too high.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(d) Proper number of workers for each operation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(e) Are personnel lifting loads correctly?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(f) Are materials protected from weather conditions?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(g) Protection against falling.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(h) Is dust protection observed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(i) Extinguishers and other fire protection.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. EXCAVATION AND SHORING:</td>
<td>A</td>
<td>B</td>
<td>CONDITION AND ACTION PLAN</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---</td>
<td>---</td>
<td>--------------------------</td>
</tr>
<tr>
<td>(a) Are adjacent structures properly shored?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Is shoring and sheathing used for soil and depth?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Are roads and sidewalks supported and protected?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Is material stored too close to excavations?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e) Is excavation barricaded and lighting provided?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(f) Is equipment a safe distance from edge of excavation?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(g) Are ladders provided where needed?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(h) Are equipment ramps adequate?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Is job supervision adequate?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>17. DEMOLITION:</th>
<th>A</th>
<th>B</th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Are operations planned ahead?</td>
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<tr>
<td>(b) Is there shoring of adjacent structures?</td>
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<tr>
<td>(c) Are material chutes used?</td>
<td></td>
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<tr>
<td>(d) Is there sidewalk and other public protection?</td>
<td></td>
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<tr>
<td>(e) Clear operating space for trucks and other vehicles.</td>
<td></td>
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<tr>
<td>(f) Adequate access ladders or stairs.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>18. PILE DRIVING:</th>
<th>A</th>
<th>B</th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Are there proper storage procedures?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(b) Is unloading performed only by properly instructed worker?</td>
<td></td>
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<tr>
<td>(c) Are tag lines, slings, etc. in good condition?</td>
<td></td>
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<td></td>
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<tr>
<td>(d) Are pile driving rigs properly supported?</td>
<td></td>
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</tr>
<tr>
<td>(e) Are ladders on frames?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(f) Are cofferdams maintained and inspected?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(g) Is adequate pumping available?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(h) Is personnel protection adequate? Hearing protection?</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>19. EXPLOSIVES:</th>
<th>A</th>
<th>B</th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Qualified operators and supervision.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Proper transport vehicles.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(c) Local laws and regulations observed.</td>
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<td></td>
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</table>
(d) Storage magazines constructed per regulations or as recommended.

(e) Experienced personnel handling explosives at all times.

(f) Cases opened properly.

(g) “No Smoking” posted and observed where appropriate.

(h) Detonators tested before each shot.

(i) All personnel familiar with signals, and signals properly used at all times.

(j) Inspection after each shot.

(k) Proper protection and accounting for all explosives at all times.

(l) Proper disposition of wrappings, waste and scrap.

(m) Advise residents nearly of blasting cap danger, and inspect potential damage points.

(n) Check radio frequency hazards.

20. FLAMMABLE GASES AND LIQUIDS: A B CONDITION AND ACTION PLAN

(a) All containers clearly identified.

(b) Proper storage practices observed.

(c) Fire hazards checked.

(d) Proper storage temperatures and protection.

(e) Proper types and number of extinguishers nearby.

(f) Carts for moving cylinders.

21. MASONRY: A B CONDITION AND ACTION PLAN

(a) Proper scaffolding.

(b) Masonry saws properly equipped, dust protection provided.

(c) Safe hoisting equipment.

22. ROADWAY CONSTRUCTION: A B CONDITION AND ACTION PLAN

(a) Laws and ordinances observed. State/local police approval?

(b) Competent flaggers properly dressed, instructed, and posted.

(c) Adequate warning signs and markers.

(d) Equipment not blocking right-of-way.

(e) Traffic control through construction site.

(f) Adequate marking and maintenance of
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>(g) Dust control.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(h) Adequate lighting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Meets specification requirements.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 23. PERSONAL PROTECTIVE EQUIPMENT:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Eye protection.</td>
<td></td>
<td></td>
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<tr>
<td>(b) Face shields.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Respirators and masks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Helmets and hoods.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e) Head protection.</td>
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<td></td>
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<tr>
<td>(f) Gloves, aprons, and sleeves; rubber or plastic, designed to afford protection from alkalis and acids; electrician’s rubber gloves with protectors.</td>
<td></td>
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</tbody>
</table>

### 24. SECURITY VULNERABILITIES:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>CONDITION AND ACTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Threats from known individuals are controlled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Site-specific threats have been analyzed and controlled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Property and material is secured at all times</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(g) Respirators for harmful dust, asbestos, sand blasting, welding (lead paint, silica, chromium and galvanized zinc or cadmium). Compliance with hazmat requirements. Provide adequate ventilation when painting or applying epoxy resins. (When there is a question about injurious exposure, notify superior immediately who in turn shall arrange for atmospheric samples to be taken.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. UNSAFE ACTS OR PRACTICES OBSERVED (list):</td>
<td></td>
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<tr>
<td>---------------------------------------------</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>25. REPETITIVE VIOLATIONS OBSERVED:</th>
</tr>
</thead>
</table>


### CRANE INSPECTION RECORD

<table>
<thead>
<tr>
<th>CONTRACTOR: ____________________</th>
<th>CONTRACT NO.: ____________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRANE NO: _______</td>
<td>MILEAGE: _______</td>
</tr>
</tbody>
</table>

#### A. GENERAL REQUIREMENTS

- **OK**
  - Capacity Charts in cab
  - Special instruction posted
  - Barricades (tailswing)
  - Exhaust pipes guarded
  - BC fire extinguisher in cab
  - First-aid kit in cab
  - Safety glass in cab
  - Guardrails/hand holds
  - Platform and steps/non-skid
  - Proximity signs, 10 ft. min.

- ***REP**
  - Controls
  - Clutches
  - Brakes
  - Brake locks
  - Main drum
  - Boom hoist panel
  - Boom hoist kickout
  - Oil leaks
  - Hook rollers and turret

#### B. ATTACHMENTS

- ***Hooks and blocks (safety latch on hook)**
  - Steering
  - Brake (whole system)
  - Lights, horn, wipers
  - Transmission
  - Differential
  - Clutch
  - Engine
  - Tires and wheels
  - Gauges

#### USE WIRE ROPE FORM FOR CABLE INSPECTIONS

Inspected at: (Location) ______________________________ By:

* Repair or Replace - Respond on reverse side by specific item letter and number. Requires separate, recorded annual inspection for deformation or cracks.
### MONTHLY WIRE ROPE INSPECTION RECORD

<table>
<thead>
<tr>
<th>CONTRACTOR:</th>
<th>CONTRACT NO.:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRANE NO:</td>
<td>MILEAGE:</td>
</tr>
<tr>
<td>HOURS:</td>
<td>DATE INSPECTED:</td>
</tr>
</tbody>
</table>

#### WIRE ROPE

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SIZE</th>
<th>(A) NUMBER OF BROKEN WIRES PER:</th>
<th>(B) %DIAMETER REDUCTION (WEAR OR CORE DAMAGE)</th>
<th>(C) KINKED CRUSHED OR CUT, ETC.?</th>
<th>(D) LUBED, CORROSION (INTERNAL OR EXTERNAL) HEAT DAMAGE?</th>
<th>(E) TERMINAL TACKLE, BLOCKS, HOOKS, ETC.?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Hoist (LD. Line)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Boom Hoist (Top Lift)</td>
<td></td>
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</tr>
<tr>
<td>Jib Hoist (Whip Line)</td>
<td></td>
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<tr>
<td>Pendants (Main)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pendants (150 foot boom +)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Jib guys (Upper)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Jib guys (Lower)</td>
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</table>

Replacement of hoisting rope shall be done in compliance with the equipment manufacturers published replacement criteria and the Washington Administrative Code Chapter 296-155 Part L.

Inspected at: (Location) ____________________________ By: ____________________________

Comments:


ACKNOWLEDGEMENT OF SAFETY/SECURITY INDOCTRINATION

Contract No: ___________
Date: ___________

I, ______________________, attended the safety and security indoctrination session on _____________
given by ___________________________________________ covering the following information:

✓ Hazards present in the work assignment and in the general area in which I will be working;

✓ Personal protective equipment required;

✓ Instructions on the proper procedure for reporting unsafe job conditions that I may encounter;

✓ Reporting of any and all injuries, incidents, and damage (no matter how slight);

✓ Contractor’s job safety and security rules;

✓ Location of first aid and medical facilities;

✓ Toolbox Safety and Security Meeting requirements;

✓ Emergency service notification procedure for fire, medical emergencies, police problems, or other emergency situations;

✓ An orientation by the foreman or superintendent of my work area.

I affirm and understand the information and will abide by the requirements presented.

Signature: ____________________________________
Affiliation: ____________________________________
SECTION 01 35 29.10 - EXHIBIT H

SOUND TRANSIT RECORDKEEPING POLICY FOR OCCUPATIONAL INJURIES AND ILLNESSES

Introduction

The methods outlined in this procedure are in compliance with American National Standards Institute (ANSI) Standard Z.16 for recording and measuring work injury and illness experiences, independent of workers compensation laws and rulings, but compatible with the recordkeeping requirements of the Bureau of Labor Statistics and Occupational Safety and Health Administration (OSHA).

The fact that an employer or employee did not have control over the cause of a work-related (occupational) injury or illness shall not be a criterion for excluding the case from being recorded under the provisions of this procedure.

Thorough investigation of all factors relating to the occurrence of each reported work-related injury or illness is essential. Determination as to whether or not the case should be considered recordable under ANSI Standard Z.16 shall be based upon the evidence developed in such investigations. Unless there is a preponderance of evidence that the injury or illness did not result from the work activity or environment of employment, the injury or illness shall be considered a work-related case.

Purpose

The purpose of reporting occupational injuries and illnesses to Sound Transit and the Resident Engineer is to provide an accurate and uniform method for recording, classifying, and reporting as a means of evaluating programs designed to control such injuries and illnesses and establishing training requirements for the project. This procedure will allow management to measure its safety and security program against others and implement incentive and award programs. This procedure is not intended to replace employers' OSHA responsibility for reporting work-related injuries and illnesses.

Scope

This procedure shall be followed by all Sound Transit staff, consultants, prime contractors, and Subcontractors.

Definitions

1. **Employee**: Any person engaged in activities for, and receiving direct payment for services, from an employer associated with the Link Light Rail System.

2. **Exposure or Employee Hours**: The total number of hours worked by all personnel direct billing to a project or contract including craft workers, clerical, administrative, and supervision. This shall also include all hours for any Subcontractor, but NOT for suppliers and vendors. Actual hours worked are to be used for calculating incidence rate, frequency rate, and severity measure. However, when actual hours cannot be accurately determined, estimated hours may be used. Employee hours shall be calculated as set forth below:
   a. **Actual Exposure Hours**: Employee hours of exposure for non-exempt personnel are to be taken from certified payroll records and include only actual straight-time hours worked and actual overtime hours worked.
   b. **Estimated Exposure Hours**: When actual employee hours of exposure are not available, estimated hours may be used. Such estimated hours should be obtained by multiplying the total employee Days worked for the period by the average number of hours worked per Day. If the hours worked per Day vary among departments or crews, a separate estimate should be made for each department or crew and these estimates added to obtain the total hours. Estimates for overtime hours should be included.
If employee hours are estimated, indicate the reason or basis upon which estimates are made.

c. **Exempt Employee**: For executives, project management, supervisors, and other personnel whose working hours are not defined, the employer shall use an average of 8 hours per Day for computing exposure hours.

d. For Sound Transit, 75 percent of projects direct charge personnel’ hours as identified in the monthly labor report maintained by the accounting department shall be utilized in determining exposure hours.

3. **Work Environment**: The work environment is comprised of the physical location, equipment used, and kinds of operations performed by an employee in the performance of work associated with the Sound Transit Link Light Rail System, whether on or off the project premises.

4. **First-Aid Treatment**: One-time treatment and subsequent observation of minor injuries that may include minor scratches, cuts, burns, splinters, etc., which do not ordinarily require medical treatment. Treatment and observation for this purpose are considered first-aid even though provided by a physician or registered professional personnel.

5. **Medical Treatment**: All non-first-aid treatment of injuries administered by physicians, registered professional personnel, or lay persons. Medical treatment does not include first-aid treatment provided by a physician or registered professional personnel as previously defined.

6. **Diagnostic Procedures**: Certain diagnostic procedures performed by medical personnel may be classified as first-aid, such as the following:
   a. Hospitalization for observation is considered first-aid as long as no medical treatment was provided;
   b. Visits to a physician or nurse for observation only or for a routine change of dressing;
   c. X-ray examinations where negative findings and no other medical treatment was performed; and
   d. Physical examinations yielding no findings and not substantiating subjective complaints.

7. **Preventive Procedures**: Certain preventive procedures and treatments may be classified as medical treatment or first-aid treatment.

Tetanus shots or tetanus boosters are considered preventive and not considered medical treatment. However, a tetanus shot administered because of an injury shall be considered medical treatment and is recordable.

Prescription medication administered as a single dose is considered not recordable. When prescription medication is administered for more than a single dose, it is considered medical treatment and is recordable.

8. **Work-Related Case**: Any occupational injury suffered by an employee which results from a work incident or from an exposure involving a single incident in the work environment, and any illness caused by exposure to environmental factors associated with employment. Work environment is made up of the physical location, equipment and materials used, and kinds of operations performed by an employee in the performance of his work, whether on or off the employer's premises. Therefore, injuries or illnesses occurring in such places as an employee parking lot, lunchroom, restroom, or another office or location, and during rest or lunch periods can be work-related. Whether any case is work-related will be determined by the employer.

9. **Recordable Case**: Any work-related injury case requiring more than first-aid and all occupational illnesses. Recordable cases include:
   a. Deaths, regardless of the time between occupational injury or illness and death.
   b. Injuries resulting in any of the following:
      1. Lost work days - Days away from work.
      2. Medical treatment other than first-aid.
   c. All work-related illnesses.

10. **Lost Work Days**: Lost Work Days - Days Away From Work: Days away from work are those work days (consecutive or not) on which the employee would have worked but could not due to an occupational injury or illness. Lost work days shall not include the day of injury or onset of illness
or any days on which the employee would not normally have worked such as weekends and holidays.

Lost workday cases involving days of restricted work activity are those cases where, because of injury or illness, (1) the employee was assigned to another job on a temporary basis, or (2) the employee worked at a permanent job less than full time, or (3) the employee worked at his or her permanently assigned job but could not perform all the duties normally connected with it.

Restricted work activity occurs when the employee, because of the job-related injury or illness, is physically or mentally unable to perform all or any part of his or her normal assignment during all or any part of the normal workday or shift. The emphasis is on the employee's inability to perform normal job duties over a normal work shift.

11. Measurability of Recordable Injury and Illness Cases:
   a. **Total Recordable Incidence Rate**: Total number of OSHA recordable cases for the reporting period.

   \[
   \text{TOTAL RECORDABLE INCIDENCE RATE: } \frac{\text{NO. OF RECORDABLE CASES}}{\text{ACTUAL EMPLOYEE HOURS}} \times 200,000
   \]

   b. **Lost Workday Incidence Rate**: Total recordable cases that resulted in death or lost work days/restricted duty for the reporting period.

   \[
   \text{LOST WORKDAY INCIDENCE RATE: } \frac{\text{NO. OF LOST WORKDAY CASES}}{\text{ACTUAL EMPLOYEE HOURS}} \times 200,000
   \]

   c. **Severity Measure**: Total number of work days lost that occurred during the reporting period.

   \[
   \text{SEVERITY MEASURE: } \frac{\text{NO. OF LOST WORK DAYS}}{\text{ACTUAL EMPLOYEE HOURS}} \times 200,000
   \]

   For the purpose of the above formulas, the allocation of days when a death or a permanent total disability is involved is as follows:
   a. Each death from an occupational injury or illness is assigned a time of 6,000 days.
   b. Permanent Total Disability from an occupational injury or illness is assigned a time of 6,000 days.

**Procedure**

Upon notification of a work-related injury or illness the employer shall determine if it is recordable or non-recordable. Employer shall use the established guidelines contained in this procedure and ANSI Standard Z.16.

Submitting a Workers Compensation Employer First Report does not alone determine that an occupational injury or illness is recordable. Employer First Reports may be submitted for cases for which only first-aid treatment was rendered by a physician or registered professional.

Employer shall notify the Resident Engineer immediately of all occupational injuries or illnesses and, within 24 hours, submit a copy of the Employers First Report, supervisor’s incident investigation, medical
release form, and physician report. These documents assist Link Safety/Security in determining injury or illness trends, and verification that all work-related injuries and illnesses are properly recorded.

By the twelfth business day of each month, each employer shall submit to the Resident Engineer, the CSM, and the Link CSM the Monthly Statistics and the Safety and Security Information Summary with complete information for the previous month. These forms shall include, for prime contractors and Subcontractors:

- Total hours worked
- Total number recordable cases for that month
- Total number of recordable lost time cases for that month
- Total lost work days for that month
- Lost work days resulting from an injury or illness from a preceding month
- Information on recordable injuries (name, craft, type injury, disposition, days off and Contractor).
### CONSTRUCTION SAFETY/SECURITY SURVEY FORM

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<tr>
<th>OK</th>
<th>LTA</th>
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<th>OK</th>
<th>LTA</th>
<th>NA</th>
<th>OK</th>
<th>LTA</th>
<th>NA</th>
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</tbody>
</table>

**DATE:**

**CONTRACT NO.:**

**CONTRACTOR:**

**SUBCONTRACTOR:**

**SAFETY OFFICER:**

**OBSERVATIONS:**

**ORIGINATOR SIGNATURE:**

**RESPONSE / CORRECTIVE ACTIONS TAKEN:**
INSTRUCTIONS FOR CONSTRUCTION SAFETY/SECURITY SURVEY FORM

1. The Construction Safety and Security Survey is required for daily site surveys and shall be used to record all unsafe conditions and/or acts noted by the ConSM, SSSR or RE personnel.

2. This form is primarily intended for the use of the Contractor’s safety and security personnel in accordance with the requirements of this specification. Unsafe conditions and/or actions shall be corrected immediately and reported daily on this form.

3. Completed copies of all construction safety and security survey forms indicating action taken and/or date completed shall be submitted to the RE on a weekly basis. These forms shall be signed by the Contractor’s project manager and Sound Transit’s RE.

4. This form shall be used by the RE and/or the CSM to document any unsafe act and/or conditions noted during site surveys conducted by the RE or Sound Transit safety personnel. Recommendations may be made to the Contractor’s safety and security representative and/or project manager or superintendent for immediate corrective action.

5. This form, when filled out by the RE or Sound Transit safety personnel, shall be handled in the following manner:
   a. The original shall be given to the Contractor and a copy retained or sent to the RE.
   b. The Contractor shall complete the action taken and/or date completed section of the original survey and return it signed by the project manager to the RE.
   c. The RE shall sign the survey and distribute it in accordance with Exhibit C, Summary of Construction Safety and Security Reports.

6. Observed safety or security deficiencies will require immediate corrective actions with written response to the Resident Engineer within 24 hours of verbal or written notice.

7. Failure to take immediate corrective action in a timely manner may result in a Stop-Work Order issued in accordance with the General Conditions, Section 000200.
## SUPERVISOR’S INCIDENT INVESTIGATION REPORT

### CONTRACTOR:

### INCIDENT DATE: ______________________  TIME: ___________________

### INCIDENT LOCATION (SPECIFIC):

### INJURY/ILLNESS     NEAR MISS     SECURITY BREACH     PROPERTY DAMAGE     THIRD PARTY

### WHAT HAPPENED? (Describe operation, activity, condition and, how incident or loss occurred. Use separate sheet and diagram if necessary.):

1. 
2. 
3. 
4. 
5. 

### PRIMARY CAUSE (Condition or act that caused the incident.):

1. 
2. 
3. 
4. 

### Recommended correction action:

1. 
2. 
3. 

### Equipment involved: ___________________________ #: __________________

### Employee involved:

### Employee Injury (Describe):

1. 
2. 
3. 

### Medical Referral:

### Company Property Damage or Loss (Describe):

1. 
2. 
3. 

### Property, Damage or Injury to Others (Describe):

1. 
2. 
3. 

### Owner/injured (Name, address, phone):

### Witnesses (Name, address, phone):

---

**ORIGINAL:** Contractor’s File  
**COPY:** Sound Transit
1. This form shall be submitted by the Contractor for each incident involving any of the following:

   a. Injury to an employee of the Contractor or any Subcontractor.
   b. Any injury to persons not directly connected with the project (including all alleged injuries reported by a member of the public.)
   c. Incidents resulting in damage to public, private, or commercial property (including all alleged property damages).
   d. Incidents that are “Near misses” that could have resulted in any of the above.

2. Submittals shall be made within 24 hours of the incident. Pertinent facts not available within the above time shall be submitted in a supplemental report.

3. This form shall be prepared by the Contractor and distributed in accordance with Exhibit C, Summary of Construction Safety and Security Reports.

Complete investigation of any incident, whether or not injury or damage is involved, is a vital part of effective incident prevention. The investigation is not complete until the causes and proper corrective actions are determined.

The investigation and this report shall be completed by you immediately after any incident relating to your job which involves:

- Personal injury to any of our personnel or any other persons,
- Damage or loss to company property, materials or equipment,
- Damage or loss to property of other, and
- "Near misses" - which could have resulted in any of the above.

If property damage or personal injury to others is involved, do not assume any responsibility or obligate the company or Sound Transit in any way. Do not sign anything for anyone except your employer’s representative. You should politely refer any question to your Project Manager.

In your investigation and preparation of this report, give extra attention to the following areas:

WHAT HAPPENED?

(a) This does not mean list the injuries or damages that resulted. It means explain the events, which led to the injuries or damages.

(b) Describe the work or activity involved, the conditions and what the people involved were doing.

(c) Describe the tools, equipment or materials involved, their condition, and how they were involved.

(d) Describe the unexpected event or occurrence, which resulted in the injury, damage, or loss.

(e) If more space is needed or if a diagram will help your description, please attach another sheet.

CAUSES

Primary and Secondary - See Common Causes of Incidents
CORRECTIVE ACTIONS
Primary and Secondary

LOCATION
Specific place at job-site (street and city when applicable).

PROPERTY DAMAGE OR INJURY TO OTHERS
Describe the property, extent of damage or nature of injury. If vehicle is involved, show year and model.

DESCRIBE PRACTICES OF EMPLOYEE:
Safety equipment provided but not used. Personal protective equipment provided but not used, improper or unsafe tool or equipment used. Horseplay or practical jokes. Instructions or rules disregarded. Inattention. Inexperience. Physical condition of employee. Improper method of doing work. Action of another person. Improper clothing.

UNSAFE EQUIPMENT OR MATERIALS:
Ineffectively guarded equipment. Unguarded equipment. Defective materials. Defective tools. Defective equipment (not motor vehicles). Defective motor vehicle equipment. Improper type or poor design. Unsafe equipment or material of another Contractor or a customer.

UNSAFE CONDITIONS:
Poor light. Poor ventilation. Congested area. Improper storage of materials. Exits or emergency escapes inadequate or not provided. Faulty layout of plant or facilities. Tools or equipment improperly stored. Poor housekeeping. Unsafe conditions caused by another Contractor or a customer.

- Submit original and copy to the Resident Engineer
- Retain copy for your records
- Use a Medical Referral slip for any injured employee who goes to a Doctor
- Keep your office advised
### WORKSHEET FOR JOB HAZARD ANALYSIS

<table>
<thead>
<tr>
<th>Contractor:</th>
<th>JHA by:</th>
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| Briefly Describe the Job or Operation: |

| Required and Recommended Personal Protective Equipment: |

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<th>Safe Job Actions Needed</th>
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### Pre-Task Analysis (PTA) Risk Reduction Talk

**SUPERVISOR:**

**DATE:**

**JOB DESCRIPTION:**

**LOCATION:**

**DOES TASK REQUIRE SPECIAL TRAINING?**

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#### PTA Checklist

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**EXHIBIT L**

**SECTION 01 35 29.10 - PRE-TASK ANALYSIS (PTA)**

---

**NOTES:**

- Sound Transit
- Risk Reduction Talk
- Pre-Task Analysis (PTA)
- Location:
- Supervisor:
- Date:
- Job Description:
- Does task require special training? Yes/No
- JHA required: Yes/No
- Completed: Yes/No

---

**Emergency Response Procedures 60%**

---

**PAGE 95**

---

**SECTION 01 35 29.10 - EXHIBIT L**

---

**PRE-TASK ANALYSIS (PTA)**

---

**NORTH LINK FINAL DESIGN SECTION 01 35 29.10 RTA/LR 0177-09**

---

**BROOKLYN STATION FINISHES HEALTH, SAFETY, SECURITY AND LINK PROJECT N140**

---

**EMERGENCY RESPONSE PROCEDURES 60%**

---
## SAFETY AND SECURITY TRACKING SUMMARY FORM

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### HAZARD RATING DEFINITIONS

I: A condition, practice, or vulnerability likely to cause permanent disability; loss of life or body part, or extensive loss of structure or material.

II: A condition, practice, or vulnerability or practice likely to cause serious injury or illness, resulting in temporary disability or moderate property damage.

III: A condition, practice, or vulnerability or practice likely to cause minor (non-disabling) injury or illness or non-disruptive property damage.

IV: A condition, practice, or vulnerability or practice likely to cause trivial injury or damage but has the potential to become more severe.
SECTION 01 35 29.10 - EXHIBIT N
VISITOR’S RELEASE AND HOLD HARMLESS AGREEMENT

Contractor: ____________________________________________________________

Contract No: ________________________________ Date: __________

I am voluntarily entering a potentially hazardous Link Light Rail Project construction site for my own purposes and interests. As consideration for such entry, it is my intent to release, hold harmless, and indemnify Sound Transit, the construction managers, Contractors, Subcontractors, and their agents and personnel from any liability for injury or damages of whatsoever nature to the maximum extent permitted by law.

Specifically, in consideration of being permitted, for my own purposes and interests, to enter upon the premises or construction site of the Link Light Rail Project, I hereby release, hold harmless, and indemnify Sound Transit, the construction managers, Contractors, Subcontractors from and against, and assume the risk, for and on behalf of myself, my heirs, my survivors and my estate, for all damages, losses, injuries, and any and all other claims of any type whatsoever for personal injury (including death) and other loss or damage of any nature whatsoever including damage to my personal property, sustained or caused while on such premises or site, except (1) those injuries which are caused solely by the negligence of one or more of the Indemnified Parties, or (2) those injuries caused by or resulting from the concurrent negligence of one or more of the Indemnified Parties but in such case only to the extent of the negligence of the Indemnified Parties. In the event any clause, term, or provision of this agreement shall be declared or adjudicated void or invalid, it shall in no manner affect the other clauses, terms, and provisions hereof, which shall remain in full force and effect, as if the clause, term, or provision so declared or adjudicated invalid was not originally a part hereof.

Print Name: __________________________________________________________

Signature: __________________________________________________________

Address: ___________________________________________________________________

__________________________________________________

Date: ______________________
SECTION 01 35 29.10 - EXHIBIT O
UNDERGROUND CONTACT LOG

CONTRACT NO: _________________
CONTRACTOR/SUBCONTRACTOR: __________________________

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END OF EXHIBITS
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SECTION 01 35 43
HAZARDOUS AND CONTAMINATED SUBSTANCE HEALTH AND SAFETY PROGRAM

[If no project specific studies or documentation of contamination related to the project exist (e.g., Phase 1, Phase 2 studies, Brownsfield, Superfund, building evaluations for lead, chromium, asbestos or other hazardous materials), do not use this specification section. Use Section 01 35 43.15, Unknown Hazardous and Contaminated Substances instead.]

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for the preparation and implementation of procedures for dealing with known and unknown Hazardous and Contaminated Substances. Perform Work in accordance with Section 01 35 29. Health, Safety, Security and Emergency Response Procedures.

B. [Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.]

1. Section 01 35 43.20, Hazardous and Contaminated Substance Air Monitoring.
2. Section 02 61 13, Excavation and Handling of Contaminated Material.
3. Section 02 65 00, Underground Storage Tank Removal.
4. Section 02 82 33, Removal and Disposal of Asbestos Containing Material.
5. Section 02 83 33, Removal and Disposal Material Containing Lead.
6. Section 02 84 33, Removal and Disposal of Polychlorinate Biphenyls.
7. Section 02 88 33, Removal and Disposal of Mercury Containing Components.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. The National Institute for Occupational Safety and Health (NIOSH)
   a. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities
2. Code of Federal Regulations (CFR)
   a. 29 CFR 1910 Occupational Safety and Health Standards (OSHA)
   b. 29 CFR 1926 OSHA Construction Standards
3. Environmental Protection Agency (EPA)
   a. SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods
4. Washington Administrative Code (WAC)
   a. WAC 173-303 Dangerous Waste Regulations
   b. WAC 173-340 Model Toxics Control Act - Cleanup
   c. WAC 296-62 General Occupational Health Standards
   d. WAC 296-843 Hazardous Waste Operations

5. Washington State Department of Ecology
   a. Publication 94-49 Guidance on Sampling and Data Analyses Methods
   b. Publication 97-602 Analytical Methods for Petroleum Hydrocarbons

6. Revised Code of Washington (RCW)
   a. RCW Chapter 70.105D Model Toxics Control Act (MTCA)

1.03 DEFINITIONS

A. Certified Industrial Hygienist (CIH): A trained specialist with at least five (5) years experience in Hazardous and Contaminated Substance handling and working knowledge of selection and use of PPE, air monitoring, regulation, and other health and safety issues who is currently certified by the American Board of Industrial Hygiene.

B. Contaminated Groundwater: Groundwater containing levels of contaminants in excess of applicable clean up levels such as MTCA Method A if no other cleanup levels are specified in a site contamination report.

C. Contaminated Material: Another term for Contaminated Substance. General term for contaminated soil, groundwater, or other debris or environmental media. See definitions for Contaminated Soil and Contaminated Groundwater.

D. Contamination Reduction Zone: Designated area that provides a physical separation between the Exclusion and Support Zones to decontaminate personnel, equipment, and vehicles prior to entering the Support Zone from the Exclusion Zone. This area must be clearly identified and designated as a “Caution” zone, and can be entered only by employees with HAZWOPER certification and who have signed the HCS-HASP.

E. Contaminated Soil: Soil containing levels of contaminants in excess of applicable clean up levels such as MTCA Method A Cleanup Levels for Unrestricted Use, or other relevant cleanup levels established by state, local, or federal regulation, law, or permit condition, if no Method A level has been developed.

F. Contaminated Substance Screening and Handling Plan (CS-SHP) A work plan covering activities, excavation, staging, transport, sampling, emergency release, and disposal of identified Contaminated Substances in soil, groundwater, or other environmental media. This is a separate plan from the HCS-HASP.

G. Dangerous Waste: Solid wastes which are dangerous to public health and environment, as defined in WAC 173-303.
H. Exclusion Zone: Area of exposed contamination designated for Hazardous or Contaminated Substance storage, excavation, or removal. All work performed within the Exclusion Zone must be covered in the HCS-HASP by workers who are appropriately HAZWOPER certified as specified in this specification. The exclusion zone must be clearly marked and designated as a “Danger” zone, Methods must be in place to keep non-designated people out, and can only be entered by employees with HAZWOPER certification who have signed the HCS-HASP.

I. Hazardous and Contaminated Substance – As defined in the General Conditions.

J. Hazardous and Contaminated Substance Health and Safety Plan (HCS-HASP): A supplemental plan to the Construction Safety and Security Manual which establishes in detail the protocols necessary for protecting workers, on-site personnel, visitors, potential off-site personnel, and the public from potential hazards that may be encountered during excavation, stockpiling, handling, sampling, transportation, and disposal of contaminated soils, water, and other environmental material. This plan must meet the requirements of a Health and Safety Plan as specified in WAC 296-843-120.

K. Hazardous or Contaminated Substance Screening and Handling Plan (HCS-SHP) –a plan detailing how suspected Hazardous and Contaminated Substances are tested and evaluated, how regulatory notifications are to be made, and how clean up will occur.

L. Hazardous Material – Another term for Hazardous Substance. General term for demolition debris that contains asbestos, lead, polychlorinated biphenyls, or mercury.

M. HAZWOPER: Hazardous Waste Operations and Emergency Response

N. MTCA: Washington State Model Toxics Control Act, Chapter 70, 105D, RCW

O. Permissible Exposure Limits (PEL): Maximum amount or concentration in air for each contaminant that a worker may be exposed to under OSHA regulations.

P. Personal Protective Equipment (PPE): All clothing and other work accessories designed to create a barrier against workplace hazards. Examples include safety goggles, blast shields, hard hats, hearing protectors, gloves, respirators, aprons and work boots.

Q. Site Safety and Health Officer (SSHO): A trained specialist in health and safety with a minimum of three (3) years’ experience and working knowledge of use of (Personal Protective Equipment) PPE, regulations and hazard identification.

R. Support Zone: Area designated to provide an entry and exit for personnel, materials, and equipment through the Contamination Reduction Zone to the Exclusion Zone, as an area for support facilities and storage of clean work equipment. Workers may rest, eat, and drink in this area

S. Unknown Hazardous or Contaminated Substance Health and Safety Plan (UHCS-HASP) a plan establishing in detail the protocols to be followed to protect workers, on-site personnel, visitors, potential off-site personnel, the public, and the environment in the event that Suspected Contaminated Soil, Groundwater, or other environmental media is encountered during the course of work in areas where contamination has not been previously documented.

1.04 SUBMITTALS

A. HCS-HASP: Within 30 Days after the effective date of the Notice to Proceed (NTP) and prior to start of work.
B. **UHCS-HASP:** Within 30 Days after the effective date of the Notice to Proceed and prior to start of work.

C. **SHP:** Within [___] Days following discovering of potential contamination.

D. **Updated HCS-HASP(s):** Within [___] Days following discovery of new contamination.

E. **[Lead workplan: Within [___] Days of NTP].**

F. **Qualifications:** Within 30 Days after the effective date of the Notice to Proceed.

G. **Certifications:** Within 30 Days after the effective date of the Notice to Proceed.

H. **Reports**
   1. Security and training logs and worker compliance agreements.
   2. Safety inspection logs, daily and weekly health and safety reports, and a closeout health and safety report.
   3. Emergency and accident report(s) within 24 hours following each occurrence.
   4. Written monthly reports on status of HCS-HASP.

1.05 **QUALITY ASSURANCE**

A. **Qualifications**
   1. **CIH:**
      a. Minimum of five (5) years experience in managing employee health and safety when working in Hazardous Materials, Contaminated Soils, groundwater, or other contaminated environmental media.
      
      b. Demonstrable experience in Personal Protective Equipment (PPE) selection and use, health hazard analysis of Hazardous and Contaminated Substance, decontamination processes, air monitoring techniques, and site control measures.

      c. Working knowledge of federal and state employee health and safety regulations.

      d. Completion of required OSHA Training in accordance with 29 CFR 1910.120 and WAC 296-843, including completion of 40-hour HAZWOPER training and eight (8) hour annual update and completion of three (3) Days on-site training by a fully qualified instructor or mentor.

      e. Current certification with the American Board of Industrial Hygiene.

   2. **SSHO:**
      a. Minimum of three (3) years experience in supporting employee health and safety protection programs when working with Hazardous Materials, Contaminated Soils, groundwater, or other contaminated environmental media.

      b. Current certification in first aid and cardiopulmonary resuscitation (CPR).
c. Working knowledge of federal and state employee health and safety regulations.

d. Completion of required OSHA Training in accordance with 29 CFR 1910.120 and WAC 296-843, including completion of 40-hour supervisory training and eight (8) hour annual update and completion of three (3) Days on-site training by a fully qualified instructor or mentor.

B. Responsibilities

1. CIH:
   a. Responsible for certifying the HCS-HASP, any task specific HCS-HASPs, selecting PPE, and all additions and/or modifications thereto.
   b. Required to be accessible to the SSHO as necessary, to assist in the identification and evaluation of potential hazards and the development of appropriate procedures for addressing known or suspected conditions or activities that may pose routine occupational hazards or immediate danger to life or health of work site personnel, Sound Transit personnel, utility crews working in the project construction area, personnel related to third party stakeholders or the public.
   c. Evaluate health and safety hazards when changes in conditions occur or are identified.
   d. Specify personal exposure monitoring protocols and procedures.

2. SSHO:
   a. Required to be on site and present during Hazardous and Contaminated Substance work to be completed as part of the Contract. Such work includes, but is not limited to: air monitoring, Hazardous Materials removal, removal of contaminated soil and groundwater, removal of Underground Storage Tanks (UST), and work related to the presence or potential for unknown contaminated materials specified in Section 02 61 13, Excavation and Handling of Contaminated Material, and Section 02 65 00, Underground Storage Tank Removal.
   b. Responsible for the development, implementation, enforcement, and monitoring of the HCS-HASP for the project.
   c. Responsible for conducting the pre-construction indoctrination, Pre-Entry Briefings, and other periodic training of on-site personnel with regard to contents of the HCS-HASP and other safety requirements to be observed during construction.
   d. Responsible for performing air monitoring as required by the HCS-HASP.

C. Authority

1. The CIH and the SSHO have the authority to:
   a. Suspend field activities if health and safety of work site personnel, Sound Transit personnel, other crews working in the Project Site, or the public is endangered.
b. Suspend individuals from field activities due to infractions of the HCS-HASP.

c. Suspend field activities if unknown contamination is identified during field activities until the Hazardous or Contaminated Substance is characterized, the HCS-HASP is updated, and field personnel have been trained on the HCS-HASP updates.

D. Certifications

1. CIH and SSHO current certifications:
   a. HAZWOPER 40 Hour
   b. 8 hour HAZWOPER refresher within the previous 12 months.
   c. CPR and first aid certification.

2. That work site and subcontractor personnel assigned for the purpose of performing or supervising Hazardous or Contaminated Substance work in accordance with the provisions of the HCS-HASP and Section 02 61 13, Excavation and Handling of Contaminated Material.

3. Have the CIH certify the HCS-HASP.

E. Laboratories: Use laboratories for analytical analyses which follow procedures that are consistent with the Model Toxics Control Act (MTCA) guidelines for selection of appropriate analytical procedures (WAC 173-340-830), The Washington State Department of Ecology’s Guidance on Sampling and Data Analyses Methods (Ecology Publication number 94-49) and Analytical Methods for Petroleum Hydrocarbons ((Ecology Publication number 97-602), and USEPA’s “Test Methods for Evaluating Solid Waste Physical/Chemical Methods”, SW-846. Personal air samples must be analyzed by an AIHA certified laboratory.

F. Instruments used for air monitoring must be maintained and calibrated as specified in the manufacturer’s instructions and user manuals.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform work required by the Contract in a safe and environmentally acceptable manner. Provide for the safety of site personnel, Sound Transit personnel, personnel representing third party stakeholders, and the public for the duration of the Contract.

B. Maintain a current HCS-HASP conforming to applicable federal, state, and local statutes, rules, regulations, and ordinances, in effect at the time the Work is performed.

C. Maintain a UHCS-HASP detailing procedures to follow in the event that suspected contamination is identified during the course of work to ensure that all applicable federal, state and local statutes, rules, regulations and ordinances in effect at the time the Work is performed are met for work in areas of contamination.
D. Ensure that personnel working with Hazardous Materials, Contaminated Soil, groundwater or other environmental media have current HAZWOPER training and are thoroughly briefed on the anticipated hazards, safety equipment to be employed, safety practices to be followed, and emergency procedures and communications, and have reviewed and signed the HCS-HASP. The signed HCS-HASP must be kept on the job site and be made available for inspection.

E. Adhere to applicable federal, state, and local statutes, rules, regulations, and ordinances for the duration of the Contract.

F. Develop and maintain on site industrial hygiene information including right-to-know information, such as Material Safety Data Sheets (MSDS).

G. If an emergency condition arises during the Contract:
   1. Immediately suspend work activities associated with this Contract in the vicinity of the area of the emergency.
   2. Notify the Resident Engineer.
   3. Secure the area as needed to restrict and protect work site personnel and the public from exposure to the emergency condition.

H. Meetings: Conducted daily and weekly by the SSHO, health and safety meetings with the workers throughout the duration of all Hazardous and Contaminated Substance work. The SSHO shall discuss each day’s activities and associated health and safety issues with the workers and address concerns and issues that the workers may have. Hold the weekly meeting at the beginning of the workweek.

3.02 HAZARDOUS AND CONTAMINATED SUBSTANCE HEALTH AND SAFETY PLAN (HCS-HASP)

A. Prepare and implement a HCS-HASP in accordance with the requirements of 29 CFR 1910.120 and WAC 296-843-120 for work in areas of documented contamination. Include, as a minimum, the following site specific information:
   1. Site Description and Evaluation
   2. Comprehensive work plan
   3. Site Map, including demarcation of zones
   4. Names of key personnel and alternates responsible for site safety and health (responsible party, and lines of communication, and chain of command), including site safety and health officer, and identified responsibilities of each
   5. Emergency contact names and phone numbers
   6. Map to nearest emergency medical services
   7. Site specific safety and health hazard assessment and risk analysis based on contaminants known or expected to be present.
   8. Training
   9. Personnel Protective Equipment
   10. Medical Surveillance
11. Air Monitoring Program
12. Site Control Measures (Work Zones, Communications and Security)
13. Personnel Hygiene and Decontamination
14. Equipment Decontamination
15. Sanitation
16. Logs, Reports, and Record Keeping
17. Noise, Heat and/or Cold Stress, and other physical hazard Monitoring
18. Emergency Response including excavation routes and procedures
19. Spill containment plans
20. Procedures to follow if unexpected contamination is found, including reporting, analysis, and a requirement to stop work until the HCS-HASP can be updated with a revised hazard assessment.
21. Drug handling protocols
22. Site Specific Hazard Communication
23. Material Safety Data Sheets (MSDS)
24. Accident Prevention Plan
25. Reference listing of environmental reports reviewed in the preparation of the HCS-HASP.

B. If identified materials include asbestos, abatement work must be performed per:
1. Chapter 296-52 WAC Part I-1, (Asbestos, Tremolite, Anthophyllite and Actinolite),
2. WAC 296-65-001 through 50 (Safety Standards for Asbestos Removal and Encapsulation),
3. WISHA Regional Directive (WRD) 23.10 Asbestos
4. WISHA Regional Directive (WRD) 23.35 Demolition of Buildings with ACM
5. Puget Sound Clean Air Agency Asbestos Control Standards and Forms Regulation III, Article 4
6. US Environmental Protection Agency AHERA 40 CFR 763

C. If identified materials contain lead, work must be performed per WAC 296-155-176. A lead workplan must be developed and submitted. This may be included as an appendix to the HCS-HASP for contamination in soils and groundwater, or submitted as a separate work plan for lead in building materials. The lead workplan must include:
1. Air monitoring for personnel exposures

2. Training for lead workers (minimum 2 hour lead awareness training) per WAC 296-155 17625

3. Work procedures to minimize exposures, including airborne (respiratory) exposures and exposures resulting from tracking lead outside of the work area.

4. Plans for actions to take prior to receiving air monitoring results and if air monitoring results indicate that exposures exceed the action level of 30 ug/m³ (micrograms per cubic meter) as an 8 hour Time Weighted Average (TWA):
   a. Use of respirators
   b. Personal Protective equipment
   c. Medical Monitoring, including zinc protoporphoryn blood levels (ZPP) per WAC 296-155-17621 and medical removal if ZPP levels exceed 50 ug/dl (microgram per deciliter) per WAC 296-155-17623
   d. Hand washing facilities
   e. Change areas
   f. Housekeeping
   g. Signage

3.03 UNKNOWN HAZARDOUS OR CONTAMINATED SUBSTANCE HEALTH AND SAFETY PLAN (UHCS-HASP)

A. Prepare and implement a UHCS-HASP that documents how discoveries of suspect or potential contamination are to be handled when found in areas outside of known documented contamination. Include the following:

   1. Signs that would indicate that soils, groundwater or other environmental media may be contaminated
   2. Immediately suspension of work activities associated with this Contract in the vicinity of the area of the potential or suspect Hazardous or Contaminated Substances.
   3. Notification of the Resident Engineer
   4. Securement of the area as needed to restrict and protect work site personnel and the public from exposure to the emergency condition. Set up and designate Exclusion Zone and Contamination Reduction Zones using "Danger" tape to identify the Exclusion Zone and "Warning" tape to designate the Contamination Reduction Zone.
   5. Hazardous or Contaminated Substance Screening and Handling Plan (HCS-SHP) for handling of contaminated soils and groundwater, including obtaining quantitative data to determine if the suspected Hazardous and Contaminated Substances are in fact contaminated.
   6. Procedures to develop a HCS- HASP for work performed under the HCS-SHP.
7. If positive contamination is established, a HCS-HASP per section A and the results obtained in B(5) for project work in the area of contamination. Training of all workers on the HCS-HASP and for following work specifications outlined therein.

B. Distribute the HCS-HASP and UHCS-HASP to Contract employees. Require employees to read the plan, sign the plan, and abide by its provisions. Display or make the plan available at the site to employees, Sound Transit representatives and regulatory inspectors.

C. Any review, acceptance, or approval of the Contractor’s HCS-HASP and UHCS-HASP by the Resident Engineer shall be construed merely to mean that Sound Transit is unaware of any reasons at the time to object thereto. Review by the Resident Engineer of the plan shall not impose any liability upon Sound Transit nor shall any such review relieve the Contractor of any responsibilities under the Contract.

D. The HCS-HASP must be regularly updated and reviewed as work progresses and more information about the site becomes known, including discovery of additional Hazardous or Contaminated Substances.

3.04 HAZARDOUS OR CONTAMINATED SUBSTANCE SCREENING AND HANDLING PLAN (HCS-SHP)

A. Prepare a HCS-SHP for potential or suspect Hazardous or Contaminated Substances encountered during construction. At a minimum, include the following items in the plan:

1. Schedule of activities
2. Sampling and testing plan
3. Plan for analysis of sampling and test results
4. Notifications to regulatory agencies

B. If test results indicate cleanup activities must take place, then the HCS-SHP must include:

1. Methods and procedures of excavation and equipment to be used
2. Shoring or side-wall slopes proposed
3. Staging and storage methods, procedures and locations
4. Borrow sources and haul routes
5. Methods and procedures for the transporation, disposal and treatment facilities and use of certified, licensed transporters
6. Decontamination procedures
7. Sampling, screening and analysis plan and responsibilities
8. Spill contingency plan
9. Spill prevention plan
10. Water Management plan
11. Procedures for documenting and reporting encounters with and releases of Hazardous and Contaminated Substances
C. Coordinate with requirements of Section 02 61 13, Excavation and Handling of Contaminated Material.

D. Coordinate with requirements of the Stormwater Pollution Prevention Plan (SWPPP) as specified in Section 01 57 19, Temporary Environmental Controls, and Section 01 57 24, Site Water Discharge.

E. Obtain all required permits and notifications for removal, excavation, dewatering, storage, transportation and disposal of Hazardous or Contaminated Substances. In furtherance of this requirement, the Resident Engineer will provide sampling results and other information developed by Sound Transit, if any. Obtain permits at no additional cost to Sound Transit.

3.05 SITE CONTROL MEASURES

A. For excavation around suspected underground storage tank locations and for Hazardous or Contaminated Substances encountered elsewhere, furnish and install site fencing, warning tapes, or other barricades to physically separate the work zones on sites based on the HCS-HASP. Establish the following work zones:

1. An Exclusion Zone. Perform work involving Hazardous or Contaminated Substances inside the Exclusion Zone.

2. Contamination Reduction Zone.

3. Support Zone.

B. Be responsible for costs associated with cleanup of all Hazardous or Contaminated Substances that may be tracked outside of the exclusion zone.

3.06 PERSONAL PROTECTIVE EQUIPMENT (PPE)

A. Provide appropriate PPE and ensure that it is kept clean and well maintained. PPE must be selected by the CIH, and be appropriate for the hazards likely to be encountered, required tasks, duration, and site requirements and limitations.

B. Decontaminate and/or properly dispose of personal protective equipment worn on site. Decontaminate and inspect personal protective equipment for integrity before being reissued. Unless agreed otherwise by Sound Transit, handle used PPE and disposable equipment in accordance with the requirements for the contaminated waste.

3.07 PERSONAL HYGIENE AND DECONTAMINATION

A. Define personnel decontamination protocols in the HCS-HASP to be followed by workers performing or supervising work within designated areas or exposed to contaminated materials. The HCS-HASP must include a map or diagram of the steps to be followed during decontamination.

B. Perform decontamination procedures inside the Contamination Reduction Zone.

3.08 EQUIPMENT DECONTAMINATION

A. Decontaminate vehicles and equipment used during the handling of Hazardous or Contaminated Substances inside the Contamination Reduction Zone before leaving the Site. Collect, treat, or dispose of decontamination rinse water at an approved off-site facility.
B. Keep roads inside the Contamination Reduction Zone free of contamination. Carefully load to avoid contamination of exterior truck surfaces.

3.09 NEW DISCOVERIES

A. Upon discovery of an abnormal condition, or potential indicator of a Hazardous or Contaminated Substance:

1. Immediately suspend work activities associated with this Contract in the vicinity of the area of concern.

2. Notify the Resident Engineer immediately after discovery of such abnormal condition or potential indicator.

3. Secure the area as needed to restrict and protect Contractor personnel, Sound Transit personnel, other project site workers, and the public from exposure to potential Hazardous and Contaminated Substances.

4. Delineate and establish site control measures for:
   a. Exclusion Zone
   b. Contamination Reduction Zone
   c. Support Zone

5. Provide reasonable assistance to the Resident Engineer in the performance of Sound Transit duties under this Section. Such assistance may include: documenting site conditions, providing access, collecting soil and water samples with a backhoe (at the direction of the Resident Engineer), providing sampling and analysis of the contents of unknown containers, arranging for the disposal of Contaminated Substances, and attending regular project meetings.

B. Provide Resident Engineer with appropriate documentation to assist in notifying federal, state, and local agencies, as part of the removal, cleanup, mitigation, handling, transportation, and disposal of unexpected Hazardous and Contaminated Substances.

C. Secure necessary and applicable permits, certificates, licenses, and approvals required for the performance of this work.

D. Perform work using only qualified personnel who are fully HAZWOPER trained and certified, as required, for Hazardous or Contaminated Substance site work in accordance with WAC 296-843, 29 CFR 1910.120 and all other applicable federal, state, and local statutes, rules, regulations, and ordinances. Do not allow personnel who are not properly trained to enter or work in areas identified as containing or potentially containing Hazardous and Contaminated Substances.

E. Comply with reporting and record keeping requirements in accordance with the provisions of this Contract and applicable federal, state, and local statutes, rules, regulations, and ordinances.

F. When a Hazardous or Contaminated Substance is confirmed by field screening techniques as specified herein, remove the material in accordance with the HCS-SHP and HCS-HASP.

G. Do not resume construction operations in the vicinity of the area where an Unknown Hazardous or Contaminated Substance has been discovered or encountered until so directed by the Resident Engineer.
H. Conduct any removal or cleanup work, where feasible, to accommodate continued construction activities. Coordinate the Work with other Site activities. Use staging to contain Hazardous or Contaminated Substances, and keep isolated from clean materials.

I. Off-Site Disposal

1. Load Hazardous or Contaminated Substance for off-site disposal.

2. Provide transportation in accordance with Department of Transportation (DOT) Hazardous Material Regulations. Obtain necessary permits, licenses, and approvals.

3. Treatment, Disposal, and Recycling
   a. Include all necessary personnel, labor, transportation, packaging, equipment, and reports for this work.
   b. Contaminated Soil can be treated or landfilled.
   c. If landfilled, dispose of Contaminated Soils in a licensed landfill in accordance with applicable requirements.
   d. Documentation of Treatment or Disposal:
      1) Transfer the materials to a treatment, storage, disposal facility which has EPA or appropriate state permits and hazardous or special waste identification numbers and complies with the provisions of the disposal regulations.
      2) Furnish the original return copy of the hazardous waste manifest, signed by the owner or operator of a facility legally permitted to treat or dispose of those materials furnished to the Resident Engineer not later than five Days following the delivery of those materials to the facility.
      3) Furnish a statement of agreement from the proposed treatment, storage or disposal facility and certified transporters to accept hazardous or special wastes in the HCS-SHP.
      4) If a different facility from that identified in the HCS-SHP is proposed, provide documentation for approval to certify that the facility is authorized and meets the standards specified in 40 CFR 264 and applicable state, and local regulations.

3.10 LOGS, REPORTS AND RECORDKEEPING

A. Maintain logs and reports covering the implementation of the HCS-HASP including the Air Monitoring Program. Include daily logs, weekly reports, audits, and a close out report.

B. Include in Daily Safety Logs, at a minimum, the following:
   1. Date
   2. Area (site specific) checked
   3. Employees in particular area
   4. Equipment being utilized by employees
5. Protective clothing being worn by employees

6. Protective devices being used by:
   a. Contractor’s personnel
   b. Visitors
   c. Designated State and Federal representatives

7. Air Monitoring Equipment and Data

8. Work activities for the day and associated health and safety issues discussed during the daily Health and Safety meeting.

9. SSHO signature and date

C. Include pertinent information from the daily logs in the weekly log. This report should be a summary of the daily reports filed during that workweek.

D. Conduct health and safety audits of the work area and procedure monthly. Prepare an audit report/check list and attach to the weekly report.

E. Prepare and submit a health and safety closeout report at the completion of the project. The report shall summarize the health and safety issues and associated procedures and resolution for the project.

F. Comply with federal and state laws such as OSHA (29 CFR) and WAC 296-802-200 that require the retention of chemical exposure records and medical records for a 30 years after the termination of the job. MSDSs are considered exposure records under these regulations.

3.11 AIR MONITORING

A. The CIH shall design, develop, and implement an Air Monitoring Program to detect and quantify airborne contaminants present during the Work, as specified in Section 01 35 43.13, Hazardous and Contaminated Substance Air Monitoring, to evaluate the inhalation exposure for workers. Submit the details of this program as part of the HCS-HASP.

B. Information gathered during the Air Monitoring Program shall be used by the CIH to determine appropriate safety and personnel protective measures and medical monitoring to be implemented during excavation, stockpiling, handling, sampling, transporting and disposing of contaminated and potentially contaminated soils, groundwater debris and/or Hazardous or Contaminated Substances.

C. Assess off-site migration of contaminants released during work activities.

D. Calibrate and maintain air monitoring instruments in accordance with manufacturer’s recommendations.

E. Monitor air for potential explosive hazards during excavation and handling of contaminated environmental media.

F. Action Levels
1. The CIH shall develop appropriate action levels to minimize exposure by Contractor personnel, Sound Transit personnel, personnel representing third party stakeholders, and the public. Include action levels in the HCS-HASP. Action Levels must be below the PEL.

2. Ensure that action levels are appropriate for the contaminants of concern.

G. Action: If concentrations of contaminants exceed the action levels established by the CIH, cease all work in the area until potential risks can be evaluated further and immediately notify the Resident Engineer.

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 01 35 43.15
UNKNOWN HAZARDOUS AND CONTAMINATED SUBSTANCES

[Use the section if no known project specific studies or documentation of contamination related to project exist. Otherwise, use Section 01 35 43, Hazardous and Contaminated Substance Health and Safety Plan]

PART 1 - GENERAL

1.01 SUMMARY

A. This Section applies to work performed on properties in which there is no known or identified contaminated material (soil, groundwater, or other environmental media), but where the possibility exists that contaminated materials may be unexpectedly encountered. This section specifies responses to unknown Hazardous and Contaminated Substances unexpectedly encountered during construction, as defined herein.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents:

   a. 29 CFR 1910 Occupational Safety and Health Standards
   b. 29 CFR 1926 OSHA Construction Standards

2. The National Institute for Occupational Safety and Health (NIOSH)
   a. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities

3. Environmental Protection Agency (EPA)
   a. SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods

4. Washington Administrative Code (WAC)
   a. WAC 173-303 Dangerous Waste Regulations
   b. WAC 173-340 Model Toxics Control Act - Cleanup
   c. WAC 296-62 General Occupational Health Standards
   d. WAC 296-155 Safety Standards for Construction Work
   e. WAC 296-843 Hazardous Waste Operations

5. Washington State Department of Ecology
   a. Publication 94-49 Guidance on Sampling and Data Analyses Methods
   b. Publication 97-602 Analytical Methods for Petroleum Hydrocarbons
c. Project Manager’s Reference Document for Environmental Stewardship (PMRDES)

1.03 DEFINITIONS

A. Certified Industrial Hygienist (CIH) – A trained specialist with at least five (5) years experience in Contaminated Material handling and working knowledge of selection and use of PPE, air monitoring, regulation, and other health and safety issues who is currently certified by the American Board of Industrial Hygiene.

B. Contaminated Groundwater – Groundwater containing levels of contaminants in excess of applicable cleanup methods, such as MTCA Method A if no cleanup levels are specified in a site contamination report.

C. Contamination Reduction Zone – Designated area that provides a physical separation between the Exclusion and Support Zones to decontaminate personnel, equipment, and vehicles prior to entering the Support Zone from the Exclusion Zone. This area must be clearly identified and designated as a “Caution” zone, and can be entered only by employees with Hazardous Waste Operations and Emergency Response (HAZWOPER) certification and who have signed the HCS-HASP.

D. Contaminated Materials – Another term for Contaminated Substances. General term for contaminated soil, groundwater or other debris or environmental media. See definitions for Contaminated Soil and Contaminated Groundwater.

E. Contaminated Soil – Soil containing levels of contaminants in excess in excess of applicable cleanup methods, such as MTCA Method A Cleanup Levels for Unrestricted use, or other relevant cleanup levels established by state, local, or federal regulation, law, or permit condition, if no Method A Level has been developed.

F. Contaminated Substances Health and Safety Plan (CS-HASP): A supplemental plan to the Construction Safety and Security Manual which establishes in detail the protocols necessary for protecting workers, on-site personnel, visitors, potential off-site personnel, and the public from potential hazards that may be encountered during excavation, stockpiling, handling, sampling, transportation and disposal of contaminated soils, water, and other environmental material. This plan must meet the requirements of a Health and Safety Plan as specified in WAC 296-843.

G. Contaminated Substances Screening and Handling Plan (CS-SHP) – A work plan covering activities, excavation, staging, transport, sampling, emergency release, and disposal of identified Contaminated Substances in soil, groundwater, or other environmental media.

H. Dangerous Waste: Solid wastes which are dangerous to public health and the environment, as defined in WAC 173-303.

I. Exclusion Zone – Area of exposed contaminated designated for Hazardous or Contaminated Substance storage, excavation, or removal. All work performed within the Exclusion Zone must be covered in the HCS-HASP by workers who are appropriately HAZWOPER certified as specified in the HCS-HASP. The exclusion zone must be clearly marked and designated as a “Danger” zone. Methods must be in place to keep non-designated people out, and can only be entered by employees with HAZWOPER certification who have signed the HCS-HASP.

J. Hazardous Material – Another term for Hazardous Substances. General term for demolition debris that contains asbestos, lead, polychlorinated biphenyls, or mercury.
K. Hazardous and Contaminated Substances – As defined in the General Conditions.

L. Hazardous and Contaminated Substances Screening Plan (HCSSP) A plan that is developed to sample and quantitatively measure contaminants in Suspected Contaminated Soils, Groundwater, or other environmental media that is encountered during the course of work to make a determination as to whether or not the suspect material meets the definition of Contaminated Groundwater, Contaminated Soil, or Contaminated Substance.

M. HAZWOPER – Hazardous Waste Operations and Emergency Response

N. MTCA – Model Toxics Control Act, as defined in Chapter 70.105D, RCW.

O. Permissible Exposure Limits (PEL) – Maximum airborne time weighted average concentration for each contaminant that a worker may be exposed to under Washington State Department of Safety and Health (DOSH) regulations.

P. Personal Protective Equipment (PPE) – All clothing and other work accessories designed to create a barrier against workplace hazards. Examples include safety goggles, blast shields, hard hats, hearing protectors, gloves, respirators, aprons, and work boots.

Q. Site Safety and Health Officer (SSHO) – A trained specialist in health and safety with minimum three (3) years’ experience and working knowledge of use of PPE, regulations and hazard identification.

R. Support Zone – Area to provide an entry and exit for personnel, materials, and equipment to the Contamination Reduction Zone and then the Exclusion Zone. An area for support facilities and storage of clean work equipment. Workers may rest, eat, and drink in this area.

S. Suspected Contaminated Substance – Soil, groundwater, or other debris in contact or close proximity to known Contaminated Groundwater, Soil, or other media that has not yet been tested for verification of contamination levels, OR having visual or odor evidence of contamination, OR located in an area identified as potentially contaminated based on-site history, and that has not been tested yet for verification of contamination levels.

T. Unknown Contaminated Substance Health and Safety Plan (UCS-HASP): A plan establishing in detail the protocols to be followed to protect workers, on-site personnel, visitors, potential off-site personnel, the public, and the environment in the event that Suspected Contaminated Soil, Groundwater, or other environmental media is encountered during the course of work.

U. Unknown Contaminated Substances Health and Safety Plan (UCS-HASP) – A supplemental plan to the LINK Construction Safety Manual that identifies in detail how Contaminated Substances may be identified and the protocols to be taken in the event that potential contaminated is identified.

1.04 SUBMITTALS

A. UCS-HASP: Prior to start of site work.

B. Hazardous and Contaminated Substance Screening and Handling (HCMSH) Plan: Within three (3) Days from identifying Unknown Hazardous and/or Contaminated Substances.
C. CS-HASP Within seven (7) Days of receiving results indicating that material encountered meets criteria for Contaminated Groundwater, Contaminated Soil, or Contaminated Substance..

D. Qualifications: Within 30 Days after the effective date of Notice to Proceed.

E. Certifications: Within 30 Days after the effective date of Notice to Proceed.

F. Reports
   1. Security and training logs and worker compliance agreements.
   2. Safety inspection logs, daily health and safety reports, and a closeout safety report.
   3. Emergency and accident report(s) within 24 hours following each occurrence.

1.05 QUALITY ASSURANCE

A. Qualifications
   1. CIH:
      a. Minimum of 5 years experience managing employee health and safety when working in contaminated soils, groundwater, or other contaminated environmental media.
      b. Current certification in first aid and cardiopulmonary resuscitation (CPR).
      c. Demonstrable experience in Personal Protective Equipment (PPE) selection and use, health hazard analysis of Contaminated Substances, decontamination processes, air monitoring techniques, and site control measures.
      d. Working knowledge of federal OSHA and state WISHA regulations.
      e. Completion of required OSHA Training in accordance with 29 CFR 1910.120 and WAC 296-843, including completion of 40-hour HAZWOPER training, completion of three (3) Days on-site training by a fully qualified instructor or mentor, and 8-hour annual update HAZWOPER refresher training.
      f. Board certification with the American Board of Industrial Hygiene.
   2. SSHO:
      a. Minimum of 3 years experience supporting employee health and safety protection programs when working in contaminated soils, groundwater, or other contaminated environmental media.
      b. Current certification in first aid and cardiopulmonary resuscitation (CPR).
      c. Working knowledge of federal, state, and local occupational health and safety regulations.
      d. Completion of required OSHA Training in accordance with 29 CFR 1910.120 and WAC 296-843, including completion of 40-hour HAZWOPER training, completion of three (3) Days on-site training by a...
fully qualified instructor or mentor, and 8-hour annual update HAZWOPER refresher training.

B. Responsibilities

1. CIH:
   a. Responsible for certifying the UCS-HASP, CS-HASP, and all additions and/or modifications thereto.
   b. Review results of environmental sampling of Suspected Contaminated Soils, Groundwater, or substances.
   c. Evaluate health and safety hazards when changes in conditions occur or are identified.
   d. Required to be accessible to the SSHO as necessary, to assist in the identification and evaluation of potential hazards and the development of appropriate procedures for addressing suspected conditions or activities that may pose routine occupational hazards or immediate danger to life or health of work site personnel, Sound Transit personnel, utility crews working in the project construction area, personnel related to third party stakeholders or the public.

2. SSHO:
   a. Required to be on-site and present if Hazardous and Contaminated Substance work is required. Such work includes, but is not limited to: air monitoring, and work related to the presence or potential for Unknown Hazardous and/or Contaminated Substances.
   b. Responsible for the development, implementation, enforcement, and monitoring of the UCS-HASP for the project, and CS-HASP if required.
   c. Responsible for conducting the pre-construction indoctrination, Pre-Entry Briefings, and other periodic training of on-site personnel with regard to contents of the UCS-HASP and/or CS-HASP and other safety requirements to be observed during construction.
   d. Responsible for performing air monitoring as required by the CS-HASP.

C. Authority

1. The CIH and the SSHO have the authority to:
   a. Suspend field activities if health and safety of work site personnel, Sound Transit personnel, other crews working in the Project Site, or the public is endangered.
   b. Suspend individuals from field activities due to infractions of the UCS-HASP/CS-HASP.
   c. Suspend field activities if unknown contamination is identified during field activities until the contamination is characterized, a CS-HASP is written and accepted by Sound Transit, and field personnel have been trained on the CS-HASP.

D. Certifications
1. CIH and SSHO current certifications:
   a. 40 Hour HAZWOPER
   b. 8 hour HAZWOPER refresher within the previous 12 months.
   c. CPR and First Aid Certification
   d. Have the CIH certify the UCS-HASP, and the CS-HASP if needed.

E. Calibrate air screening instruments as specified in the manufacturer’s instrument user manuals.

F. Laboratories: Use laboratories for analytical analyses which follow procedures that are consistent with the Model Toxics Control Act (MTCA) guidelines for selection of appropriate analytical procedures (WAC 173-340-830), The Washington State Department of Ecology’s Guidance on Sampling and Data Analyses Methods (Ecology Publication number 94-49) and Analytical Methods for Petroleum Hydrocarbons (Ecology Publication number 97-602), and USEPA's “Test Methods for Evaluating Solid Waste Physical/Chemical Methods”, SW-846. Personal air samples must be analyzed by an AIHA certified laboratory.

1.06 UNKNOWN CONTAMINATED SUBSTANCE HEALTH AND SAFETY PLAN (UCS-HASP)

A. General requirements for inclusion in the UCS-HASP:

1. Perform work in a safe and environmentally acceptable manner. Provide for the safety of site personnel, Sound Transit personnel, personnel representing third party stakeholders, and the public for the duration of the Contract.

2. Maintain a current UCS-HASP conforming to applicable federal, state, and local statutes, rules, regulations, and ordinances, in effect at the time the Work is performed.

3. Ensure that field and support personnel are trained in accordance with applicable regulatory requirements and thoroughly briefed on-site conditions and the anticipated hazards, how to identify situations that indicate presence of Contaminated Soils, Contaminated Groundwater, or other environmental media, safety equipment to be employed, safety practices to be followed, and emergency procedures and communications.

4. Adhere to applicable federal, state, and local statutes, rules, regulations, and ordinances for the duration of the Contract.

5. Develop and maintain on-site industrial hygiene information including right-to-know information, such as Material Safety Data Sheets (MSDS).

6. Procedures to follow if a discovery is made of suspect or potentially contaminated soils, groundwater, or other environmental media (including all requirements of section 3.02):

   a. Immediately suspend work activities associated with this Contract in the vicinity of the area of the potential or suspect contamination..
   b. Notify the Resident Engineer.
   c. Secure the area as needed to restrict and protect work site personnel and the public from exposure to the emergency condition. Set up and
designate Exclusion Zone and Contamination Reduction Zones using
danger tape to identify the Exclusion Zone and Warning Tape to
designate the Contamination Reduction Zone.

d. Develop a CS-SHP and obtain quantitative data to determine whether
the suspected Contaminated Substances are in fact contaminated

e. If positive contamination is established, develop a CS-HASP in
accordance with WAC 296-843 and the results obtained following the
CS-SHP. Train all workers on the CS-HASP and follow work
specifications outlined therein.

7. Meetings: Conducted daily and weekly by the SSHO, health and safety meetings
with the workers throughout the duration of all Hazardous material work. The
SSHO shall discuss each day's activities and associated health and safety issues
with the workers and address concerns and issues that the workers may have.
Hold the weekly meeting at the beginning of the work week.

B. Prepare and implement the UCS-HASP in accordance with the requirements of OSHA 29
CFR 1910.120 and WISHA Standards WAC 296-62 and 296-843. Include, as a
minimum, the following site specific information:

1. Site Description and Evaluation

2. Names of key personnel and alternates responsible for site safety and health
(responsible party and chain of command)

3. A description of what is known about site contamination, potential contamination,
and a reference to the documents upon which this information is based.

4. Types of contamination that may be encountered, along with a description of how
a site worker would know that he/she has encountered this contamination.

5. Procedures to stop work and notify key personnel if potential or suspect
contamination is encountered.

6. Procedures to set up work zones and security if potential or suspect
contamination is encountered.

7. Procedures to develop a CS-SHP to characterize the contamination and
implement a CS-HASP based upon screening and sampling results prior to re-
starting work.

8. Training

9. Personal Protective Equipment to be worn while setting up work zones and
security in the event that potential or suspect contamination is encountered

10. Air Monitoring equipment available if potentially Contaminated Substances are
encountered

11. Spill containment procedures

C. Distribute the UCS-HASP to contract employees. Require employees to read the plan,
sign a compliance statement, and abide by its provisions. Display or make the plan
available at the site.
D. Any review, acceptance, or approval of the Contractor's UCS-HASP by the Resident Engineer shall be construed merely to mean that Sound Transit is unaware of any reasons at the time to object thereto. Review by the Resident Engineer of the plan shall not impose any liability upon Sound Transit nor shall any such review relieve the Contractor of any responsibilities under the Contract.

E. Prepare an addendum for each additional Unknown Hazardous or Contaminated Substance that may be discovered during the course of the Project.

1.07 CONTAMINATED SUBSTANCE SCREENING AND HANDLING PLAN (CS-HSP)

A. If potential or suspect Contaminated Substances are encountered during construction, prepare a CS-SHP Plan. At a minimum, include the following items in the plan:

1. Schedule of activities
2. Sampling and testing plan
3. Plan for analysis of sampling and test results
4. Notifications to regulatory agencies

B. If test results indicate cleanup activities must take place, then the CS-SHP must include:

a. Methods and procedures of excavation and equipment to be used
b. Shoring or side-wall slopes proposed
c. Staging and storage methods, procedures, and locations
d. Borrow sources and haul routes
e. Methods and procedures for the transportation, disposal, and off-site treatment of materials, in compliance with applicable federal, state, local and University of Washington laws and regulations, including the identification of disposal and treatment facilities, and the use of certified, licensed transporters.
f. Decontamination procedures
g. Sampling, screening and analysis plans and responsibilities
h. Spill contingency plan
i. Spill prevention plan
j. Water Management Plan
k. Procedures for documenting and reporting encounters with and releases of Hazardous or Contaminated Substances

C. Coordinate with requirements of the Stormwater Pollution Prevention Plan (SWPPP), as specified in Section 01 57 19, Temporary Environmental Controls, and Section 01 57 24, Site Water Discharge.

D. Obtain all required permits and notifications for removal, excavation, dewatering, storage, transportation, and disposal of Contaminated Substances. In furtherance of this requirement, the Resident Engineer will provide sampling results and other information
E. Develop and implement a Contaminated Substances Health and Safety Plan (CS-HASP), and distribute to Contract employees. Employees must read the plan, sign it, and abide by its provisions. The CS-HASP must be made available on-site to employees, Sound Transit representatives, and regulatory inspectors. The CS-HASP must be written in accordance with WAC 296-843-120, which includes at a minimum:

1. Site description and evaluation
2. Comprehensive work plan
3. Site map, including demarcation of zones
4. Names of key personnel and alternates responsible for site safety and health (responsible party, and lines of communication, and chain of command) including site safety and health officer, and identified responsibilities of each.
5. Emergency contact names and phone numbers
6. Map to nearest emergency medical services
7. Site specific safety and health hazard assessment and risk analysis based on contaminants known or expected to be present.
8. Training
9. Personnel Protective Equipment
10. Medical Surveillance
11. Air Monitoring Program
12. Site control measures and Security
13. Personnel Hygiene and Decontamination
14. Equipment Decontamination
15. Sanitation
16. Logs, reports and recordkeeping
17. Noise, heat and/or cold stress, and other physical hazard monitoring
18. Emergency response including excavation routes and procedures
19. Spill containment plans
20. Drum handling protocols
21. Site specific hazard communication
22. Material Safety Data Sheets (MSDS)
23. Accident Prevention Plan
24. Reference listing of environmental reports reviewed in the preparation of the CM-HASP.

[Delete the next two paragraphs (and their sub-paragraphs), if there are no building-related hazardous and contaminated materials]

F. If identified materials include asbestos, abatement work must be performed per:
   1. Chapter 296-52 WAC Part I-1, (Asbestos, Tremolite, Anthophyllite and Actinolite),
   2. WAC 296-65-001 through 50 (Safety Standards for Asbestos Removal and Encapsulation),
   3. WISHA Regional Directive (WRD) 23.10 Asbestos
   4. WISHA Regional Directive (WRD) 23.35 Demolition of Buildings with ACM
   5. Puget Sound Clean Air Agency Asbestos Control Standards and Forms Regulation III, Article 4
   6. US Environmental Protection Agency AHERA 40 CFR 763

G. If identified materials contain lead, work must be performed per WAC 296-155-176. A lead workplan must be developed and submitted. This may be included as an appendix to the HCS-HASP for contamination in soils and groundwater, or submitted as a separate work plan for lead in building materials. The lead workplan must include:
   1. Air monitoring for personnel exposures
   2. Training for lead workers (minimum 2 hour lead awareness training) per WAC 296-155 17625
   3. Work procedures to minimize exposures, including airborne (respiratory) exposures and exposures resulting from tracking lead outside of the work area.
   4. Plans for actions to take prior to receiving air monitoring results and if air monitoring results indicate that exposures exceed the action level of 30 ug/m³ (micrograms per cubic meter) as an 8 hour Time Weighted Average (TWA):
      a. Use of respirators
      b. Personal Protective equipment
      c. Medical Monitoring, including zinc protoporphyrin blood levels (ZPP) per WAC 296-155-17621 and medical removal if ZPP levels exceed 50 ug/dl (microgram per deciliter) per WAC 296-155-17623
      d. Hand washing facilities
      e. Change areas
      f. Housekeeping
      g. Signage
PART 2 - PRODUCTS

2.01 PERSONAL PROTECTIVE EQUIPMENT
   A. Provide appropriate personal protective equipment (PPE) and ensure that it is kept clean and well maintained. PPE must be selected by the CIH, and be appropriate for the hazards likely to be encountered, required tasks, duration, and site requirements and limitations.
   B. Decontaminate or properly dispose of PPE worn on-site. Decontaminate and inspect PPE for integrity before being reissued. Unless agreed otherwise by Sound Transit, handle used PPE and disposable equipment in accordance with the requirements for the contaminated waste.

2.02 AIR MONITORING EQUIPMENT
   A. Instruments: As required by the CIH and specified in the UCS-HASP, CS-SHP, and CS-HASP.
   B. Capable of detecting the contaminants of concern.

2.03 FIELD SCREENING EQUIPMENT
   A. Utilize a photoionization detector (PID) or flame ionization detector (FID) and organic vapor analyzer (OVA) to perform screening for Hazardous and Contaminated Substances. Use a PID/FID able to perform headspace analysis and able to detect contaminants of concern.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS
   A. Perform work covered under this Section in accordance with the Unknown Contaminated Substances Health and Safety Plan (UCS-HASP) as specified herein, as well as applicable federal, state, and local laws and regulations. Resolve discrepancies in favor of the more stringent provision.
   B. An HAZWOPER certified SSHO must be on-site and available to respond to employees if potential contamination is encountered.
   C. A CIH must be available to respond to the SSHO.

3.02 NEW DISCOVERIES
   A. Upon discovery of an abnormal condition, or a potential indicator of a Hazardous or Contaminated Substance:
      1. Immediately suspend work activities associated with this Contract in the vicinity of the area of concern.
      2. Notify the Resident Engineer immediately after discovery of such abnormal condition or potential indicator.
      3. Secure the area as needed to restrict and protect Contractor personnel, Sound Transit personnel, other project site workers, and the public from exposure to potential Hazardous and Contaminated Substances.
4. Delineate and establish site control measures for:
   a. Exclusion Zone
   b. Contamination Reduction Zone
   c. Support Zone

5. Provide reasonable assistance to the Resident Engineer in the performance of Sound Transit duties under this Section. Such assistance includes providing access to collect soil and water samples and otherwise document site conditions. Such assistance may also include collecting soil samples with a backhoe at the direction of the Resident Engineer, the sampling and analysis of the contents of unknown containers, the arrangement for disposal of the Contaminated Substances, and attendance at regular project meetings.

B. Provide Resident Engineer with appropriate documentation to assist in notifying federal, state, and local agencies, as part of the removal, cleanup, mitigation, handling, transportation, and disposal of unexpected Hazardous and Contaminated Substances.

C. Secure necessary and applicable permits, certificates, licenses, and approvals required for the performance of this work.

D. Perform the work using only qualified personnel who are fully HAZWOPER trained and certified, as required, for Hazardous or Contaminated Substance site work in accordance with WAC 296-843, 29 CFR 1910.120 and all other applicable federal, state, and local statutes, rules, regulations, and ordinances. Do not allow personnel who are not properly trained to enter or work in areas identified as containing or potentially containing Hazardous and Contaminated Substances.

E. Comply with reporting and record keeping requirements in accordance with the provisions of this Contract and applicable federal, state, and local statutes, rules, regulations, and ordinances.

F. When a Hazardous or Contaminated Substance is confirmed by field screening techniques as specified herein, remove the material in accordance with the CS-SHP Plan and CS-HASP.

G. Do not resume construction operations in the vicinity of the area where an Unknown Hazardous or Contaminated Substance has been discovered or encountered until so directed by the Resident Engineer.

H. Conduct any removal or cleanup work, where feasible, to accommodate continued construction activities. Perform work in accordance with the CS-SHP Plan and CS-HASP. Coordinate the Work with other Site activities. Use staging to contain Hazardous or Contaminated Substances, and keep isolated from clean materials.

I. Off-Site Disposal

   1. Load Hazardous or Contaminated Substance for off-site disposal.
   2. Provide transportation in accordance with Department of Transportation (DOT) Hazardous Material Regulations and federal, state, and local requirements. Obtain necessary permits, licenses, and approvals.
   3. Treatment, Disposal, and Recycling
a. Perform treatment, disposal, and recycling of materials in accordance with all applicable laws and regulations, and conditions specified herein. Include all necessary personnel, labor, transportation, packaging, equipment, and reports for this work.

b. Contaminated Soil can be treated or landfilled.

c. If landfilled, dispose of Contaminated Soils in a licensed landfill in accordance with applicable requirements.

d. Documentation of Treatment or Disposal:

1) Transfer the materials to a treatment, storage, disposal facility which has EPA or appropriate state permits and hazardous or special waste identification numbers and complies with the provisions of the disposal regulations.

2) Furnish the original return copy of the hazardous waste manifest, signed by the owner or operator of a facility legally permitted to treat or dispose of those materials furnished to the Resident Engineer not later than five (5) Days following the delivery of those materials to the facility.

3) Furnish a statement of agreement from the proposed treatment, storage or disposal facility and certified transporters to accept hazardous or special wastes in the CS-SHP Plan.

4) If a different facility from that identified in the CS-SHP Plan is proposed, provide documentation for approval to certify that the facility is authorized and meets the standards specified in 40 CFR 264 and applicable state, and local regulations.

3.03 PERSONAL HYGIENE AND DECONTAMINATION

A. Define personnel decontamination protocols in the CS-HASP to be followed by workers performing or supervising work within designated areas or exposed to hazardous chemical vapors, liquids or Contaminated Substances. The CS-HASP must contain a map or diagram of the steps to be followed during decontamination.

B. Perform decontamination procedures inside the Contamination Reduction Zone.

3.04 EQUIPMENT DECONTAMINATION

A. Decontaminate vehicles and equipment used during the handling of hazardous chemicals and materials inside the Contamination Reduction Zone before leaving the Site. Collect, treat, or dispose of decontamination rinse at an approved off-site facility.

B. Keep roads inside the Contamination Reduction Zone free of contamination. Carefully load to avoid contamination of exterior truck surfaces.

3.05 LOGS, REPORTS AND RECORDKEEPING

A. Maintain logs and reports covering the implementation of the CS-SHP including the Air Monitoring Program. Include daily logs, weekly reports, audits, and a close out report.

B. Include in Daily Safety Logs, at a minimum, the following:

1. Date
2. Area (site specific) checked
3. Employees in particular area
4. Equipment being utilized by employees
5. Protective clothing being worn by employees
6. Protective devices being used by:
   a. Contractor’s personnel
   b. Visitors
   c. Designated State and Federal representatives
7. Air Monitoring Equipment and Data
8. Work activities for the day and associated health and safety issues discussed during the daily Health and Safety meeting.
9. SSHO signature and date

C. Include pertinent information from the daily logs in the weekly log. This report shall be a summary of the daily reports filed during that work week.

D. Conduct health and safety audits of the work area and procedure monthly. Prepare an audit report/check list and attach to the weekly report.

E. Prepare and submit a health and safety closeout report at the completion of the project. The report shall summarize the health and safety issues and associated procedures and resolution for the project.

F. Comply with federal and state laws such as OSHA (29 CFR) and WAC 296-802-200 that require the retention of chemical exposure records and medical records for a specified length of time after the termination of the job. MSDSs are considered exposure records under these regulations.

3.06 AIR MONITORING
A. The CIH shall design, develop, and implement an Air Monitoring Program to detect and quantify airborne contaminants present during the Work. Submit the details of this program as part of the CS-HASP.

B. Information gathered during the Air Monitoring Program shall be used by the CIH to determine appropriate safety and personnel protective measures, and medical monitoring, to be implemented during excavation, stockpiling, handling, sampling, transporting and disposing of contaminated and potentially contaminated soils and debris.

C. Assess off-site migration of contaminants released during work activities.

A. Calibrate and maintain air monitoring instruments, in accordance with manufacturer’s recommendations.

B. Monitor air for potential explosive hazards, during excavation of suspected Contaminated Substances, and during handling of materials suspected of containing Hazardous Materials.
D. Action Levels

1. The CIH shall develop appropriate action levels to minimize exposure by Contractor personnel, Sound Transit personnel, personnel representing third-party stakeholders, and the public. Include action levels in the CS-HASP. Action levels must be at or below the PEL.

2. Ensure that action levels are appropriate for the contaminants of concern.

E. Action: If concentrations of contaminants exceed the action levels established by the CIH, cease all work in the area until potential risks can be evaluated further and immediately notify the Resident Engineer.

3.07 SCREENING, SAMPLING AND ANALYSIS

A. Perform required sampling and chemical analyses relating to generation, use, release, and disposal of Hazardous or Contaminated Substances in the course of operations, in accordance with the CS-SHP.

B. Perform required sampling and chemical analyses relating to existing potentially Hazardous or Contaminated Substances unless otherwise provided herein or in the Contract Documents. Include characterization sampling and the sampling necessary to determine disposal methods in this sampling. Do not dispose of material until directed to do so by the Resident Engineer.

C. After suspected Hazardous or Contaminated Substance is removed, confirmation samples will be collected and analyzed by the Resident Engineer. Based on test results, proceed with additional removal that may be required to remove material that is above action levels, as directed by the Resident Engineer. Mark locations of samples in the field and document on the surveys and the as-built drawings.

D. Action levels: Establish site-specific action levels for this project, dependent on the specific suite of contaminants expected at the project location.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies the air monitoring procedures that are required to assist in protecting worker health during construction.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 01 35 43, Hazardous and Contaminated Substance Health and Safety Program.
2. Section 01 35 43.15, Unknown Hazardous and Contaminated Substances.
3. Section 02 82 33, Removal and Disposal of Asbestos Containing Material.
4. Section 02 83 33, Removal and Disposal of Material Containing Lead.

1.02 DEFINITIONS

A. CIH and SSHO as specified in Section 01 35 43, Hazardous and Contaminated Substance Health and Safety Program.

B. Contaminated Material: As specified in Section 01 35 43, Hazardous and Contaminated Substance Health and Safety Program.

C. Hazardous Air Contaminant: Any air contaminant considered by regulatory agencies to cause or contribute to an identifiable and significant increase in mortality or to an increase in serious irreversible or incapacitating reversible illness and for which no ambient air standard exists.

D. Industry Standards: Applicable standards of construction industry have the same force and effect on performance of the Work as if copied directly into Contract Documents or bound and published therewith. If overlapping or conflicting requirements are found between standards referenced in these specifications and non-referenced standards, implement the more stringent requirements.

E. Suspect Areas: Areas where soil or groundwater contamination was previously detected, and where soil or groundwater contamination is suspected based on historical information.

1.03 GENERAL REQUIREMENTS

A. Monitor air for Hazardous Air Contaminants in breathing zones when work is being conducted in Suspect Areas. Potential substances of concern include, but are not limited to, the following:

1. Petroleum hydrocarbons (gasoline-, diesel-, and oil-range).
2. Benzene, toluene, ethylbenzene and xylenes (BTEX).
3. Chlorinated volatile organic compounds (cVOCs).

B. During demolition in asbestos and lead paint abatement areas, monitor air in accordance with Section 02 82 33, Removal and Disposal of Asbestos Containing Material, and Section 02 83 33, Removal and disposal of Material Containing Lead.

C. Conduct the Contaminated material air monitoring program as specified herein, and in accordance with Section 01 35 43, Hazardous and Contaminated Substance Health and Safety Program. Conduct an air monitoring program to help evaluate worker exposure to Contaminated Materials.

1.04 SUBMITTALS

A. Plan describing methods for conducting air monitoring, as developed by the Certified Industrial Hygienist (CIH). Submit this plan as part of the Hazardous and Contaminated Substance Health and Safety Plan (HCS-HASP) as described in Section 01 35 43, Hazardous and Contaminated Substance Health and Safety Program.

B. Air monitoring instrument calibration and data sheets.

1.05 QUALITY ASSURANCE

A. Site Safety and Health Officer (SSHO) shall conduct air monitoring.

B. Calibrate and maintain air monitoring instruments, per manufacturer’s recommendations.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Instruments: As required by the CIH.

B. Suitable for providing continuous readings.

C. Capable of detecting the contaminants of concern.

PART 3 - EXECUTION

3.01 AIR MONITORING

A. Monitor air for potential explosive hazards:

1. In confined space areas.

2. Where explosive gases were previously detected.

B. During excavation, use an instrument to evaluate levels of Hazardous Air Contaminants.

1. The use of this instrument is intended to provide warning and evaluate appropriate action to be taken to minimize exposure to Contaminated Materials.

2. Conduct continuous air monitoring in the areas of possible contamination to evaluate the presence of organic compound vapors.

C. During demolition, quantitatively evaluate levels of particulate lead and asbestos.

1. Asbestos containing materials are present in some buildings as indicated on the Contract Drawings.
2. Lead-based or lead-containing paint is expected to be present in all buildings.

3. Evaluate and handle asbestos containing materials in accordance with Section 02 82 33, Removal and Disposal of Asbestos Containing Materials.

3.02 ACTION LEVELS

A. The CIH shall develop appropriate action levels to minimize exposure by Contractor personnel, Sound Transit personnel, personnel representing third-party stakeholders, and the public. Include action levels in the air monitoring plan.

B. Ensure that action levels are appropriate for the contaminants of concern.

3.03 ACTION

A. If concentrations of contaminants exceed the action levels established by the CIH, cease all work in the area until potential risks can be evaluated further and immediately notify the Resident Engineer.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for protecting and minimizing impact to historical buildings and properties.

1.02 REFERENCES

A. This Section incorporates by reference the following regulations.

1. Section 106 of the National Historic Preservation Act (16 USC 4701)
2. 36 CFR Part 800, Protection of Historic Properties
3. U.S. Secretary of Interior’s Standards for Treatment of Historic Properties

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PROTECTION

A. Comply with measures to mitigate construction impacts to historic buildings and properties along the alignment as stipulated by the [name of agreement or plan] between the [List signatories: e.g., Federal Transit Administration, the Washington State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation] for the Sound Transit Link Light Rail Transit Project.

B. The [name of environmental document] identifies and describes the eligible following historic property(ies) located in the area of potential affecting the Contract area:

1. [_____].
2. [_____].

C. Minimize construction impacts to historic properties, located in the Contract area.

1. Do not use historic property (listed above or [if applicable: a designated City of [Seattle] Landmark]) for construction staging without prior approval from EAS Staff. EAS Staff will consult with the SHPO and/or seek approval for use from local review boards. Any Contractor-proposed staging areas must be authorized by EAS Staff who will conduct the appropriate review for historic properties.

2. Coordinate with EAS staff if any of the listed historic property(ies) above has/have also been identified for potential monitoring for settlement. Please refer to Section 31 09 00 Geotechnical Instrumentation and Monitoring of Earthwork. If any damages is incurred to any historic property(ies), any repair is required to be
consistent with the U.S. Secretary of Interior’s Standards for Treatment of Historic Properties.

3. If necessary, Sound Transit has the authority to require the Contractor to take the following measures, or other measures necessary, to minimize construction related impacts on historic properties:

   a. Use of rigid excavation support structures (shoring) to minimize ground movement.

   b. Underpinning before excavation.

4. Ground stabilization using cementitious or chemical grouts, ground freezing, or other modification techniques. Cost of Sound Transit directed Work to support historic properties will be reimbursed on a Time and Materials Basis in accordance with the General Conditions under the Provisional Sum item in the Contract Price Schedule or by Change Order, should no Provisional Sum item exist.

D. Protect facades of historic buildings listed above from accumulation of excessive dirt. Clean in an appropriate manner at the conclusion of construction.

E. If any physical damage occurs to the historic property(ies), immediately notify EAS staff. Repair any damage, which may result from the excavation and construction work. EAS staff will determine the appropriate repair/restoration methods in accordance with the “U.S. Secretary of Interior’s Standards for Treatment of Historic Properties,” in consultation with SHPO and the local review board regulating the property.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for responsibilities and actions for both the Contractor and Sound Transit in the event that archeological finds are encountered during any construction activities at the [_____] Site.

B. The Contractor shall comply fully with the requirements set forth in Chapter 27.53 RCW—Archaeological Sites and Resources. If any Contractor employee believe that he or she has uncovered a cultural resource, at any point in the project, all work adjacent to the discovery shall be ceased and the discovery site shall be protected. The Contractor shall immediately notify the Resident Engineer, Project Archaeologist, and Environmental Lead and submit a written Stop Work Order. The suspension of Work shall remain in effect until written permission to proceed has been obtained by the Resident Engineer, in consultation with the Project Archaeologist. If there is Stop Work order, the Resident Engineer will work with the Contractor to develop a Work-around Plan to minimize disruption to the Contractor’s work and schedule. Such suspension and/or Work-around Plan will be developed to minimize disruption to the Contractor’s work and schedule. Such suspension and/or Work-around Plan may allow the Contractor an adjustment in Contract Time or Contract Price, in accordance with Article 4, Changes and Change Order Process. Sound Transit shall have sole and exclusive title to any discovered articles.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. Revised Code of Washington (RCW)
   a. RCW Chapter 27.44 – Indian Graves and Records
   b. RCW Chapter 27.53 – Archeological Sites and Resources

2. Code of Federal Regulations (CFR)
   a. 43 CFR Part 10 – Native American Graves Protection and Repatriation Regulations
   b. 36 CFR Part 800 – Protection of Historic Resources

1.03 BACKGROUND:

A. Sound Transit has developed a project specific Archaeological Resources Monitoring and Treatment Plans (ARMT Plans) or Unanticipated Discovery Plan (UDP) to govern the actions to be taken when cultural resources are discovered during the implementation of the [Project name]. The Plan describes the general research, design, field techniques, analytic methods, notification protocols, and list of contacts that will guide the actions of the Contractor, Resident Engineer, Project Archaeologist, and Environmental Lead, if archaeological deposits are identified during construction of the [Project name]. Include the ARMT Plan or UDP in the Subcontracts for which Work on Site is likely to disturb land. Detailed data recovery plans, or supplements to the ARMT Plans] [UD Plans], will
be developed by the Project Archeologist on a case-by-case basis if archaeological deposits are identified.

1.04 IMPLEMENTATION

A. Contractor shall insert these implementation provisions in any Subcontracts for which Work on-site is likely to disturb land.

B. Sound Transit has contracted with a Project Archaeologist, who will work with the Contractor, Residential Engineer, and Environmental Lead to implement the ARMT Plans. The roles and responsibilities are generally as described herein.

1.05 CONTRACTOR’S AND SOUND TRANSIT’S RESPONSIBILITIES PRIOR TO CONSTRUCTION

A. Sound Transit will develop the training program and schedule the training sessions, prior to the commencement of land disturbing construction activities. Subsequent orientation briefings and training programs may be scheduled at Contractor’s request to accommodate new personnel arriving on-site. No employee of Contractor shall be allowed to participate in land-disturbing construction without first having attended the orientation briefing and as applicable, the training program.

B. Contractor shall require all of its personnel who perform Work on-site that is likely to disturb land, to attend an orientation briefing (approximately 15 minutes) about procedures established to investigate and protect cultural resources if encountered during construction.

C. The Contractor, Project Superintendent, and other individuals responsible for land disturbing field operations, as designated by the Contractor, will be required to participate in Archaeological Pre-Construction Training meeting to be held with representatives of Sound Transit and the Project Archaeologist. The training will serve to:

1. Review construction plans, schedules, and areas that archaeologists will monitor;

2. Describe the role of field archaeologists in the construction process as established in the ARM Plan and explain procedures established to investigate and protect cultural resources, if encountered during construction;

3. Establish a chain of command for communication and decision-making among Sound Transit, Project Archaeologist, and Contractor personnel;

4. Provide introductions of the Sound Transit representatives, the Project archaeologists and the Contractor’s personnel who will be working together on a daily basis; and

5. Clarify questions about schedules, construction locations, construction techniques, or notification procedures.

1.06 CONTRACTOR’S RESPONSIBILITIES DURING CONSTRUCTION

A. The Contractor, other individuals responsible for land disturbing field operations and, potentially, applicable equipment operators, as designated by the Contractor, will be required to participate in meetings with the Project Archaeologist and the Resident Engineer to discuss field conditions and contingencies for protecting cultural resources.

B. Undiscovered archaeological materials may exist on the Site. The Contractor should be watchful for changes in soil color and/or the presence of ash, shell layers, bones, structures, or artifacts that might indicate the presence of unidentified cultural materials. If such indications are present, the Contractor shall stop work in the discovery area and protect it. Work can continue outside the protected area. The Contractor will be required
to cooperate with the Project Archaeologist to enable the Project Archaeologist to monitor the Work. Examples of cooperation may include moving equipment to provide access for observation, placing excavated material for examination, accessing trench or foundation excavations, excavating in thin lifts or otherwise reasonably modifying construction excavation procedures to provide exposures of subsurface stratigraphy. Generally, the Project Archaeologist will make any requests for such cooperation through the Resident Engineer. However, there may be times when it is necessary for the Project Archaeologist to communicate directly with Contractor’s equipment operators. The Contractor shall direct its operators to cooperate with any such requests made by the Project Archaeologist, unless so doing would create an unreasonable safety risk or hazard. In that case, the Contractor shall refrain from complying with the request and notify the Resident Engineer.

C. The Contractor shall immediately notify the Project Archaeologist, Resident Engineer, and Environmental Lead in the event that any cultural resources or suspected cultural resources are discovered during construction. The Contractor shall also submit a written Stop Work Order.

D. Re-start work upon written direction from the Resident Engineer, in consultation with the Project Archaeologist.

1.07 RESPONSIBILITIES OF THE PARTIES IF CULTURAL RESOURCES ARE DISCOVERED

A. If the Project Archaeologist observes cultural deposits, more intensive identification work may be required. First, the Project Archaeologist will notify the Environmental Lead and Resident Engineer who will stop the Work in an area large enough to ensure the integrity of the cultural deposit. This directed Work stoppage will be in the form of a written Stop Work Order. The Project Archaeologist may request the use of Contractor’s equipment to provide a better vertical exposure or to remove fill or slump that may obscure deposits. The Project Archaeologist may enter the trench and make an assessment of stratigraphy, matrix, characteristics, evidence of previous disturbance, resource type, and the spatial extent of the resource. The assessment will determine if the find is significant according to criteria specified in the ARMT Plans.

B. Non-significant finds will be recorded and collected. Provenance information will be recorded, such as the rail segment, construction station, and depth below surface, stratum, date, and name of person finding the material.

C. Construction activity shall re-commence only at the written direction of the Resident Engineer with the Project Archaeologist’s consent. Sound Transit directed written Work stoppages of less than a cumulative duration of 24 work hours shall be considered incidental to the performance of the Contract. The cost of Sound Transit directed Work stoppages in excess of the cumulative 24 work hours will be reimbursed on a Time and Materials Basis in accordance with the General Provisions under the Provisional Sum item in the Contract Price Schedule or by Change Order, should there not be a Provisional Sum item.

1.08 DISCOVERY OF HUMAN REMAINS OR BURIAL SITES

A. If the Project Archaeologist or the Contractor identifies anything that remotely appears to be human remains, construction Work shall be halted immediately in an area large enough to maintain integrity of the deposit. The Contractor shall notify the Resident Engineer if the Project Archaeologist is not monitoring the excavation at the time of the discovery.

B. If human graves and associated cultural items are discovered during construction, the applicable federal and state laws require the Contractor and Sound Transit to cease activity in the area of discovery (activities may continue elsewhere in the Project area). Sound Transit will immediately contact the King County Medical Examiner ((206) 731-
3232), the Department of Community Development, Office of Archaeology and Historic Preservation (1063 South Capitol Way, Suite 106 Olympia, Washington 98501, (360) 586-3065)), and the affected Tribes.

C. Human remains shall not be removed or handled. The area of discovery will be flagged and construction equipment and personnel shall be instructed not to enter the area. Assumptions must not be made concerning the origin of the human remains. Public disclosure of the find shall be avoided. The Resident Engineer or Project Archaeologist will ask the King County Medical Examiner to examine the remains in their location of discovery. Under no circumstances shall the remains be removed from the Site before notification to the DAHP and the affected Tribes and approval by Sound Transit.

D. If Native American burials are encountered during any construction-related activity, the Washington Indian Graves Act (WAC 27.44) and applicable sections of the Native American Graves Protection and Repatriation Act (NAGPRA) (Public Law 101-601; 104 Stat. 3048; USC 3001-13) require specific procedures that shall be followed, as appropriate.

E. Following the identification of any human remains and associated cultural materials that are subject to NAGPRA and required notification, Sound Transit will coordinate directly with affected Indian Tribes to determine their wishes with regard to the schedule for return of remains and associated cultural items. The Project Archaeologist will hold any materials that meet the definition of NAGPRA in a secure location until they are reburied under the direction of the Tribes. The Project Archaeologist may conduct non-destructive study of the human remains, subject to approval by the affected Tribes.

1.09 CULTURAL RESOURCES ON THIS CONTRACT

A. The entire work area of this Contract has a moderate to high cultural resource potential and may be monitored by the Project Archeologist pursuant to the ARMT Plan. There are no known cultural resource sites within the work area, however the areas with the highest cultural potential are:

1. Site [______].
2. Site [______].

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies permit, easement and right of entry acquisition, requirements and conditions.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections not referenced below may also be related to the proper performance of this work.

1. Section 01 31 14, Coordination with Others: Track Access Permits.

1.02 SUBMITTALS

A. Permits and easements obtained by the Contractor, prior to performing any work covered by the permit or easement.

B. Approvals when work is complete for permits obtained by the Contractor. Include a copy of the permit.

C. Easement releases.

D. Permit Review Acceptance forms.

1.03 PERMITS

A. Sound Transit has acquired, or will acquire prior to Notice to Proceed for the following permits:

1. [City of Seattle, Department of Planning and Development (DPD)] [Local authority having jurisdiction]

   a. Master Use Permits (MUPs)

      1) Demolition

      2) Staging and Grading

   b. Construction Permits

      1) Demolition Permit

      3) Electrical/Utility Relocation Permits

      4) Building (Grading, Shoring, Excavation, Drainage)

   c. Noise Variance Permit

      1) Major Public Project Construction Noise Variance

         a) Temporary Noise Variances.
i) DPD, under its own discretion, may issue to either Sound Transit or the Contractor temporary noise variance(s) under certain and extenuating circumstances.

2. [City of Seattle Department of Transportation (SDOT)] [Local authority having jurisdiction]
   a. Project Construction Permit (PCP)

3. [Washington State Department of Ecology (DOE)]
   a. Construction Stormwater Waste Discharge Permit
      1) National Pollutant Discharge Elimination System Permit.

4. [Washington State Department of Transportation (WSDOT)]
   a. Right-of-Way Permit

B. Sound Transit will initiate the process of acquiring the following permit and will work with the Contractor after contract award and notice to proceed has been issued. The Contractor will be required to provide the necessary information under Section 01 57 24, Temporary Site Water Discharge in order to compile a complete application KC can review and approve. Note, permit issuance may take a minimum 90 days, depending on the quality of information provided to King County.

1. King County Department of Natural Resources and Parks, Industrial Waste Program
   a. Construction Wastewater Permits
      1) Industrial Waste Permit
         a) [King County, at its own discretion, may issue a Waste Discharge Permit to Sound Transit under certain and unique circumstances if certain conditions are met.]

B. Terms and conditions of the permits obtained by Sound Transit prior to bid submittal that are applicable to the Contractor are included in the Contract Documents.

C. Copies of permits obtained by Sound Transit will be transmitted to the Contractor at the Preconstruction Meeting.

1.04 PERMITS OBTAINED BY CONTRACTOR

A. Be responsible for and obtain all other permits and right of entry, including requirements for ST Permits and right of entries listed below, required to perform the work that are not listed above.

B. [City of Seattle, Department of Planning and Development (DPD)] [Local authority having jurisdiction]
   1. Prepare and submit a Construction Parking and Staging Area Management Plan, [Temporary Erosion and Sediment Control Plan (TESC)] and [an Access and Haul Plan] for review and approval by Sound Transit and the [City of Seattle DPD] [local authority having jurisdiction].

C. [City of Seattle Department of Transportation (SDOT)] [Local authority having jurisdiction]
1. Street Use Permits (as necessary for temporary closure of sidewalks and City right-of-way)

D. [Washington State Department of Ecology (DOE)]

1. [Sound Transit shall prepare a draft letter of request for the Contractor to co-sign, requesting DOE to name the Contractor as a Co-Permittee to the Link Light Rail’s Project Systemwide Individual NPDES Waste Discharge Permit, WA-003192-5.]

2. Prepare and submit to the DOE, for review and approval, a construction stormwater prevention plan (SWPPP) and a construction stormwater monitoring plan (MP). Reference Section 01 57 24, Temporary Site Water Discharge, for additional information for this requirement.

E. Prepare and submit to the proper authority or owner all information, including but not limited to the Storm Water Pollution Prevention Plan (SWPPP), required for the issuance of such permits or easements. Pay all costs thereof including agency inspections and easement costs unless specifically provided otherwise in the Contract. Sound Transit will pay all permit fees, costs of agency inspections, and easement costs for the permits and rights-of-entry listed in Articles 1.03, herein.

C. When required by the permit and during work progress covered by the permit, ensure the work be inspected by the issuing agency.

1.05 POSTING PERMITS

A. Post permits, including those obtained by the Contractor, at the site of the work.

B. Post permits required by law only.

1.06 PERMIT REVIEW ACCEPTANCE FORM

A. Form provided by the Resident Engineer.

B. Read and understand conditions and provisions of all Orders, permits, and approvals relevant to this Contract.

C. The Contractor’s Project Manager, and, if required, the Contractor’s Erosion and Sediment Control Lead, sign each form.

D. Use a separate Form for each individual Order, permit, and approval and submit at least 14 Days prior to start of Work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section defines the requirements for the Contractor to establish, implement and maintain an effective Quality Program to manage, control, document and assure the Work complies with the requirements specified in the Contract Documents. This Section also defines the requirements for the Contractor to prepare, implement, and maintain plans, programs, procedures and the organization necessary to assure quality for materials, equipment, workmanship, manufacturing, installation operations covering both on-site and off-site Work by the Contractor, including subcontractors, suppliers, testing laboratories and consultants.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents. They are part of this Section as specified and modified. In case of a conflict between the requirements of this Section and those of a listed document, the requirements of this Section shall prevail.

1. Federal Transit Administration (FTA):

2. American Welding Society (AWS):
   a. AWS QCI Standard for AWS Certification of Welding Inspectors.

3. International Building Code - Structural Tests and Special Inspections (Chapter 17)

4. [City of Seattle] Building Code.

5. Washington Association of Building Officials (WABO) Requirements

B. Definitions:


2. Quality Program Plan (QPP): A plan that addresses the fifteen quality elements identified in the FTA QA/QC Guidelines FTA-IT-90-5001-02.1. Provides descriptions of and references to Quality procedures and Work instructions, including specified requirements unique to this Contract, which relate to the quality system elements.

3. Readiness Review Meeting: A meeting conducted by the Resident Engineer with the Contractor, Subcontractors, and applicable third party representatives who are involved in executing, supervising, inspecting, testing and monitoring the Work activity to discuss all Construction Work Plan elements identified below.
1.03 CONTRACTOR QUALITY PERSONNEL REQUIREMENTS

A. Assign a Contractor Quality Assurance (CQA) Manager dedicated solely to this Contract responsible for managing and acting on all quality matters and who has the authority to act on all quality matters as a representative of the Contractor. The CQA Manager cannot be subordinate to Contractor’s personnel that directly perform, supervise, or progress the Work, and; cannot be responsible for directly performing, supervising, or progressing the Work or have responsibilities for this Contract that conflict or appear to conflict with his primary responsibility for quality matters.

B. Qualification of Contractor Quality Assurance (CQA) Manager: At least seven (7) years prior experience as a Project Engineer, CQA Manager, Construction Superintendent, or QC Supervisor on a project of comparable complexity to this Contract which includes at least five (5) years experience as Quality Control Manager, Inspector, or Engineer. The CQA Manager must be approved by the Resident Engineer and be on site before Work on this Contract can begin. At the sole discretion of Sound Transit, the Contractor may be required to replace the CQA Manager. Contract Work is not permitted to be performed without an approved CQA Manager on site.

C. CQA Manager’s responsibilities include: development and implementation of the Quality Program Plan, planning, performing quality audits of design and construction activities, attending progress and quality progress meetings, approving IDR’s, issuing NCR’s, managing the Quality Control Inspectors, coordinating with the Independent Test Labs, performing and coordinating root cause analysis on non-conforming Work and monitoring the correction.

D. Employ qualified quality control inspectors with a minimum of three (3) years construction quality control experience for the Work they are responsible for inspection or testing, or; with a minimum of three (3) years quality control inspection or testing experience plus a minimum two (2) years construction experience in the engineering or inspection in the disciplines for the Work they are responsible for inspecting. Quality control inspectors must report directly to the CQA Manager and cannot be subordinate to Contractor’s personnel that directly perform, supervise, or progress the Work, and; cannot be responsible for directly performing, supervising, or progressing the Work or have responsibilities for this Contract that conflict or appear to conflict with his primary responsibility for quality matters. Inspectors are responsible for reviewing and understanding the requirements in the Construction Work Plans, drawings, and specifications, observing the construction site Work activities, inspecting the Work and documenting the results of the inspections in the Inspector Daily Reports (IDR’s).

E. Mobilize the number of experienced quality control inspectors, qualified to the type of Work being performed, that is necessary to perform the Quality Control inspections with at least one (1) inspector per worksite per shift.

1.04 CONTRACTOR QUALITY PROGRAM PLAN REQUIREMENTS

A. Quality Program Plan Elements:

2. Documented Quality Management System.
3. Design Control.
5. Subcontractor, Consultant and Supplier Control.
6. Identification, Traceability and Receiving, Handling, Storage and Control of Products Materials and Equipment.

7. Process Control, including Construction Work Plans (CWPs) and control of special fabrication and installation processes, i.e., welding, plating, soldering, waterproofing, etc.

8. Testing and Inspection: Include in quality-control plan a comprehensive schedule of Work requiring testing and receiving and in-process inspection, including the following:
   a. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
   b. Special inspections required by authorities having jurisdiction.
   c. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.
   d. Control of inspection, testing, and monitoring equipment.
   e. Inspection and Test Reporting (See Exhibit A for Inspector Daily Report form).

9. Identification, Control and Correction of Non-conforming Conditions (See Exhibit B for NCR form and Exhibit C for NCR log).


11. Quality Records.

12. Audits - Contractor internal audits and audits of Subcontractors and Suppliers (See Exhibit F for Audit Log, Exhibit G for Audit Plan and Exhibit H for Audit Reports and the Audit Schedule for the duration of the Contract).

13. Training requirements for Contractor and subcontractor staff performing audits, inspections, tests and special processes.

B. Quality Program Plan, within 30 Days after the effective date of the Notice to Proceed.

1. Contractor QPP submittal must be acceptable to Resident Engineer with a “No-Exceptions-Taken” or “Exceptions as Noted, No Resubmission Required” disposition, before design and construction Work can begin. No extension of time or additional monies is entitled for failure to secure a QPP acceptable to Resident Engineer.

2. As Work progresses, evaluate on a quarterly basis, revise as necessary and re-submit QPP to Resident Engineer for review.

1.05 SUBMITTALS

A. Name and qualifications of Contractor’s Quality Control Manager, within 15 Days after the effective date of the Notice to Proceed.

B. Name and qualifications of quality control inspectors at least 15 Days prior to commencement of Work to which they are assigned.
C. Name and qualifications of the Contractor’s Independent Testing Laboratory and all subcontracted Testing Laboratories, within 45 Days after the effective date of the Notice to Proceed.

D. Name and qualifications of personnel employed to perform special processes, at least 15 Days prior to commencement of Work to which they are assigned.

E. List of Subcontractors and subconsultants within 45 Days after effective date of Notice to Proceed. Provide updates at least 10 Days prior to each new Subcontractor or subconsultant beginning Work on Contract.

F. Quality Assurance Audit Schedule, within 60 Days after the effective date of the Notice to Proceed.

G. Non-Conformance Report form within 30 Days after the effective date of the Notice to Proceed.

H. List of Construction Work Plans, within 45 Days after the effective date of the Notice to Proceed.

I. Construction Work Plans required by the Contract Specifications, a minimum of 24 Days prior to commencement of the applicable Work activity.

J. Inspection and Test Plan, within 45 Days after the effective date of the Notice to Proceed. Submittal must be acceptable to Resident Engineer with a “No-Exceptions-Taken” or “Exceptions as Noted, No Resubmission Required” disposition, before design and construction Work can begin. No extension of time or additional monies is entitled for failure to secure a plan acceptable to Resident Engineer.

1. Include: Requirement of accreditation for the Contractor Independent Testing Laboratory; test results in a test log, recorded as submitted within the required time by a member of QA staff; requirement that test lab provide facilities and testers qualifications under a separate submittal; description of how conflicts between Contract requirements and industry testing standards will be resolved; Readiness Review Meeting quality control requirements; initial inspection requirements; follow-up inspection requirements, and; a Schedule of Tests and Inspections matrix including the following:

   a. Specification section number.
   b. Specification section title.
   c. Section article.
   d. Test/Inspection Description.
   e. Standard procedure.
   f. Whether testing is done on/off site.
   g. Minimum frequency or instance for tests and inspections.
   h. Entity responsible for performing tests and inspections.

K. Contractor Inspector’s Daily Reports (IDRs), within five (5) Business Days of inspection (as submittals) for the first four (4) weeks after the start of inspection. Transmit IDR’s thereafter, within five (5) Business Days.

1. Inspector’s Daily Reports: Create and maintain daily quality control reports for each Business Day containing factual records with numerical data of the Work
and quality control activities with format and content acceptable to the Resident Engineer. Obtain the verification and signature of the CQA Manager on all IDRs. Provide verification statement on IDRs that states: “All supplies and materials incorporated into the Work are in compliance with the terms of the Contract except as noted.” Sign and date each IDR.

L. Independent Testing Lab Inspection Reports, within seven (7) Business Days after completion of the inspection or test.

M. Independent Testing Lab Test Reports, within seven (7) Business Days after completion of the inspection or test. Submit under the technical specification section which it applies.

N. Contractor Non-Conformance Reports, as required in Article 3.06.A herein.

O. Utility Strike Log, within five (5) Business Days after Acceptance.

P. Non-Conformance Log, within five (5) Business Days after Acceptance.

Q. Contractor QA Audit and Surveillance Reports within 15 Days after the completion of each audit - Include root cause and corrective actions to audit and surveillance findings.

[The following paragraph and subparagraphs are for systems or design/build contracts]

R. Monthly Quality Reports, within 10 Days after end of each month. To include:
   1. Audits planned.
   2. Audits completed along with audit reports.
   3. Nonconformance reports, dispositions and verified corrective action.
   4. Failed tests with reason for failure and subsequent corrective actions taken.
   5. Quality related submittals submitted.
   6. Other quality issues.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 QUALITY PROGRAM PLAN

A. Management Responsibility:
   1. Provide description of QA/QC Organization and staff, including job descriptions and an organizational chart showing the relationship between the Contractor’s General Manager, Project Manager, CQA Manager, subcontractors and consultants.

B. Documented Quality Management System
   1. Describe the plans, procedures, and organization necessary to design, procure, install, inspect, test and audit to achieve compliance with the requirements of the Contract Documents. Identify all the design and installation Work processes and their Quality Control inspection and testing requirements. Develop detailed Construction Work Plans (CWPs) and other procedures for processes and Work activities determined by the Resident Engineer or the Contractor to be complex,
involve multiple Subcontractors and/or multiple activities, involve special processes, require interfacing with third parties, or require job hazard analysis to be developed.

2. Include construction operations, both on-site and off-site including fabrication, manufacturing and suppliers. Include Sound Transit and third party imposed hold points in CWPs.

C. Design Control

1. Establish, maintain, and implement procedures for the following design controls for construction and design Contracts:
   b. Requirements for professional engineer from State of Washington.
   c. Design review, approval and updating of submittals.
   d. Calculation checking requirements and documentation of assumptions and backup materials.
   e. Utilization of nomenclature and abbreviations defined in Contract Documents.
   f. Applicable code requirements satisfied.
   g. Develop and maintain configuration controls for all design and as-built documents including drawings, specifications, plans, procedures, Work instructions and software to track distribution and revisions.

   [The following seven paragraphs are additional requirements to be documented and implemented for systems, design/build and GCCM Contracts:]
   h. Applicable software quality plan and reliability plan requirements for design satisfied
   i. Internal design audits planned and performed for each submittal phase.
   j. Design checking for each design submittal phase and for design changes during construction.
   k. Qualified checker independent of design.
   l. Methods of making comments, revising documents and verifying corrections using color coding and check print stamps.
   m. Design Review Comments for each design submittal phase comments and for submittal review comments.
   n. Document and track all internal design review and external submittal review comments, responses, dispositions and incorporation of comments.

3.02 SUBCONTRACTOR, CONSULTANT AND SUPPLIER CONTROL

A. Include in contract documents to Subcontractors, the Quality Program Plan requirements and quality requirements defined herein applicable to the Work they perform.
B. Assure all products and services procured from subcontractors, consultants and suppliers have the capability of meeting Contract Document requirements and comply with Contractor’s QPP or have their QPP approved by Contractor.

C. Develop and maintain procurement procedures to select and control suppliers and subcontractors including:
   1. Evaluate and assess supplier’s and subcontractor’s quality systems.
   3. Flow down of design, reliability and quality requirements to suppliers and subcontractors.
   4. Determination of criteria for performing source inspections.

3.03 IDENTIFICATION, TRACEABILITY AND RECEIVING, HANDLING, STORAGE AND CONTROL OF PRODUCTS, MATERIALS, AND EQUIPMENT

A. Establish and maintain procedures for identifying and controlling items of production (batch materials, parts, components and subassemblies) to prevent use of incorrect or defective items and to ensure only correct and acceptable items are used or installed.
   1. Provide identification and traceability during all phases of production from receipt of raw materials, components and subassemblies through manufacturing process, to delivery of final products and systems.
   2. Utilize batch number, shipment number, packing slips or invoices along with test data sheets and material certifications for determining traceability of raw materials.
   3. Provide physical separation, procedural control or other appropriate means where physical separation is impractical or where record traceability is lost.
   4. Employ store room or inventory tracking procedures for traceability of items back to a particular order number, batch number, date received, test lot or other pertinent source.
   5. Employ routing documentation for traceability of assemblies in production.
   6. Mark final assemblies with contract number, model number, serial number, bar codes, etc.

B. Control receipt of products, materials, and equipment in accordance with Section 01 60 00, Product Requirements.

C. Inspect all products, materials and equipment received for identification, damage and quantity. Large lots may be inspected by an industry approved standard sampling method (i.e.: ANSI/American Society for Quality ASQ Z1.9 Sample Procedures and Tables for Inspection by Variables for Percent Nonconforming)

D. All products, materials, and equipment are subject to receipt inspection by Sound Transit.

3.04 PROCESS CONTROL

A. Control On-Site and Off-Site Construction through the development of Contractor Construction Work Plans (CWPs), approval of CWPs by the Resident Engineer, execution of the Work in accordance with CWPs and Contract requirements, and timely reporting of required inspections and tests.
1. Determine, in consultation with the Resident Engineer, which Work activities require submission and approval of a CWP. Prepare and submit a list of CWPs to the Resident Engineer for concurrence and approval. The Resident Engineer and the Contractor may add CWPs to the list. Update the CWP list when new CWPs are added and resubmit within five (5) Business Days to the Resident Engineer for approval.

C. Prepare and submit a CWP for each of the Work activities identified on the CWP list. Work cannot begin without Sound Transit acceptance of a CWP and convening of a Readiness Review Meeting. As a minimum include the following in each CWP:

1. Scope of Work.
2. List of persons responsible for supervision of the Work.
3. List of required approved submittals (for example; traffic control plans, and special processes), drawings (with latest revisions), and the job hazard analysis.
4. Planned start-work and completion dates, progress rate expected, and Work hours.
5. Sequence of events and construction methods for performing the Work. Include Sound Transit hold points and inspection requirements.
6. Handling and storage of materials and equipment.
7. Inspection and Test hold points required where the next process step or activity will cover up the Work.
8. Inspections and tests required by Contractor, Third Parties and/or Sound Transit.
9. Individuals responsible for performing inspections and providing input to as-built drawings.
10. Prerequisite activities and related construction safety issues.
11. Off-site inspection and test activities and their locations.
12. Procedures for controlling hazardous materials, as applicable.
14. Actions defined as “Special Events”, which may expose the general public to danger or inconvenience, and which may require a third party to be notified.
15. Safety-critical installations, inspections, and tests listed on the safety certification checklist (provided by Sound Transit).
16. Specific Job Hazard Analysis (JHA) for each CWP.

D. CWP Readiness Review Meeting

1. After the CWP has been returned by the Resident Engineer annotated with a “No Exceptions Taken” (NET) or “Exceptions as Noted, Resubmission Not Required” (EANRNR), and before beginning associated Work activities, conduct a Readiness Review Meeting. The Resident Engineer documents the meeting with an agenda and minutes of the meeting including an attendance record. Include an activity for each Readiness Review Meetings on the Project Schedule.
E. Control Of Special Processes

1. Perform special processes (i.e.: welding, brazing, and soldering) only with personnel certified in accordance with the requirements of the specific processes. Maintain qualification records of personnel performing special processes in the worksite files, submit to the Resident Engineer for approval, and reference in the applicable CWPs.

2. Obtain Sound Transit approval of qualifications of personnel performing special processes prior to starting Work.

3.05 INSPECTION AND TESTING

A. Independent Testing Laboratory

1. Employ the services of an Independent Testing Laboratory to perform on-site testing, as well as, off-site testing to confirm the acceptable quality of materials, parts, and equipment required by the Contract Documents. Independent Testing Laboratory must have special inspection capability and certification. Independent Testing Laboratory will be currently certified by a nationally and/or state recognized regulatory agency or an industrially sponsored organization.

2. Obtain Sound Transit authorization to use the Independent Testing Laboratory before commencing Work for which testing is required by Contract Documents. Obtain Sound Transit authorization before changing or adding Independent Testing Laboratories.

B. Inspection and Test Plan

1. Prepare and submit Inspection and Test Plan with a Matrix defining the types and frequency of inspections and tests and the entity responsible for performing each inspection and test (i.e.: laboratory, Contractor, Subcontractor or Third Party). The Inspection and Test Matrix included at the end of this Section is provided to assist the Contractor with preparation of an Inspection and Test Plan.

2. Update the Inspection and Test Plan whenever an Independent Testing Laboratory is added or deleted, or when an inspection or test is deleted or added by Change Order or a Change Notice-Work Directive.

3. Perform all inspections, unless otherwise stated in the Specifications. The CQA Manager is responsible for verifying that quality standards are maintained throughout the Contract through in-process inspections, substantial completion inspections and final inspections. CQA Manager shall:
   a. Prepare a schedule of special inspections required.
   b. Notify Resident Engineer in advance of date of performance of special inspections.
   c. Coordinate Work to ensure the next step in the process does not obscure the ability to inspect until the required inspections have been completed.

4. [Use the following paragraph for systems or design/build contracts]
   a. [Monitor the correction of all discrepancies and include a notation in the IDRs and the Monthly Quality Reports.]
5. Adjustments to control procedures and CWPs may be required based upon results of inspections and tests. Document inspection and test results of the in-process inspections in the inspection reports.

6. Provide five (5) Business Days advanced notice to the Resident Engineer where Sound Transit or Third Party inspection or test is required within the State of Washington and at least 10 Business Days advanced notice to the Resident Engineer for Sound Transit or Third Party inspections and tests outside of the State of Washington.

7. Notify Resident Engineer not less than five (5) Business Days in advance of Work requiring special inspections and tests requiring Washington State Labor and Industry (i.e., electrical inspection and test) and/or other jurisdictional requirements (i.e., City of Seattle Building Code). Do not proceed with the Work until a hold point has been released by the Resident Engineer. Cooperate fully with these special inspectors and provide any assistance necessary to complete their inspections.

8. Report inspection and test compliance or non-compliance with the contract requirements specified or indicated in the Contract Documents.

C. Special Inspections and Tests

1. Where required by Authority Having Jurisdiction (AHJ), the Owner will contract with a WABO qualified testing laboratory or special inspector to conduct special inspections and tests. All other special inspections and tests must be performed by the Contractor's Independent Inspection and Test Laboratory WABO-qualified inspectors.

D. Control of Inspection, Testing, and Monitoring Equipment

1. Calibrate and certify all testing equipment and monitoring devices. Calibration and certification requirements include the following and apply to the Contractor and all Subcontractors, suppliers and Independent Testing Laboratories:

   a. Be able to trace calibration to known national standards.

   b. List inspection, test, and monitoring equipment with the name and serial number, date of current calibration, due date of next calibration, and name of person or laboratory conducting the certification or calibration with a brief description of use.

   c. Store all testing equipment and monitoring devices in a safe and secure location, maintained throughout the Contract and used only for testing or monitoring Work for which they are designed.

   d. Re-calibrate, re-test, and re-inspect materials, parts and equipment if the inspection or testing equipment is suspected of being out of calibration, broken, dismantled, or damaged.

   e. Make all testing and inspection equipment calibration records available and display on the equipment calibration sticker showing the last date of calibration and the due date of the next calibration.

E. Inspection and Test Reporting

1. Inspection and test reports are considered Contract Record documents. Require parties performing testing and inspections to verbally transmit information regarding failed inspections and tests on the same Day as discovery to the
Upon receipt of the failed inspections or test information, notify the Resident Engineer by e-mail within one (1) Business Day of the failed inspection or test results.

2. Non-conforming Work shall result in the issuance of a Non-Conformance Report if it is not immediately corrected. See the following article for the process that must be followed for the correction of non-conforming items. No action shall be taken to cover or obscure the Work that is the subject of a failed inspection until it is corrected and re-inspected or otherwise approved by the Resident Engineer.

3. Include the following minimum requirements in Inspection and Test Reports:
   a. Sound Transit Contract number
   b. Reference to Contract Specification Section requirement or test procedure
   c. Identification of items tested
   d. Location where sample was taken (i.e., stationing and intersection corner)
   e. Quantity of items inspected or tested
   f. Date inspection or test was conducted
   g. Name of technician
   h. Acceptance criteria
   i. Pass or Fail disposition
   j. Results
   k. Authorized signature

F. Contractor-performed and Subcontractor-performed inspections and tests are subject to verification and approval by the Resident Engineer.

G. Inspection and testing conducted by agencies other than the Contractor's approved Independent Testing Laboratory does not relieve the Contractor of the responsibility of meeting the requirements of the Contract Documents.

3.06 IDENTIFICATION, CONTROL AND CORRECTION OF NON-CONFORMING CONDITIONS

A. Document and submit to the Resident Engineer nonconforming items and utility strikes on a Non-Conformance Report (NCR) (See Exhibit B) within one (1) Business Day of discovery. Failure to do so will result in the Sound Transit Resident Engineer documenting and issuing a Non-Conformance Report to the Contractor.

B. Document the root cause of the nonconformance and the corrective action taken in the NCR.

C. Record all NCRs in an NCR Log (See Exhibit C).

D. Upon receipt of a Non-Conformance Report from Sound Transit, the Contractor is responsible for: investigating and describing the root cause of the nonconformance, providing remedial correction for the nonconforming item(s), except for USE AS IS dispositions, providing preventive actions to prevent recurrence, and recommending a disposition within 10 Business Days of the issuance date of the NCR. Payment will be
withheld for Non-Conforming Work until corrected to the satisfaction of Sound Transit. Complete all rework within 30 Days from the date that the non-conforming condition was documented. Complete all repairs within 30 Days after the repair procedure has been annotated with a NET or ENRNR and returned to the Contractor by the Resident Engineer. The applicable disposition codes for NCRs are:

1. **USE AS IS**: allows the use of an item that does not meet specified Contract requirements without the need for corrective action, but may require some form of compensation to Sound Transit.

2. **REPAIR**: item may be repaired if it cannot be reworked to its full compliance with the Contract requirements, but it can be made suitable for use.

3. **REWORK**: item may be reworked to bring it into conformance with the requirements of the Contract.

4. **REJECT**: item is unsuitable for its intended use, is economically or physically incapable of being reworked or repaired, and must be replaced to bring it into conformance with the Contract Requirements. These items may be scrapped or returned to the supplier.

E. Nonconforming items dispositioned as USE AS IS or REPAIR require review and approval of the Resident Engineer and the Sound Transit Material Review Board. Transmit corrective and preventative action responses, along with a justification letter for using as is or repairing the non-conforming item from the Contractor’s Engineer of Record to the Resident Engineer by the due date stated on the NCR.

F. Tag or otherwise identify nonconforming items requiring REWORK, REPAIR or USE AS IS. No follow-on Work that integrates with that item can be performed until rework or repair is completed and accepted, or a Use As Is disposition is provided in writing by the Resident Engineer.

G. Red-tag and remove or isolate all nonconforming items, identified as REJECT, from the Site within 72 hours of discovery.

H. Record utility strikes involving the hitting or damaging on an existing utility in a correspondence to the Resident Engineer in a Utility Strike Log within 30 Days after strike.

1. Include the following:
   a. Location
   b. Date and time of occurrence
   c. Survey coordinates and elevation
   d. Utility Type
   e. Size of Utility
   f. Name/Description of Utility
   g. Circumstances leading to the strike
   h. Date and time of repair
   i. Party handling repair
2. The Resident Engineer and the affected utility entity determine the disposition of the non-conforming Work.

3. Record all utility strikes and repairs on the as-built drawings within three (3) Days after strike.

3.07 CORRECTIVE ACTIONS

A. Ensure those conditions that caused failures, malfunctions, deviations, deficiencies, and defects in material and equipment are promptly identified and corrected. If such conditions exist, the Contractor verifies the cause and documents corrective actions to be taken. Document implemented corrective actions and related information.

B. Determine corrective actions based on examination of nonconforming items to determine the extent and causes of the problem, to introduce corrections and improvements, review the adequacy of such measures, and monitor the effectiveness of corrective actions taken, and provide input to analyze trends in performance of Work to prevent recurrence of nonconforming products.

C. Issue a Corrective Action Request (CAR) and track in a CAR Log, (See Exhibits D and E), to document a failure to comply with previous corrective actions requested through the Audit Finding Report process and the Nonconformance Report process or when the there has been repeated failed to meet the technical and administrative requirements of the Contract.

3.08 QUALITY RECORDS

A. Records are defined as documentation required by the Contract. Record documents include, but are not limited to, correspondence, submittals, test reports, Contract and shop drawings, schedules, certificates of compliance, pay requests, change documents, requests for information (and their responses), schedules and as-built documents.

B. Quality Records are a subset of the project records that document or reflect the quality of the products of the Contract. This includes, but is not limited to, inspection reports, test reports, quality audit and surveillance reports, mill test reports, certificates of compliance, personnel qualifications and certifications, non-conformance reports, corrective action reports, failure analysis reports, instrumentation calibration reports, punch lists, and photographs.

C. Maintain and retain all records in accordance with the requirements specified in the related sections.

3.09 AUDITS

A. Schedule, perform, document and submit the results of QA audits, assessments and surveillances along with the root cause and corrective actions for the audit and surveillance findings. Audit each element of the Contractor’s QPP at least once within 180 Days after NTP and at least every 3 months thereafter plus an audit no more than 60 Days before the substantial completion date. Audit each element of each of the subcontractors and design consultants to the Contractor QPP or the Subcontractor’s QPP, approved by the CQM, every 6 months. Contractor QC Manager or Contractor corporate Quality Manager to perform QA audits, and the auditor cannot be subordinate to Contractor’s personnel that directly perform, supervise, or progress the Work, and; cannot be responsible for directly performing, supervising, or progressing the Work or have responsibilities for this Contract. Include the following scope elements in the Quality Assurance Audit Plan (See Exhibit G) and Schedule:

1. Quality Program Plan
2. Subcontractor, Consultant and Supplier Control
3. Identification, Traceability and Receiving, Handling, Storage and Control of Products, Materials, and Equipment
4. Process Control (including CWPs and workmanship)
5. Inspection and Testing
6. Identification, Control and Correction of Non-Conforming Conditions
7. Corrective Actions
8. Quality Records
9. Training

[Use the following paragraph for systems or design/build contracts]
10. Software Development and Testing [applicable only to Systems contracts]
11. Punch Lists (at Substantial Completion)
12. As-Built Documentation
13. Warranties

B. Include an executive summary, scope of the audit, the process used to perform the audit, observations, any findings and conclusion in all Audit Reports (See Exhibit H).

C. Record and maintain all audit results in an Audit Log (see Exhibit F).

D. Sound Transit will periodically audit Contractor’s document control system. Additionally, State of Washington or Federal Agencies may audit Contractor records.

E. Upon request, make available and provide copies of all record documentation to Sound Transit for audits, assessments and surveillances performed by Sound Transit, State of Washington or Federal Agencies upon request.

F. Facilitate audits, assessments, and surveillances performed by Sound Transit, the State of Washington and Federal Agencies by providing access to its facilities, personnel, and records.

G. Respond to audit, assessment, and surveillance report findings with corrective actions that have, and are to be taken, to correct non-conforming conditions and provide preventative actions that have and are to be taken to prevent a recurrence of the non-conforming conditions. Document the root cause of the non-conforming conditions and provide corrective and preventive actions to the Resident Engineer within 10 Days of the issuance date of the audit, assessment or surveillance report. Document the dates of implementation of the corrective and preventive actions in the response. Failure to provide this information within 10 Days will result in a reduction of the amount approved for payment for the affected Work on the next payment. Provide copies to Sound Transit of record documents as requested during audits or surveillances.

3.10 TRAINING

A. Provide training to personnel performing Work activities affecting quality of the processes and the product. Maintain records of the training including attendance sign-in records, curriculum, tests, certifications and training materials as well as qualification and
certification documents of personnel who have received training for special processes from outside training organizations.

3.11 EXHIBITS

A. Inspector’s Daily Report (IDR) Form
B. Nonconformance Report (NCR) Form
C. Nonconformance Report (NCR) Log
D. Corrective Action Request (CAR) Form
E. Corrective Action Request (CAR) Log
F. Audit Log
G. Audit Plan
H. Audit Report
I. Test Matrix Form

END OF SECTION
## Inspector's Daily Report

*Indicates Required Field

<table>
<thead>
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<th>Inspector Initials</th>
<th>Report No:</th>
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| Date: | Contract Information |

<table>
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<tr>
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<th>Day</th>
<th>Swing</th>
<th>Night</th>
<th>Contract Unit Description</th>
</tr>
</thead>
</table>

| □ | □ | □ | Construction Management Company: |

### Contractor Work Performed – Include Scope, Quantity, Location, Drawing #s, Inspections, Tests and Activity ID# (if available)

### Third Party Work Performed / Inspection

### Non-Conforming Work

### Contractor / Subcontractor Manual Craft Person Count

| Contractor / Subcontractor Name | (Category) |

### Total Work Force

### Work Force Notes
### Inspector’s Daily Report

#### List Major Equipment Types

<table>
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<tr>
<th>Contractor / Subcontractor Name(s)</th>
<th>Equipment Type(s)</th>
<th>Working</th>
<th>Idle</th>
<th>Down Time</th>
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</table>

#### Job Site Safety / Accident Occurrence

- 

#### Weather Conditions (Temperature, Precipitation, Sky, Wind Work Impacts)

- 

#### Material Deliveries / Manifests – Basis Code for Acceptance:

<table>
<thead>
<tr>
<th>Material</th>
<th>Basis Code</th>
<th>Buy America (Y/N)</th>
<th>Quantity Received</th>
<th>Remarks</th>
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- Yes
- No

#### Attachments

<table>
<thead>
<tr>
<th>File Attachment</th>
<th>File Attachment</th>
<th>File Attachment</th>
<th>File Attachment</th>
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</table>

#### Signatures

- Inspector Signature: Date
- Quality Manager Signature: Name

- Inspector Name: Quality Manager Name
**QUALITY ASSURANCE**

**NONCONFORMANCE REPORT (NCR)**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>NCR No:</td>
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<td>2.</td>
<td>Date:</td>
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<td>3.</td>
<td>Project Name:</td>
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<td>Contract No:</td>
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<td>5.</td>
<td>Location:</td>
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<tr>
<td>6.</td>
<td>Contractor/Subcontractor Name(s):</td>
</tr>
<tr>
<td>7.</td>
<td>Spec/Drawing No:</td>
</tr>
<tr>
<td>8.</td>
<td>Originator:</td>
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<td></td>
<td>Phone:</td>
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<td>9.</td>
<td>Nonconformance Description:</td>
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<td>10.</td>
<td>Reviewed By:</td>
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<td></td>
<td>Date:</td>
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<td>11.</td>
<td>Reply Request From:</td>
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<td>12.</td>
<td>Reply Due Date:</td>
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<tr>
<td>13.</td>
<td>Root Cause of the Problem:</td>
</tr>
<tr>
<td>14.</td>
<td>Forwarded to RE for Material Review Board (MRB) disposition*:</td>
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<tr>
<td></td>
<td>Date:</td>
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<tr>
<td>15.</td>
<td>* Sound Transit Material Review Report (MRR) No:</td>
</tr>
<tr>
<td>16.</td>
<td>* Date of Sound Transit MRB Disposition:</td>
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<tr>
<td>17.</td>
<td>Disposition (check one)</td>
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<td>Reject [ ]</td>
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<td>Rework [ ]</td>
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<td>Repair [ ]</td>
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<td></td>
<td>Use-As-Is [ ]</td>
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<td>18.</td>
<td>* QA Approval:</td>
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<td>Date:</td>
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<td>19.</td>
<td>* Engineering Approval:</td>
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<td></td>
<td>Date:</td>
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<tr>
<td>20.</td>
<td>Disposition Instructions:</td>
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<tr>
<td>21.</td>
<td>Corrective Action (C/A) and Preventative Actions (P/A) Taken:</td>
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<tr>
<td>22.</td>
<td>C/A and P/A Implemented by:</td>
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<tr>
<td></td>
<td>Date:</td>
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<tr>
<td>23.</td>
<td>Verification of C/A and P/A Satisfactorily Implemented:</td>
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<td></td>
<td>Date:</td>
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</tbody>
</table>
*“Repair” and “Use-As-Is” dispositions only: Number obtained from Sound Transit RE*

<table>
<thead>
<tr>
<th>QUALITY ASSURANCE</th>
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<tbody>
<tr>
<td>1. NCR No:</td>
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<td>2. Date:</td>
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<thead>
<tr>
<th>NONCONFORMANCE REPORT (NCR) CONTINUATION</th>
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<tbody>
<tr>
<td>3. Department:</td>
</tr>
<tr>
<td>4. Contract No:</td>
</tr>
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<td>5. Location</td>
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</table>

9. (continue)
QUALITY ASSURANCE

NONCONFORMANCE REPORT (NCR) INSTRUCTIONS

1. **NCR number** – obtained from the NCR log which consists of the contract number, year and sequence number (e.g. B231-99-01)
2. **Date** – date the NCR is prepared
3. **Project** – (i.e.: North Link)
4. **Contract No.** – Enter Contract Number
5. **Location** – Enter location of incident, material, hardware, etc.
6. **Contractor/Subcontractor** – Enter name(s) of Contractor and Subcontractor (if applicable)
7. **Spec/Drawing** – Enter applicable specification section or drawing number
8. **Origination** – Enter name and phone of NCR originator
9. **Nonconformance Description** – Enter a detailed description of the nonconformance. Note details, including drawing, section, paragraph, etc.
10. **Reviewed By** – Requires a signature and date of Contractor Quality Manager prior to submitting NCR to issuing NCR.
11. **Reply Requested From** - Enter the name and title of person responsible for investigating problem & providing corrective action(s)
12. **Reply Due Date** - Enter the date reply is due back
13. **Root Cause** – Enter the cause of the problem (Contractor to provide supplemental information when necessary).
14. **To RE for distribution to MRB** – Enter date Contractor submitted to Resident Engineer for “Use-As-Is” or “Repair” disposition
15. **MRR Number** - Entered by the Sound Transit MRB Chairperson
16. **Date of MRR Disposition** - Entered by the Sound Transit MRB Chairperson
17. **Disposition** – Check appropriate box. Note: “Rework” or “Reject” does not require MRB approval. “Repair” or “Use-As-Is” will require the Sound Transit MRB review and approval
18. **QA Approval** - Requires a signature and date of the ST Quality Assurance Representative that verified disposition is acceptable (required only for “Repair” or “Use-As-Is” disposition)
19. **Engineering Approval** - Requires a signature and date of Design Engineering A/EOR, or write “see attached” and attach the A/EOR’s signed response correspondence (required only for “Repair” or “Use-As-Is” disposition)
20. **Disposition Instructions** – Enter a description of the disposition instructions actions and responsibilities for correcting the nonconformance and preventing recurrence
21. **Corrective/Preventative Actions Taken By Contractor** - Enter a description of corrective and preventative actions taken, or write “see attached” and attach the signed response correspondence
22. **Corrective/Preventative Actions Implemented By** - Requires a signature of Contractor, and date
23. **Verification Corrective and Preventative Actions Satisfactorily Implemented** - Requires a signature of the Contractor Quality Manager and date

**When the NCR is closed/completed:**
- The original remains in the Quality Records file
- Copies sent to the Sound Transit Resident Engineer
QUALITY ASSURANCE

<table>
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<tr>
<th>NCR No:</th>
<th>Description:</th>
<th>Originator</th>
<th>Resp. Org.</th>
<th>Issue Date</th>
<th>REC Date</th>
<th>Verified by Date</th>
<th>Close Date</th>
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### Corrective Action Request (CAR) Form (3 Pages)

<table>
<thead>
<tr>
<th>3. Department:</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Responsible Individual/Organization:</td>
<td>5. Originator:</td>
</tr>
<tr>
<td>6. Response Due:</td>
<td></td>
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<tr>
<td>7. Reviewed By:</td>
<td></td>
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<tr>
<td>10. Item Location:</td>
<td></td>
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<tr>
<td>11. Requirement Reference and Description of Condition:</td>
<td></td>
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<tr>
<td>12. Problem Cause:</td>
<td></td>
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<tr>
<td>13. Corrective Action Taken to Prevent Recurrence:</td>
<td></td>
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<tr>
<td>14. Response Prepared by:</td>
<td>15. Response Date:</td>
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<tr>
<td>17. QA Disposition Signature:</td>
<td>18. Date:</td>
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<tr>
<td>19. Verification of Corrective Action:</td>
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<tr>
<td>20. Corrective Action Implementation:</td>
<td></td>
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<tr>
<td>☐ Accept</td>
<td>☐ Reject</td>
</tr>
<tr>
<td>21. Reviewed by Quality Manager:</td>
<td>Date:</td>
</tr>
<tr>
<td>1. CAR No:</td>
<td>2. Date:</td>
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</table>

## QUALITY ASSURANCE

### CORRECTIVE ACTION REQUEST (CAR)

**Continuation Sheet**

|----------------|----------------------------------------|----------------|------------------|-----------------|

[insert Contractor name here]
QUALITY ASSURANCE

INSTRUCTIONS FOR CORRECTIVE ACTION REQUEST (CAR)

Blocks 1 through 11 will be completed by the individual issuing the CAR

24. Enter CAR number
25. Enter date CAR was generated
26. Enter Department
27. Enter name (internal/external) or responsible individual/organization
28. Enter name and telephone number of individual issuing Corrective Action Request
29. Enter date the reply is due back to the originator (normally ten(10) Business Days after the date of issue
30. Signature of originator's manager/supervisor and date
31. Enter contract number
32. Enter specification/drawing procedure
33. Location of incident, material, hardware, etc.
34. Reference the requirement and describe the existing condition

Blocks 12 through 18 will be completed by the individual responsible for responding to the CAR

19. Describe the probable cause
20. Describe the corrective action/action to prevent recurrence/action to correct the immediate problem
21. Signature of the individual preparing the response to this CAR
22. Enter date
23. Enter effectivity/implementation date
24. Signature of individual dispositioning the item
25. Date of signature on line #18

Blocks 19 through 21 will be completed by organization issuing the CAR

26. Signature of Quality Representative that verified Corrective Action and date
27. Enter either accept or reject Corrective Action implementation
28. Signature of Quality Manager and date
## QUALITY ASSURANCE

### CORRECTIVE ACTION REPORT (CAR) LOG

<table>
<thead>
<tr>
<th>CAR No:</th>
<th>Description:</th>
<th>Originator</th>
<th>Resp. Org.</th>
<th>Issue Date</th>
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</table>
# Quality Assurance

## Audit Log

<table>
<thead>
<tr>
<th>Department:</th>
<th>Audit No.</th>
<th>Organization or Contract</th>
<th>Audit Scope</th>
<th>Audit Date</th>
<th>Qty of AFR(s)</th>
<th>C/A Due Date</th>
<th>Date C/A Rec’d</th>
<th>Date C/A Verified</th>
<th>Lead Auditor</th>
<th>Audit Status</th>
</tr>
</thead>
</table>

[Insert Contractor Name here]
## Audit Plan

### Quality Assurance

| 1. Audit No: |   |
| 2. Date:    |   |

### Audit Plan

**Department:**

---

**Project:**

---

**Contract:**

---

**Organization/Individual:**

---

**Activities to be Audited:**

---

**Reference Documents:**

---

**Notification:**

(copy attached)

**Audit Schedule:**

- Pre-Audit Conference:

---

**Conduct Audit:**

---

**Post-Audit Entrance Meeting:**

---

**Audit Team:**

---

**Special Concerns:**

---

**Written Checklist Attached:**

Yes  No

---

**Prepared By:**

Lead Auditor  Date

---

**Approved By:**

Division Manager  Date
Quality Assurance

Audit Report (Number)

Project – Contract – Submittal
# Table of Contents

I. executive summary 32  
II. SCOPE 33  
III. AUDIT PROCESS 33  
IV. OBSERVATIONS 33  
V. FINDINGS 33  
VI. contract cost status 33  
VII. contract schedule status 33  
VIII. REQUIREMENTS 34  
IX. CONCLUSIONS 35  
X. AUDIT FINDING REPORTS 36  
XI. DISTRIBUTION 37
I. EXECUTIVE SUMMARY

Here, in one page or less, discuss audit. Summarize purpose, findings, observations, recommendations, outcome (good, bad, etc) and status (Acceptable, Conditionally Acceptable, or Requires Corrective Action).
II. SCOPE
Here discuss the purpose of audit. Reference Program Documents and list items reviewed.

III. AUDIT PROCESS
Here discuss who participated in audit, what was audited, when and where audit took place.

IV. OBSERVATIONS
1.
2.
3.

V. FINDINGS
1.
2.

VI. CONTRACT COST STATUS
Here discuss original contract sum and current sum. Include number work directives and change orders, value of change orders and the percentage of the Contract in the changer order.

VII. CONTRACT SCHEDULE STATUS
Here discuss schedule milestones missed.
VIII. REQUIREMENTS

Here discuss what the Auditee is required to do as a result of this audit.
IX. CONCLUSIONS
X. AUDIT FINDING REPORTS

(insert AFR's here)
XI. DISTRIBUTION

AUDIT NO.: (Audit Number)

AUDIT DATES:

ORGANIZATION (Auditee)

RESPONSIBLE PARTIES: (Auditee)

LEAD AUDITOR:

QA AUDITORS

DISTRIBUTION LIST: Ahmad Fazel Executive Director, DECM
                     Hamid Qaasim, Safety & QA Director
### SECTION 01 45 00.10 - EXHIBIT I

**TEST MATRIX FORM**

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<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Section Article</th>
<th>Test/Inspection Description</th>
<th>Standard Procedure</th>
<th>On/Off Site</th>
<th>Minimum Frequency or Instance</th>
<th>Test/Inspection By</th>
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**END OF EXHIBITS**
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for the System Assurance requirements applicable to the tunnel ventilation equipment and station smoke exhaust equipment. These requirements have been established to provide for the attainment of performance requirements. They are divided into System Safety, Reliability, and Maintainability, as described herein.

B. Related Sections:
   1. Section 23 30 10, Tunnel Ventilation Equipment
   2. Section 26 24 14, Motor Starters

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents

3. Rail Fixed Guideway Systems; State Oversight – Federal Transit Administration, 49 CFR part 459
12. Maintainability Program Requirements (for Systems and Equipment) – MIL-STD-470A
14. Sound Transit Systems Assurance Program Plan
15. Sound Transit System Safety Program Plan

1.03 DEFINITIONS

A. The USDOT, System Safety Glossary dated June 1986, contains terms and definitions that are generally applicable to these Contract Specifications. Terms and definitions are contained within these Contract Specifications. In the event of conflict between definitions contained in the referenced document and those contained herein, the definitions of these Contract Specifications shall govern.

B. Availability (A): The probability that the system is completely operational at any point in time when used under stated conditions, where the time considered is operating time, diagnostic time and active repair time.

C. Independent Failure: A failure that occurs without being caused by the failure of another item.

D. Relevant Failure: A relevant failure of an item is an independent failure that results in a loss of function of that item caused by either of the following:
   1. A fault in the item while operating within its design and environmental specification limits.
   2. Improper operation, maintenance, or testing of the item as a result of Contractor-supplied documentation.

E. Non-relevant Failure: Any failure condition of an item not included in the definition of relevant failure, such as the following:
   1. A failure by human error, except error caused by improper operation, maintenance, or testing of the item as a result of Contractor-supplied documentation.
   2. A failure caused by malfunctions of other equipment.
   3. A failure caused by operating the item outside its design or environmental specification limits.

F. Lowest Line Replaceable Unit (LLRU): The lowest assemblage of components or piece parts to which a malfunction can be isolated and that can be readily replaced in its field application.

G. Mean Time Between Failure (MTBF): The arithmetic average of the times between successive failures of an individual item or each of the members of a population of items expressed as a ratio of the total operating time, t, accumulated by the total population of identical items to the total number of relevant failures, F, occurring within the population of identical items during time, t. MTBF is expressed quantitatively by the following equation

\[ MTBF = \frac{t}{F(t)} \]
H. Corrective Maintenance Time: The corrective maintenance time is the summation of elapsed time intervals actively expended to troubleshoot and fault-isolate a failure, remove and replace/repair faulty items, and perform functional checkouts to verify restoration to operational status.

I. Mean Time To Repair (MTTR): The ratio of the total active corrective maintenance time, tcm, expended during a given time interval, t, by the total population of identical items to the total number of relevant failures, F, which require corrective maintenance and which occur within the population of identical items during time, t. MTTR is expressed quantitatively by the following equation:

$$MTTR = \frac{TCM(T)}{F(N)}$$

J. Maximum mean baseline time to repair (MAXMBTTR): The 90th percentile of the distribution of baseline MTTR, in hours, for major subsystems.

1.04 SYSTEM DESCRIPTION

A. The evaluations required herein shall be provided for the:

1. The Tunnel Emergency Fan System Equipment. The system includes fans, fan dampers and tunnel dampers. Note the control system associated with the Tunnel Emergency Fan System is installed by a follow-on contractor. Evaluations and results must be coordinated with control system designer through Sound Transit.

2. The Station Smoke Control System Equipment. The system includes fans and fan dampers. Note the control system associated with the Tunnel Emergency Fan System is installed by a follow-on contractor. Evaluations and results must be coordinated with control system designer through Sound Transit.

1.05 SUBMITTALS

A. Submit the below documents and revisions thereto including initial, update, interim, and final in accordance with Section 01 33 00, Submittal Procedures.

1. System Assurance Program Plan (SAPP)
2. System Safety Program plan (SSPP)
3. Reliability Program Plan
5. Resume of the Manager of Reliability
7. Reliability Demonstration Plan
8. Reliability Demonstration Test Procedure and Test Forms
9. Reliability Demonstration Test Reports
10. Final Reliability Test Report
11. Initial / Predicted Theoretical Assessment of Functional Availability
12. Final Theoretical Assessment of Functional Availability
13. Existing Data
14. Final Acceptance Audit Results
15. Safety Test and Verification Plan
16. Incident/Failure Reports
17. Preliminary Failure Analysis Reports
18. Failure Analysis Report updates
19. System Safety and Reliability Test Reports

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PREPARATION

A. System Assurance Program Plan – Establish, maintain, and submit to Sound Transit for approval a System Assurance Program Plan (SAPP), and include, individually or collectively, program plans for System Safety, Reliability and Maintainability disciplines. Within 90 Days after Notice to Proceed (NTP) submit preliminary plan. Interim and final plan to be submitted as agreed to by Sound Transit and in accordance with Sound Transit Systems Assurance Program plan referenced in Article 1.02 A.14 herein, include at minimum the following:

1. Systems Assurance Objectives
2. Organization of the Systems Assurance effort, including the authority, duties, qualifications, responsibilities of personnel and means of implementing each of the three disciplines.
3. Interfaces, including the lines of authority and relationships of subcontractors, suppliers, component selection, procurement, manufacture, assembly, installation, testing, logistics planning, and other elements of the organization, in-service support, and warranty-related support
4. Rationale for meeting safety criteria, reliability and maintainability goals and requirements.
5. Systems Assurance Schedule - includes identification of milestones, submittal schedules for analyses, major inspections, tests, and audits.
6. Description of safety and reliability failure data collection system.

B. System Safety Program Plan - Submit the System Safety Program Plan (SSPP), describing how the identification, elimination, and/or control of hazards that could lead to injury or loss of life will be achieved. Include the following in the description, Within 90 days after Notice to Proceed (NTP) submit preliminary plan. Interim and final plan to be submitted as agreed to by Sound Transit and in accordance with Sound Transit System
Safety Program Plan referenced in Article 1.02 A.1, A.2, A.3, A.15 and A.16, include a minimum of the following:

1. System Safety and Reliability Test Schedule and Procedure
2. Specific information on how the attainment of System Safety Requirements is verified during the design, manufacture, test, and installation phases
3. A preliminary list of safety-critical items, functions, circuits, and interfaces
4. The means of assuring that suppliers and sub-suppliers are meeting the System Safety requirements, and how specific information is disseminated to designers as well as to the Contractor's vendors
5. Methodology used to eliminate or control identified hazards.
6. Preliminary Hazard Analysis (PHA)
7. System / Subsystem Hazard Analysis (SHA / SSHA)
8. Interface Hazard Analysis (IHA)
9. Operating & Support Hazard Analysis (O&HA)
10. Failure Mode Effect and Criticality Analysis (FMECA) / Single Point Failure Analysis
11. Fault Tree Analysis
12. Hazard Management
13. Catastrophic / Critical Items List (C/CIL)
14. Software Hazard Analysis / Safety Integrity Level Assessment (SIL) (if applicable)
15. Hazard Analyses - Submit the following analyses, in accordance with the FTA Hazard Analysis Guidelines for Transit Properties and approved System Safety Program Plan.
   a. Hazard Analysis (HA) – includes Preliminary Hazard Analysis, System / Subsystem Hazard Analysis (SHA / SSHA) and Interface Hazard Analysis (IHA). The HA must exhaustively answer the following questions:
      1) What are the effects of all failure modes on the employees and patrons using the transit system?
      2) How is each failure detected by the operator, Link Control Center (LCC) and/or maintenance personnel?
      3) What are the effects of secondary failures?
      4) Should the system be removed from service following the failure? Immediately? At the end of the run? Failure to be repaired at the next maintenance period?
      5) If the failure is not detected, are there special maintenance or operations actions required on a periodic basis to detect the
failure and ensure the exposure to a secondary, hazardous failure is limited?

16. Operating Hazard Analysis (OHA). Identify, classify, and format hazards in accordance with the above FTA Guidelines, and present a means for resolving the identified hazards. Documented verification of past analyses that show compliance with the specified requirements may be submitted for approval to the Sound Transit or its designee. The OHA must thoroughly answer the following questions:

a. What are the effects of personnel not performing the required maintenance and operation actions or of performing the actions incorrectly?

b. Do the maintenance tasks expose personnel to any hazards?

c. What special training is required to perform tasks safely?

C. Reliability Program Plan: Within 120 Days after NTP and in accordance with MIL-STD-785B. The plan shall describe the establishment and maintenance of an approved reliability effort that is planned and developed in support of the specified Reliability requirements. Include the following as a minimum:

1. Reliability objectives

2. The methodology whereby compliance is predicted with the specified requirements

3. The organization and the personnel responsible for managing the reliability effort

4. Controls for subcontractors and vendors, and methods for assuring compliance

5. Reliability Prediction Analysis, including Reliability Block Diagram and Predicted Mean Time Between Failure (PMTBF) of the equipment. The PMTBF shall be in accordance with the Applicable Guidelines and Standard referenced in Article 1.02 A.10 and A. 16 herein. Prepare a reliability prediction analysis and submit to Sound Transit for evaluation and comment. Base the reliability analysis on historical performance of like equipment in an application and environment similar to that of Sound Transit or prior test data from other Transit Agencies. As a minimum, identify the following with the historical performance reliability analysis:

a. Prior application and environment

b. A list of Lowest Line Replaceable Units (LLRU)

c. Equipment identification by LRLU part number

d. Precise design use of LLRU in the Sound Transit System

e. For part numbers, exact description of modifications since accumulation of prior use data

f. Adjustment factors and related rationale used to modify historical data to the Sound Transit equivalent performance. Consider differences in application including level of use and duty cycle, environment, and modification as a minimum for adjustments.
g. User identification by name and geographical location

h. Date of use

i. Number of individual LLRU’s in use

j. Number of hours of use per unit and total

k. Number of independent failures experienced during the operating hours for which the analysis is presented

l. Calculated MTBF

m. Comparison of calculated MTBF with the required MTBF

n. Demonstration testing for verification of compliance with the specified reliability requirements.

6. Reliability Calculations and Substantiating Data - Prior to release of design for manufacturing, obtain Sound Transit’s approval of reliability calculations and allocations. Submit reliability calculations and allocations to substantiate the design of the equipment. Include the following, as a minimum:

a. Subsystem reliability apportionment

b. Statement of characteristics

c. Description of operation

d. Component failure rates (or MTBF) assumed in the calculations and their bases

D. Resume of the Manager of Reliability within 30 Days after NTP. Manager experience: minimum 10 years prior experience implementing MIL-STD-882C, IEC 61508, and other similar programs on rail systems, demonstrated experience implementing such theoretical information into maintenance programs and developing procedures to test for effect.

E. Maintainability Program Plan: With the interim Design submittal and in accordance with MIL-STD-470A. Include description of the methods by which maintainability shall input to design, maintainability prediction and the maintainability concept.

1. Establish, maintain and submit to Sound Transit for approval a Maintenance Program Plan that addresses the following:

2. Optimize considerations of equipment downtime, maintenance costs, technical skills, and spare equipment costs.

3. Maintenance Concept - The maintenance concept employs the maximum use of modular LRU items such that restore to service is accomplished by LRU removal and replacement. Minimize the use of external test equipment by using suitably buffered, built-in annunciation of an LRU fault condition.

a. Preventive maintenance and inspection for equipment using accepted industry standards for equipment of the type specified herein. Determine the requirements for preventive maintenance and inspection, and submit to Sound Transit for review and approval.
b. Maintenance will be performed at three discrete levels: on-line, off-line, and depot, as follows:

1) Level 1 - On-line maintenance is that performed on an in-place and operational equipment element without disrupting service. Facilitate identification of interfaces with other system elements using test points or built-in indicators.

2) Level 2 - Off-line maintenance is that performed on in-place but out-of-service equipment elements. Periodically test equipment that frequently enters and leaves revenue service to verify proper operation. Thoroughly exercise each equipment function with special test equipment. Facilitate fault isolation to the functional module level using the test equipment. Allow maintenance to lowest line level replaceable unit with this equipment and procedures.

3) Level 3 - Depot maintenance is that which is performed on out-of-place and out-of-service equipment elements. Perform this maintenance a shop or depot area where standard test equipment and fixtures are available. Allow maintenance of the lowest line level replaceable unit with this equipment and procedures.

4. Maintenance Analyses
   a. Develop a detailed system/equipment maintenance plan based upon the operational and support concepts and requirements established in this Contract. Develop inputs to the Plan for a detailed Contractor-furnished maintenance concept with inputs to the Plan as the initial step, and evolve the Plan through repetitive maintainability analysis into detailed maintenance.

5. Maintainability Calculations and Substantiating Data
   a. Provide a quantitative allocation of maintainability requirements to significant functional levels of the system, subsystems, and equipment.
   b. Predict the adequacy of the design to meet maintainability quantitative requirements.
   c. Predict design features that will require corrective action during early stages of design and development.
   d. Provide Corrective Maintenance Analysis and Preventive Maintenance Schedules prepared in accordance with ST procedures.

6. Quantitative Requirements – Meet or improve maintainability requirements stated in mean time to repair (MTTR) through design and analysis for equipment. These requirements are the following:
   a. Proposed selection of representative tasks (corrective- and preventative-maintenance tasks) that constitute the maintainability test sample. For purposes of maintainability demonstration, a task is defined as all necessary steps (i.e., troubleshooting, disassembling, removing, replacing, repairing, and verifying) that constitute one sample task.
b. Identification of facility/resources needs, safety procedures to be followed, personnel skill levels and training, support equipment or special tools, spare parts, and the Commission or its designee coordination requirements.

c. The criteria for measuring MTTR values for individual equipment items, subsystems and system under test.

d. Test schedule.

e. Detailed maintainability test procedures, and the maintenance procedures to be followed.

f. Recommended accept/reject decision criteria for the maintainability demonstration test that can be quantitatively measured.

g. Attain Sound Transit’s approval of the Plan prior to the start of maintainability demonstration testing. Base the extent of calculations and data submittals on the complexity and intended use of the products. Existing data and calculations for standard manufactured products may be submitted.

h. Meet MTTR of 4 hours for Emergency Fans and Station Smoke Exhaust Fans.

i. Perform supplemental failure analysis for any unit where the time to repair exceeds 2 times the MTTR.

F. Microprocessor/Processor Software Documentation and its Reliability Analysis Report 120 Days after Notice to Proceed. Identify the hardware required, other software required, execution timing programs, displays, and database in software documents. Annotate all source code in higher level language. Supply top down documentation for all microprocessor/processor software including:

1. top-level flow chart
2. functional descriptions
3. applicable program compilation listings
4. detailed design descriptions of all algorithms
5. program flowcharts
6. program design languages or pseudo code
7. data base descriptions
8. detailed operating instructions
9. program logic and data interface diagrams and descriptions
10. hardware interfaces
11. Fault Tree Analysis

G. Submit a Reliability Demonstration Plan for demonstrating that the reliability of the systems and equipment meeting the goals of the approved Reliability Program Plan at
least 400 days prior to the scheduled Testing and Commissioning Date. (not required if equipment is UL listed)

1. Description of the tests to be performed
2. The success/failure criteria for measuring MTBF values for individual equipment items, subsystems and system under test
3. Test schedule
4. Detailed reliability test procedures
5. Recommended accept/reject decision criteria for the reliability test that can be quantitatively measured

H. Reliability Demonstration Test Procedure and Test Forms 60 Days prior to Reliability Testing (not required if equipment is UL listed).
   1. Prepare a Reliability Demonstration Test Procedure to substantiate the Reliability Calculations and Substantiating Data.

I. Reliability Demonstration Test Reports within three (3) Business Days after completion of test (not required if equipment is UL listed).
   1. Prepare a Reliability Demonstration Test Report to document the test results.
   2. Report all failures and the MTBF for each individual equipment, items, subsystems and system under test.

J. Final Reliability Test Report due 24 months after start of Reliability Demonstration Test.

K. Initial / Predicted Theoretical Assessment of Functional Availability: With the Preliminary Design submittal.

L. Final Theoretical Assessment of Functional Availability: With the Final Design submittal.

M. Existing Data – Subject to Resident Engineer approval, existing analyses and data from other rail transit projects, which are properly documented and verifiable, may be submitted in support of the above submittals; and, for equipment and applications which are identical or manifestly similar to those required under this Contract. Existing analyses needs to be conformed to the format in the Sound Transit Guideline document referenced in Article 1.02 A.16 herein.

N. Final Acceptance Audit Results; Within 30 Days after final acceptance of each stage.

O. Submit a Safety Test and Verification Plan for planning all the safety critical functions are being tested and verified during the Testing and Commissioning at least 400 days prior to the scheduled Testing and Commissioning date.

P. Incident/Failure Reports within 3 Days after Incident or Failure

Q. Preliminary Failure Analysis Reports within 30 Days after Incident or Failure

R. Failure Analysis Report updates every 15 Days after the Preliminary Failure Analysis Report is issued and every 15 Days thereafter until the Final Failure Analysis report is issued.
S. System Safety and Reliability Test Reports including test data and test log summaries. In the event of rejection decision, provide corrective action recommendations. Submit these reports 5 Days prior to the final acceptance audit.

3.02 APPLICATION

A. Reliability Performance Validation Tests - Perform tests on equipment on the Contractor’s premises.

1. Exhibit availability equal to, or greater than, 99.997 percent for the ventilation equipment. Base this system reliability value on the following formula:

\[
Ro = \left( \frac{N_{toa} - N_{tof}}{N_{toa}} \right) \times 100
\]

Where:

- \( Ro \) = Operational Reliability
- \( N_{toa} \) = Number of test operations attempted
- \( N_{tof} \) = Number of test operations failed

2. Perform the minimum number of test operations required to achieve the specified reliability with a 95% confidence level. Record test operation failures in the test data when a detected cessation or error in the specified response of the operation being tested occurs. Record the failure of the system to furnish all correct responses to a test operation.

3. Maintain a failure summary record that contains all the information necessary to calculate the reliability values of the subsystems. Maintain equipment to verify the successful demonstration of the Reliability requirements. Make the failure record available for review by Sound Transit or its designee.

4. Test for validation of sensitivity, adjustment of range, reset, durability and environmental performance. Conduct sufficient testing to adequately demonstrate the confidence levels of performance specified. Develop a comprehensive test plan to demonstrate all of the preceding by a series of tests at facilities approved by Sound Transit or its designee.

B. Reliability Demonstration Test

1. Perform the Reliability Demonstration Test to show compliance with specified Reliability requirements. Commence the test following the conclusion of the System Integration Tests and continue for a period of one year during the pre-revenue and revenue operations periods under full system operations. Sound Transit or its designee operates and maintains the system according to procedures described in approved Contractor documentation.

2. If the system and its subsystems and assemblies do not meet the specified reliability requirements, make the necessary corrections so that the specified reliability requirements are met.

3. Maintain a failure summary record which contains all the information necessary to calculate the reliability values of the system and its subsystems in order to verify the successful demonstration of the reliability requirements. Make failure records available for review by Sound Transit or its designee. Capture maintainability data during this test.
C. Corrective Action for Test Rejection – Perform failure analysis of reported failures in order to identify the cause of the failure and the need for corrective action. Submit a plan for corrective action that includes proposed restart procedures, proposed changes, and appropriate supporting data, and clearly identify a specific method of verifying the effectiveness of the correct actions. Do not discount or change and the specified performance and required characteristics of the equipment to achieve specified reliability requirements.

D. Submit a final report summarizing all aspects of the System Assurance Program Plan. Include analyses, test procedures, actual values, assumptions, descriptions of the program, final audit results, and problems encountered.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for general requirements for Systems Assurance for Reliability, Maintainability, and Availability that is applicable to the Static Uninterruptible Power System (UPS)

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. U.S. Department of Transportation (USDOT)
   a. System Safety Glossary

2. Hazard Analysis Guidelines for Transit Projects
   a. FTA-MA-26-5005-00-01

   a. MIL-STD-882C

4. Underwriters Laboratory (UL)
   a. UL 1778

1.03 DEFINITIONS

A. The USDOT, System Safety Glossary dated June 1986, contains terms and definitions that are generally applicable to these Contract Specifications. Terms and definitions are contained within these Contract Specifications. In the event of conflict between definitions contained in the referenced document and those contained herein, the definitions of these Contract Specifications shall govern.

B. Availability (A): The probability that the system is completely operational at any point in time when used under stated conditions, where the time considered is operating time, diagnostic time and active repair time.

C. Independent Failure: A failure that occurs without being caused by the failure of another item.

D. Relevant Failure: A relevant failure of an item is an independent failure that results in a loss of function of that item caused by either of the following:

   1. A fault in the item while operating within its design and environmental specification limits.

   2. Improper operation, maintenance, or testing of the item as a result of Contractor-supplied documentation.
E. Non-relevant Failure: Any failure condition of an item not included in the definition of relevant failure, such as the following:

1. A failure caused by malfunctions of other equipment.
2. A failure by human error, except error caused by improper operation, maintenance, or testing of the item as a result of Contractor-supplied documentation.
3. A failure caused by operating the item outside its design or environmental specification limits.

F. Lowest Line Replaceable Unit (LLRU): The lowest assemblage of components or piece parts to which a malfunction can be isolated and that can be readily replaced in its field application.

G. Mean Time Between Failure (MTBF): The arithmetic average of the times between successive failures of an individual item or each of the members of a population of items expressed as a ratio of the total operating time, t, accumulated by the total population of identical items to the total number of relevant failures, F, occurring within the population of identical items during time, t. MTBF is expressed quantitatively by the following equation:

\[ MTBF = \frac{t}{F(t)} \]

H. Corrective Maintenance Time: The corrective maintenance time is the summation of elapsed time intervals actively expended to troubleshoot and fault-isolate a failure, remove and replace/repair faulty items, and perform functional checkouts to verify restoration to operational status.

I. Mean Time To Repair (MTTR): The ratio of the total active corrective maintenance time, tcm, expended during a given time interval, t, by the total population of identical items to the total number of relevant failures, F, which require corrective maintenance and which occur within the population of identical items during time, t. MTTR is expressed quantitatively by the following equation:

\[ MTTR = \frac{tcm(t)}{F(n)} \]

J. Maximum mean baseline time to repair (MAXMBTTR): The 90th percentile of the distribution of baseline MTTR, in hours, for major subsystems.

1.04 SYSTEM DESCRIPTION

A. UPS Reliability Requirements

1. A guaranteed minimum MTBF for each UPS assembly is 50,000 hours under indicated environmental conditions. This value includes the contribution of the Static Bypass Switch that applies to the UPS itself, whether the bypass source is available or not.

2. A guaranteed minimum MTTR for each UPS assembly is not to exceed 90 minutes.

3. Demonstrate that each UPS assembly has an Availability (A) of not less than 99.997 percent. This value includes the availability of the utility bypass source.

4. Complies with UL 1778
1.05 SUBMITTALS

A. Reliability Prediction Analysis Report within 120 Days after Notice to Proceed

B. Reliability Demonstration Test Plan within 240 Days after Notice to Proceed (not required if equipment is UL listed)

C. Reliability Demonstration Test Procedure and Test Report Forms 90 Days prior to Reliability Testing

D. Reliability demonstration Test Report(s) within three (3) Business Days after completion of test

E. Fault Isolation and Troubleshooting Plan within 240 Days after Notice to Proceed

F. Incident/Failure Reports within 3 Days after Incident or Failure

G. Preliminary Failure Analysis Reports within 30 Days after Incident or failure

H. Failure Analysis Report updates every 15 Days after the Preliminary Failure Analysis Report is issued and every 15 Days thereafter until the Final Failure Analysis report is issued.

I. Maintenance Program Plan 30 Days prior to Reliability Testing

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PREPARATION

A. Reliability Prediction Analysis – Prepare a Reliability Prediction Analysis Report and submit to Sound Transit for review and approval. Base the reliability analysis on historical performance of like equipment in an application and environment similar to that of prior test data from other rail transit agencies. As a minimum, the historical performance reliability analysis is to identify the following:

1. Equipment identification by LLRU part number.

2. Prior application and environment.

3. Precise design use of LLRU.

4. For part numbers, exact description of modifications since accumulation of prior use data.

5. Adjustment factors and related rationale used to modify historical data to the Sound Transit equivalent performance. Consider differences in application including level of use and duty cycle, environment, and modification as a minimum.

6. User identification by name and geographical location.

7. Date of use.

8. Number of individual LLRUs in use.

9. Number of hours of use per unit and total.
10. Number of independent failures experienced during the operating hours for which
    the analysis is presented.

11. Calculated MTBF.

12. Comparison of calculated MTBF with the required MTBF in a table for each
    LLRU.

13. Estimated infant mortality failure, if any.

14. UL listed identification and comparison of use for any LLRU without a MTBF.

B. Incident/Failure Reporting System - Employ controlled data collection system for
    collecting, analyzing, and recording all functional non-conformances and suspected non-
    conformances that occur during in-plant tests and those that occur at installation or test
    site prior to acceptance. Prepare Failure Analysis Report in accordance with FTA Hazard
    Analysis Guidelines for Transit Projects. Differentiate between failures due to design or
    workmanship and those due to other causes such as error in handling, transporting,
    storing, and operating the equipment in the Incident/Failure Reports and in the Failure
    Analysis Reports. Include provisions to ensure that problems are detected and
    investigated, and that effective corrective actions are taken on a timely basis to reduce or
    prevent repetition of the incidents/failures. Provide copies of Incident/Failure Reports and
    Failure Analysis Reports to Sound Transit.

C. Develop a detailed Maintenance Program Plan for system/equipment maintenance based
    upon the operational and support concepts and requirements established in this Contract.
    The initial step in the development of the inputs to the plan includes development of
    inputs to a detailed Contractor-furnished maintenance concept, which evolves through
    repetitive maintainability analysis into a detailed maintenance plan for supporting the
    timely operation of the system/equipment in the planned operational environment.
    Provide manufacturer’s recommendations for the following:

1. Frequency of maintenance required for each lowest level replaceable unit,
    subassembly and assembly.

2. Facilities required.

3. Support equipment and tools required.

4. Skill level and number of personnel required.

5. Equipment, component, and piece part repair policy.

6. MTTR (repair and replace)

7. MTBF

D. Fault Isolation and Troubleshooting Plan - Prepare and maintain a Fault Isolation and
    Troubleshooting Plan as part of the submittals, and is a working document to ensure that
    fault isolation and troubleshooting features essential to the achievements of specified
    requirements are incorporated in the equipment.

E. Follow the approved Maintenance Plan for the UPS. Follow this plan during the period
    for which the Contractor is responsible for maintenance.

F. Prepare a Reliability Demonstration Test Plan to meet requirements specified herein.
    Include Reliability Demonstration Test Procedures and Test Report Forms.
3.02 APPLICATION

A. Reliability Testing

1. Perform reliability and availability testing in accordance with Contractor developed and Sound Transit approved test procedures.

2. Exhibit availability equal to or greater than, 99.99 for the UPS. Base this system reliability value on the following formula:

\[ R_o = \frac{N_{toa} - N_{tof}}{N_{toa}} \times 100 \]

Where:

- \( R_o \) = Operational Reliability
- \( N_{toa} \) = Number of test operations attempted
- \( N_{tof} \) = Number of test operations failed

3. Require that reliability test be equal to, or greater than, the minimum MTBF specified herein to be acceptable.

4. Demonstrate that availability test requirements are equal to, or greater than, those specified herein.

5. Maintain a failure summary record that contains all the information necessary to calculate the reliability values of the subsystems. Maintain equipment to verify the successful demonstration of the Reliability requirements. Make the failure record available for review by Sound Transit or its designee.

B. Maintainability

1. Optimize considerations of equipment downtime, maintenance costs, technical skills, and spare equipment costs in the Maintenance Program Plan.

2. Maintenance Concept - The maintenance concept employs the maximum use of modular LLRU items such that restoration to service is accomplished by LLRU removal and replacement. Minimize use of external test equipment by the use of suitably buffered, built-in annunciation of an LLRU fault condition.
   a. Utilize accepted industry standards for equipment of the type specified herein for preventive maintenance and inspection for this equipment. Determine the requirements for preventive maintenance and inspection and submit to Sound Transit for review and approval.

   b. Perform maintenance at three discrete levels: on-line, off-line, and depot, as follows:

       1) Level 1 – Perform on-line maintenance on an in-place and operational equipment element. Facilitate identification of interfaces with other system elements using test points or built-in indicators without disrupting service.

       2) Level 2 – Perform off-line maintenance on in-place, but out-of-service equipment elements. Periodically test equipment that frequently enters and leaves revenue service to verify proper operation. Use special test equipment to thoroughly exercise each equipment function. Use test equipment to facilitate fault
isolation to the functional module level. Use equipment and procedures to allow maintenance to the LLRU.

3) Level 3 – Perform depot maintenance on out-of-place and out-of-service equipment elements, in a shop or depot area where standard test equipment and fixtures are available. Utilize equipment and procedures to allow maintenance of the LLRU.

C. Failure Analysis Reports

1. Prepare detailed Failure Analysis Reports on all failures on forms approved by Sound Transit. Replace any unit that can not be repaired in 2 times the MTTR. Redesign to be repairable or to perform without replacement for 1.5 times the original identified MTBF any unit or assembly requiring more than 3 replacements

D. Reliability Demonstration Testing


2. Perform reliability demonstration testing for one year, excluding a period sufficient to rule out burn-in or infant mortality failures.

E. If the equipment is listed U.L. for the intended application, Failure Analysis Reports and Reliability Demonstration Testing may be waived subject to the approval by the Resident Engineer.

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies general requirements for furnishing, installing, operating, and maintaining temporary facilities and controls.

1.02 REFERENCES

A. This Section incorporates by references the latest revisions of the following documents:

   a. ASTM A392 Zinc-Coated Steel Chain-Link Fence Fabric

2. National Fire Protection Association (NFPA):
   a. NFPA 130 Fixed Guideway Transit and Passenger Rail Systems
   b. NFPA 14 Installation of Standpipes and Hose Systems

3. Manufacturers Standardization Society (MSS):
   a. MSS SP 58 Pipe Hangers and Supports – Materials, Design and Manufacture
   b. MSS SP 69 Pipe Hangers and Supports – Selection and Application
   c. MSS SP 89 Pipe Hangers and Supports – Fabrication and Installation Practices

4. City of [Seattle (COS)]:
   b. COS Standard Specifications for Road, Bridge, and Municipal Construction
   c. COS Standard Plans

5. Washington State Department of Transportation (WSDOT):
   a. WSDOT Standard Specifications for Road, Bridge and Municipal Construction, Division 9-28
   b. WSDOT Standard Plans

6. Occupational Safety Health Administration (OSHA):
   a. 29 CFR Underground Construction - 1926.800

7. Washington Industrial Safety and Health Administration (WISHA):
1.03 TEMPORARY BRIDGING, HOISTING AND HANDLING MATERIAL DISTRIBUTION
A. Provide Contractor’s temporary bridging, hoisting and material handling required for the execution of the Work.
B. Provide temporary bridging, hoisting and material handling required in support of the System-wide Contractors’ performance of the work.

1.04 TEMPORARY UTILITIES
A. Determine the need for additional temporary utility service as may be required to prosecute the Work and make arrangements with utility companies for such services. Remove all materials and equipment involved with temporary utility services as part of final cleanup, except as otherwise indicated.
B. Provide and maintain during the course and progress of the Work all electrical power and wiring requirements to facilitate the work of all trades and services associated with the Work. Provide electrical power at own expense. Furnish all temporary wiring, feeders, and connections, as required.
C. Provide utilities and power for Sound Transit Construction Offices, as specified herein.
D. Refer to Section 01 51 15, Temporary Electrical Power, for details of interim feed and permanent site feeder.

1.05 TEMPORARY SANITARY FACILITIES
A. Provide the necessary toilet conveniences and washing facilities, secluded from public observation. Keep facilities in a clean, sanitary condition.
B. The use of sanitary facilities in adjacent commercial buildings, tenant areas, or other private facilities will not be permitted.
C. Service temporary toilet facilities regularly, and secure them to prevent damage by vandals.

1.06 TEMPORARY FIRST AID FACILITIES
A. Furnish, install, maintain, and remove temporary first aid facilities and services at each Site of the Work throughout the construction period.
B. First aid personnel:
   1. Trained in the rendering of first aid.
   2. Possess a valid first aid certificate issued by the American Red Cross.
   3. The number of first aid-trained personnel shall comply with the applicable safety regulations.
   5. First aid personnel training shall conform to the requirements of OSHA and WAC 296-800-150.
C. First aid supplies:
   1. Approved by a physician licensed to practice in the State of Washington.
2. Conform to the requirements of OSHA and WAC 296-800-150.

3. Accessible for immediate use.

D. Furnish at least one 16-unit first aid kit (or equivalent) for every 25 persons, or fraction thereof, present on Site. Store first aid supplies such that they can be moved to the location of an injured or acutely ill worker. Provide stretchers, and maintain, protect, and make stretchers readily accessible at all times.

E. Clearly identify a first aid station as such. Provide an enclosed space protected from the weather, cooled in hot weather, warmed in cold weather, and lighted. Furnish station with facilities to render medical services appropriate to the occupational working conditions and response time of the local emergency medical service. Position station adjacent to either access road or public street.

1.07 TEMPORARY OFFICES FOR SOUND TRANSIT CONSTRUCTION MANAGEMENT

A. Assume operations and maintenance of the temporary office for Sound Transit Construction Management from the Contractor at Substantial Completion of the Contract. Maintain and service as specified herein until the Substantial Completion of the Contract or as otherwise permitted by Sound Transit, whichever occurs sooner.

B. Provide maintenance and service throughout the specified period as follows:

1. Repair and daily cleaning of the field office, parking and access area. Cleaning service shall include providing paper towels and toilet tissue.

2. Furnish all utilities excluding telephone and internet service.

3. Provide security measures and area protection equivalent to that used for the Contractor field office. Minimum security shall include security bars on windows. At least two windows to have bars that are removable during emergencies. All doors shall have additional steel plate security hardware to protect door hardware and jamb.

4. Bottled water and water dispenser with hot and cold water.

C. Field offices and furnishings shall become the property of Sound Transit at the conclusion of the Contract.

D. Additional requirements as indicated on Contract Drawings.

E. Submittals:

1. Procedures: Section 01 33 00, Submittal Procedures.

1.08 PROJECT IDENTIFICATION


1. Design:

a. Construct F.T.A. Project and General Construction Signs from a sheet of plywood 4 feet by 8 feet in size, mounted on two posts set in the ground. See Exhibit A for example images. Digital image graphic files will be provided by Sound Transit.
b. Provide Resident Engineer’s field office signs of similar design, 3 feet by 6 feet in size, for wall or post mounting, as required by Sound Transit.


3. Construction: Set the plywood signs into the frame, and miter and screw the frame corners together. Screw the sign to two, 2-by-6 Douglas-fir cleats that are in turn bolted to the posts with at least two 1/4-inch bolts per post.

4. Installation: Set the sign posts in the ground 3 feet 6 inches, with the top of the sign horizontal and even with the top of the posts, 4 feet 6 inches above the ground.

5. Painting: Apply one coat of primer sealer and two base coats of exterior semi-gloss enamel with the wording dimensions and colors for each sign as shown in Exhibit A.

6. Maintenance: Keep signs clean and in good repair. Upon completion of the work, either leave the signs in place, or remove and dispose of as directed.

7. Other Signs: Additional identical signs desired and paid for by the Contractor may be placed at intermediate points as approved by Sound Transit. Place no other signs on the right-of-way or within the work limit line, unless approved by Sound Transit.

B. Business Access Signs During Construction: Provide 10 signs for directing access to impacted businesses or University of Washington facilities during construction, including directions for parking.

1. Sound Transit will supply layout and design of each sign. Each sign will be 4 feet by 4 feet in size. See Exhibit B for an example.

2. Materials: Engineer-grade reflective sheeting applied to 0.080-inch aluminum sheeting. Mount sign on metal tripod stand as manufactured by AABCO Barricade Co. or approved equal.

3. Construction: In accordance with these Contract Specifications and WSDOT Standard Specifications for Road, Bridge and Municipal Construction, Section 9-28. Secure sign assembly to remain stationary during high winds.

C. Install signs provided by Sound Transit.

D. Maintenance: Repair, clean, or replace signs damaged by vandalism or other causes. Review signs every month and replace if necessary.

1.09 TEMPORARY FENCING

A. Furnish and construct as necessary temporary fencing and maintain, and later remove all temporary fencing around the Site perimeter as indicated.

B. Install Temporary Fencing and Gates a minimum of six (6) feet tall and be able to completely secure the site as shown in the Contract Drawings. Fence shall be Zinc-Coated Chain Link Fence complying with the requirements of ASTM A392.
C. All fencing and wood construction walls shall be painted or be provided with a presentable finish to be approved by the Resident Engineer. Refurbish finish of fences annually or as directed by the Resident Engineer.

D. Used materials may be employed for temporary fencing, provided such used materials are good, sound, and suitable for the purpose intended.

E. Repair or replace temporary fencing that is damaged from any cause during the progress of the Work at no additional cost to Sound Transit.

F. When no longer required for the Work, remove temporary fencing from the jobsite, except as otherwise provided herein. Removed fencing and related materials will remain the property of the Contractor.

G. Provide 2’ x 2’ viewing windows at the locations indicated in the Contract Drawings. Cover opening in plywood with ¼” clear transparent polycarbonate and secure in a manner to prevent unauthorized removal. At the direction of the Resident Engineer repair or replace damaged polycarbonate to maintain functionality of the viewing window. Submit plans for viewing windows to the Resident Engineer prior to construction of the windows.

1.10 SITE LIGHTING

A. Provide lighting of sites as required to complete the work.

B. Keep lighting as low as possible (in both height and foot-candles) while providing safe working conditions.

C. Provide additional perimeter lighting as necessary adequate for the safety and way finding of pedestrians.

D. Provide cut-off luminaires to direct the light onto the construction site and eliminate glare skyward or onto surrounding properties.

1.11 STAGING AND STORAGE AREAS

A. [The work areas available for staging and storage are shown on the Contract Drawings.]

1.12 ENCLOSED STORAGE AND SHOPS

A. Provide all temporary storage and shop rooms that may be required at the Site for safe and proper storage of tools, materials, and equipment.

B. Remove such facilities within three Days of receipt of notices from the Resident Engineer that removal is necessary, and incur all expenses for such removal.

C. Storage of gasoline or similar fuels shall conform to NFPA regulations and local fire department regulations.

1.13 UTILITY MAINTENANCE

A. Support and protect all utilities indicated to remain in place as required by the utility owner. Avoid service disruptions and maintain access to all utilities during construction.

B. [Conform to requirements of Section 33 01 00, Operation and Maintenance of Utilities.]

1.14 TEMPORARY WATER SERVICE

A. [Seattle Public Utilities] will only allow one domestic meter and one fire service connection to serve the Sound Transit project site. The [_____] contractor will obtain
temporary service connections from [SPU] for their work. For the duration that the [_____] contractor and [_____] Contractor both occupy the site, the [_____] Contractor may purchase water from and connect to the [_____] contractor’s construction water system. The [_____] contractor will provide sub-meters for the [_____] Contractor’s connections and bill the [_____] Contractor for water used in accordance with the [City of Seattle SPU’s] current water use billing rates.

B. Once the [_____] contractor completes construction they will retire their service meters with [SPU] and then the [_____] Contractor will then need to coordinate directly with [SPU] to obtain service from the existing meters.

1.15 TEMPORARY SEWER CONNECTIONS

A. Maintain side sewer piping as necessary for the Sound Transit Construction Offices and contractor’s convenience on the University of Washington property. Discharge to existing sewer manholes within the construction site. Additional temporary sewer connections to MH-1 are not acceptable.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXHIBITS

A. [TITLE]

B. [TITLE]

END OF SECTION
SeaTac/Airport Station

Construction Hotline 1-888-298-2395, TTY relay 1-800-833-6388 or 711

END OF EXHIBIT
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for site access, haul routes, and parking for the construction sites.

1.02 SUBMITTALS

A. Access and Haul Plans, Locations, and Certifications
   1. Initial plan.
   2. Updates to reflect modifications and/or alternative plans.

B. Haul Summary Reports.
   1. Weekly Reports, or as directed by the Resident Engineer.

C. Parking and Staging Area Plan.

1.03 ACCESS AND HAUL PLANS

A. Written plan with drawings which includes the following:
   1. Detailed Access and Haul Plan for the Work, including:
      a. Truck routes and access information.
      b. Access into and out of the construction staging areas.
      c. An alternate location as necessary to stow trucks during times of site congestion.
   2. A copy of all necessary street use permits in connection with Contractor's operations and activities.
   3. Locations where on-street parking should be removed, times and durations of parking removal to provide safe construction activities, and allow adequate truck access and turning movements. Obtain permits from the local authority having jurisdiction.
   4. On-site roads required to transport materials.
   5. Survey and document pre-existing roadway conditions along proposed haul routes.
   6. Copies of truck drivers driver licenses and certifications kept on record or file and made available upon request.

B. Truck Haul Route Plan will be based on the Contract Documents and this Section.

C. Haul locations:
1. List all haul locations for all types and classification of material to be removed from the Site.
   a. If haul locations are to be added or location of material haul is changed, submit new haul location and types and classification of material.

2. Certifications that all haul locations are legally permitted for the type and content of the material to be disposed.
   a. Submit new certifications if the haul location is changed or if the type or content of the materials being disposed varies from that previously approved.

D. Truck Site access hours:

1. Hours of Work and trucking hours have been established for material haulage and deliveries (non-spoils removal) to and from the sites. [Conform to hours and requirements established in Section 01 12 16, Work Sequence]. Obtain all necessary permits and approvals to work beyond these hours.

2. [For tunnel excavation removal of spoils from the Site, hours of work will occur Monday through Saturday, 24 hours per day.]

3. For activities that require continuous work and hauling for which halting of truck traffic would compromise the quality of the finished work, such as continuous concrete pours, obtain the written approval of the Resident Engineer for hauling outside the hours specified herein a minimum of 24 hours prior to the start of the activity.

E. Truck Hauling Restrictions:

1. 

1.04 HAUL SUMMARY REPORTS

A. Include the following daily information for each Site:

1. Material type.
2. Material weight.
3. Identity of each truck.
4. Total number of trucks per day entering the Site.
5. Origin of material for material brought on Site.
6. Location of material disposal removed from the Site.

B. Format as approved by the Resident Engineer.

1.05 PARKING AND STAGING AREA PLAN

A. Written plans with drawings and narrative describing parking and staging areas. Include the following details:

1. Location, size (number of stalls), and access requirements, if any, for Contractor’s off-site parking and staging areas.
2. Sign locations and text to be posted at each work site and at the Site access locations so employees are knowledgeable where parking is allowed and prohibited.

3. When parking or staging is provided on private property, include copy of lease, easements, or other agreements from the property owner prior to accessing the property.

4. Do not use parking lanes/spaces [along locations in Exhibit _____] for loading or unloading of materials. All loading and unloading shall occur within the Site.

5. Prohibit trucks from staging on city streets adjacent to the Site.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 RESPONSIBILITIES

A. Employee, Subcontractor and Vendor parking:
   1. Prohibited on city streets.
   2. Provide parking in accordance with the ordinances and regulations of the [local authority having jurisdiction].
   3. Unless otherwise indicated, be responsible for obtaining and maintaining parking and staging areas.
   4. All Subcontractors, Suppliers, and individuals associated with Contract activities must use approved routes and parking.
   5. Failure by any employee on this Contract to observe these rules may be grounds for discipline, including discharge of the employee in violation.

B. When hauling is done over highways or city streets trim and cover loads. Clean vehicle shelf areas after each loading.

C. Perform work with extreme caution around all motorized vehicles, bicycles, and pedestrians in the area of heavy traffic operations. [See Section 01 55 26, Traffic Control for additional requirements.]

3.02 MAINTAINANCE/REPAIR/RESTORATION

A. During the Work, maintain and repair as necessary or as directed by the Resident Engineer, haul routes roadways as related to construction activities, at no additional cost to Sound Transit. Share haul routes with businesses, residential, pedestrian, and bicycle traffic and maintain in good condition.

B. Provide required Contractor oversight for approved truck route requirements to ensure compliance with traffic routing requirements. Trucks are prohibited on local/neighborhood streets and must avoid all cut-through routes. If Contractor fails to abide to the approved haul routes, Resident Engineer, if deemed to be in the public's interest, will direct the Contractor to assign [City of _____] off-duty police officers for enforcement of haul route restrictions at the expense of the Contractor, at no additional cost to Sound Transit.
C. Maintain haul routes smooth, level, clean and free of debris, and suitable for the public to drive passenger cars on without damage to vehicles and pedestrians and cyclists to travel safely at all haul route crossings. Maintain crosswalks and sidewalks for pedestrians to cross safely. [Inspect and clean haul routes daily.] [Inspect haul routes daily to ensure compliance with Section 01 57 19, Temporary Environmental Controls.] Maintain signs, lights and pavement markings along haul routes.

D. Maintain access to alley ways, driveways and delivery/loading zones. If access agreement must be modified, provide access agreement signed by property owner(s) or tenant(s).

E. If pavement, curb and sidewalk damage results, including potholes or loose chunks of pavement due to Contractor’s work, be responsible to promptly, within 48 hours, remove damaged asphalt/concrete/curb/sidewalk and replace with a minimum of four (4) inches of asphalt concrete [in accordance with Section 32 12 16, Asphalt Paving]. [Replace concrete in accordance with Section 32 13 13, Concrete Paving.] Perform these and any other needed repair work in accordance with [City of Seattle Standards and Specifications. See Article 1.03.A.5 for preconstruction survey to be performed] [the local authority having jurisdiction].

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies temporary traffic control.

B. This Section incorporates by reference the latest revisions of the following documents:

1. [Local Authority Having Jurisdiction]

   a. [City of Seattle Department of Transportation, (SDOT) Traffic Control Manual for In-Street Work]

   b. [City of Seattle, (COS), Standard Specifications for Road, Bridge and Municipal Construction.]

2. Washington State Department of Transportation (WSDOT) and other jurisdictions

   a. WSDOT Standard Specifications for Road, Bridge and Municipal Construction current edition

   b. Work Zone Traffic Control Guidelines, M55-44

3. U. S. Department of Transportation, Federal Highway Administration (FHWA)

   a. Manual on Uniform Traffic Control Devices (MUTCD)

1.02 SUBMITTALS

A. Traffic Control Plan: In accordance with these documents, WSDOT Standard Specifications or COS Standard Specifications

   1. The Traffic Control Plan shall provide description of all devices and management to be used during working and non-working periods of time and submitted for approval to the Resident Engineer a minimum of [30] Days prior to the implementation of the plan to allow time for review and approval

B. Qualifications for Traffic Control Manager (TCM) and Traffic Control Supervisor (TCS).

1.03 QUALITY ASSURANCE

A. Qualifications for the Traffic Control Manager: As specified in WSDOT Standard Specification 1-10.2(1)A.

B. Qualifications for the Traffic Control Supervisor: As specified in WSDOT Standard Specification 1-10.2(1)B.

C. The TCS and the TCM shall have a valid certificate as a “Traffic Control Supervisor” as issued by the Evergreen Safety Council or approved equal.
PART 2 - PRODUCTS

2.01 TRAFFIC CONTROL DEVICES

A. Provide or construct all traffic control devices, including temporary concrete barriers and temporary construction fencing, in conformance with applicable [COS], WSDOT or other jurisdiction specifications and requirements. Include descriptions of traffic control devices in the Traffic Control Plan.

PART 3 - EXECUTION

3.01 GENERAL CONSTRUCTION

A. For temporary traffic control on streets, roadways and pedestrian facilities that are to be owned or maintained by [the City of Seattle], WSDOT or another jurisdiction, perform work described in this Section in conformance with the applicable requirements of that jurisdiction.

B. Work with the Resident Engineer and the responsible jurisdiction to coordinate any necessary signal changes if required by the traffic control plan. Traffic signals shall only be countermanded by a uniformed police officer.

C. Identify the use of flaggers and/or Police staff for traffic control in the Traffic Control Plan and obtain prior approval from the Resident Engineer. Minimize roadway lane and sidewalk closures. Limit lane and roadway closures to non-peak traffic flow hours or other hours as determined by the responsible jurisdiction. Typical peak hours are from [7 to 9AM and 4 to 6PM].

D. When sidewalks or bike paths are closed temporarily, provide alternate detour paths complying with ADA accessibility. Parking lanes may be used for this purpose if a transition between the existing top of curb and the roadway is accessible. Include proposed design, including pedestrian detour and wayfinding signage, business access and devices with the Traffic Control Plan. If the temporary walkway is to remain in place during non-working hours, clearly describe, in a separate section/chapter of the Traffic Control Plan, the traffic control devices to be in place during this period. Obtain all applicable permits for parking lane use and sidewalk closures.

E. Do not close sidewalks on opposite sides of the roadway at the same time.

F. Coordinate work activities with affected transit agencies, including temporary relocation of bus stops and posting of informative signs (by others). See Section 01 31 14, Coordination with Others, and other Contract Documents.

G. Coordinate street closures, lane closures and other in-street work activities including haul routes with Fire Departments, other emergency responders. [For long-term street closures, notify post offices, major private delivery services, school districts, and solid waste collection operators].

H. Obtain prior approval from [the City of Seattle], other local jurisdictions, or WSDOT, and transit agencies for closing or partial closing of all streets, sidewalks, or bike routes, as applicable. Give at least [30] Business Days advance notice of all full street closures after approval of the traffic control plan, to all agencies providing emergency services, including without limitation, police, fire, and ambulance services, and at least [30] Business Days advance notice of any partial closure to the same agencies. Include, at the least, the dates and times of commencement and completion of work, names of streets or location of sidewalks and alleys to be closed or partially closed, and schedule of operations and routes of detours where applicable.
I. Ensure that reliable emergency access is maintained to avoid delays in response time.

J. When the work involves use of public ways, follow standard construction safety measures, which include but are not limited to, installing advance warning signs and high visibility construction barriers, providing necessary flaggers as required by the local authorities, and installing and maintaining means of reasonable access to all fire hydrants, parking garages, and other property.

K. During nighttime work hours, use lighted or reflective signage to direct drivers, pedestrians and bicyclists through work zones, and direct truck drivers to truck haul routes. Cover all conflicting signage.

L. Obtain approvals from all jurisdictions if detours pass through multiple jurisdictions.

M. Obtain all permits required for short term and long term on-street parking displacements.

3.02 TRAFFIC CONTROL MANAGEMENT

A. Before beginning work on the project, designate individual(s) to perform the duties of Traffic Control Manager (TCM) and Traffic Control Supervisor (TCS), as described in Article 1.04.

B. Identify an alternate TCM and TCS that can assume the duties of the assigned or primary TCM and TCS in case of that person’s inability to perform. Alternates will be adequately trained and certified to the same degree as the primary TCM and TCS.

C. Maintain 24-hour telephone numbers at which the TCM and TCS can be contacted and be available at the Resident Engineer's request at other than normal working hours. Supply the TCM and TCS with appropriate personnel, equipment and materials to correct any deficiency in the traffic control system at any time.

D. Patrol the traffic control area daily and reset all disturbed signs and traffic control devices.

E. Remove or cover signs and other traffic control devices during periods when they are not necessary.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:

1. Development of a Landscape Protection Plan approved by the Resident Engineer for all landscape requiring protection, and all associated tree protection elements that are in place at the beginning of the Contract prior to commencement of construction activity.

2. Furnish all labor, materials, equipment, supplies, and operations as required to install and maintain tree and plant protection as indicated and as required by the approved Landscape Protection Plan.

3. Maintenance of existing (installed under previous Contract), as well as newly installed tree protection elements, including, but not limited to, fencing, woodchip mulch, landscape fabric, cabling, and signs.

1.02 REFERENCES

A. This Section incorporates by reference the following documents:

1. [City of Seattle (COS)]:
   a. [Standard Plans for Road, Bridge and Municipal Construction.]

2. Council of Tree and Landscape Appraisers:
   a. Guide for Establishing Values of Trees and Other Plants, issued by the Council of Tree and Landscape Appraisers.

1.03 DEFINITIONS

A. Landscape requiring protection and trees requiring protection:

1. All existing trees, plants, and lawn identified to remain in the Contract Documents including areas of tree critical root zones within the vicinity of the Project Site, which may be affected by construction.

B. DBH: Diameter of a tree at breast height, as measured 4-1/2 feet above root crown.

C. CRZ: The critical root zone of a tree is described as an area equal to 1 foot radius for every 1 inch diameter of DBH.

D. Project Arborist: International Society of Arborists (ISA) certified arborist as approved by Sound Transit.

E. Most current Guide for Establishing Value of Trees and Other Plants, issued by the Council of Tree and Landscape Appraisers.

F. ISA: International Society of Arborists.
G. Dripline: The dripline of a tree is described as the area on the ground beneath the tree’s canopy.

1.04 SUBMITTALS

A. A Landscape Protection Plan accepted by the Resident Engineer. Include in the Landscape Protection Plan:
   1. Final landscape protection fence locations and phasing plan.
   2. List of all intended landscape maintenance practices to be provided, with a schedule.
   3. Tree labels.
   4. The watering schedule for temporary watering of landscape requiring protection.
   5. All work activities within 50 feet of landscape requiring protection.
   6. Proposed tree and root avoidance techniques and anticipated work methods within CRZs.
   7. Documentation of Project Arborist’s on-site confirmation or re-designation of the CRZ for each tree.

B. Photo Documentation, Tagging, and Inventory reports to be performed by Project Arborist prior to any construction activities:
   1. Photo Document all landscape requiring protection: Photograph trees from the cardinal directions (north, south, east, west). Label all photographs with:
      a. Tree tag number, unique for each tree.
      b. Direction and description that the photograph was taken.
      c. Date photograph was taken.
   2. Written inventory of trees requiring protection confirming location, type, and size of all trees requiring protection.
   3. Provide 2 hard copies of photographic documentation and inventory and 2 electronic copies to the Resident Engineer 30 Days prior to work commencing on Site.

C. Submit in addition to Photo Documentation, Tagging, and Inventory reports an appraisal provided by the Project Arborist for all trees requiring protection identified by the Contract Documents and listed herein as not appraised. Base appraisal upon the current Guide for Establishing Value of Trees and Other Plants.

D. Qualifications of Project Arborist.

E. Product Data for:
   1. Mycorrhizae fungal inoculant.
   2. Slow release fertilizer.
   3. Landscape protection fencing.

F. Samples:
1. Landscape protection signage.
2. Tree appraisal value signage.
3. Cabling material.
4. Chain link mesh.
5. Wood chips.

G. Laboratory Test Reports:
1. Employ an accepted agricultural testing laboratory to perform wood chip testing. The testing laboratory must be accepted by the Resident Engineer in advance.
2. Submittal for wood chips:
   a. Test sample of wood chips for protection areas. Follow testing laboratory instructions for wood chip sample collection.
   b. The test shall measure and confirm pathogen levels for the following: Phytophthora (1 ppg maximum), Pythium (450 ppg maximum), Fusarium (1800 maximum), and Rhizoctonia (10 ppg).
   c. The test shall identify and measure heavy metals and other chemicals including: lead, cadmium, arsenic, and potassium.
   d. Wood chips with laboratory test results confirming pathogens at higher than the maximums levels indicated, unacceptable levels of heavy metals, or other chemicals will be rejected.

H. Watering Schedule and Plan.

1.05 PROJECT CONDITIONS
A. The Resident Engineer may order the Work stopped if landscape protection is not complete prior to site work, if unauthorized use of protected area is occurring, or if tree protection fencing is not restored within 24 hours of notice to do so.
B. Tree Identification: In all correspondence regarding trees requiring protection and tree protection systems, refer to the specific tree number on the Contract Documents or as listed herein.
C. Area requiring special attention: Refer to tree and plant protection Contract Documents. Refer to Contract Documents for complete list of trees requiring protection and their values to date.

PART 2 - PRODUCTS

2.01 MATERIALS
A. Landscape Protection Fencing Type 1 and Type 2:
   1. Chain link fence materials including footings, posts, braces, and mesh to be used to form a 6 foot high enclosure.
   2. Footings:
      a. Type 1: no footings required.
b. Type 2: above ground precast concrete block type footings, 100 pounds minimum.

3. Posts: 1-1/2 inch steel pipe, minimum. Use with approval by Resident Engineer in areas where fence must cross existing paved surfaces or where indicated by Contract Drawings or accepted Landscape Protection Plan.


B. Landscape Protection Signage:

1. Provide weather resistant, fluorescent green or yellow signs 48 inch by 48 inch with minimum of 3 inch high letters indicating the following:

a. Tree Protection Warning: No Trespassing on the critical root zone of this/these tree/trees without direct approval of Resident Engineer. Unauthorized activities or work within the critical root zone will result in a fine of $1,500, or the appraised landscape value, whichever is greater.

b. Botanical/common names.

c. Appraised value of tree.

C. Cabling: Meet landscape industry standards for permanent cabling of trees.

D. Water: Potable water supplied by the Contractor.

E. Mycorrhizae Fungal Inoculant: Mycogrow Gel, manufactured by Fungi Perfecti, Olympia, WA, (800) 780-9162, or Mycorrhizal Landscape Inoculant as manufactured by BioOrganics, Santa Monica, CA, (888) 332-7676, or accepted equal.

F. Slow Release Fertilizer: Osmocote 14-14-14 slow release pellets, Osmocote Controlled Release Fertilizer 13-13-13, Sierra Controlled Release Fertilizer Plus Minors 17-6-12, or accepted equal.

G. Wood Chips: Chipped wood mulch or hog fuel, which has composted for a minimum of 1 year.

PART 3 - EXECUTION

3.01 PREPARATION

A. Ensure that the Project Arborist will:

1. Prior to any construction activities:

a. Verify adequacy of the extent of area defined in the Contract Documents as landscape requiring protection. Review Contract Documents and periphery of site for any additional landscape which may be affected and therefore needing to be protected. Review periphery of site to identify any additional trees whose critical root zones may be affected and therefore needing to be protected. Report any deficiencies or concerns to Resident Engineer immediately. Implement adjustments to Landscape Protection Plan as directed by the Resident Engineer as needed.

b. Photograph, inventory, and determine the CRZ of all trees requiring protection as defined herein, as a condition of approval for the
Landscape Protection Plan and acceptance of photo documentation and inventory prior to any site work.

1) Photograph tree requiring protection immediately following Notice to Proceed and again after trees produce a full canopy of leaves if initial photographs are taken when trees are bare of leaves.

c. Prepare appraisal for all trees requiring protection identified on the Contract Drawings which are not already valued herein. Base appraisal upon the most current Guide for Establishing Value of Trees and Other Plants.

d. Prepare appraisal for any trees requiring protection identified in the field by Project Arborist, which are in addition to those listed in the Contract Drawings or herein. Base appraisal upon the most current Guide for Establishing Value of Trees and Other Plants.

e. Review all trees requiring protection

f. Use an air-spade to locate and protect roots within the CRZ. Supervise any root pruning required for trees 3 months prior to the commencement of construction activity.

2. At commence ment of construction activities:

a. Monitor maintenance of all landscape requiring protection to ensure landscape is in a healthy condition. Report deficiencies or concerns to the Resident Engineer immediately. Implement adjustments to Landscape Protection Plan as directed by the Resident Engineer as needed during the course of the Work. Provide maintenance site visits and field reports to review and respond to site conditions and health status of all landscape requiring protection including:

1) Construction activities affecting protected areas.

2) status of protection elements.

3) maintenance and watering conditions.

3. Perform on-site reviews as needed during construction activities that are adjacent to or affecting all landscape requiring protection.

4. Monitor clearing and grubbing in areas requiring special attention as identified on tree and plant protection Contract Documents and as specified in Section 31 11 00, Clearing and Grubbing, in order to preserve roots.

5. Monitor any work within CRZ of all trees requiring protection including all excavation, demolition, and resurfacing. See Section 31 11 00, Clearing and Grubbing, for excavation requirements for select trees.

B. Signage:

1. As a condition of approval for the Landscape Protection Plan, post tree preservation area/restrictions signage and appraised value signage on all trees requiring protection as specified herein.

C. Protection:

1. Before any construction activities begin:
a. Protect trees in accordance with approved Landscape Protection Plan.

b. Coordinate with Project Arborist regarding areas requiring special attention as identified on tree and plant protection Contract Documents and as specified in the Contract Documents.

c. Locate tree protection in accordance with the Contract Documents and approved Landscape Protection Plan unless otherwise directed by Project Arborist.

d. Protect soil and roots within the CRZ of all trees requiring protection with a layer of 4 inches of wood chips. Provide a 12 inch radius zone clear of mulch at the base of each tree.

e. In areas requiring attention for measures of special protection:
   1) Protect soil and roots within the CRZ of all trees with a 12 inch layer of wood chips.
   2) Provide a 24 inch radius zone clear of mulch at the base of each tree.

f. In areas of landscape requiring protection with understory landscape (such as lawn or shrubs) as indicated by Contract Documents, provide wood chips when directed to do so by the Resident Engineer as needed to protect soils and roots from any work taking place within the fencing.

2. Protect against cutting, breaking or skinning of roots, skinning or bruising of bark, compaction of root zones, and breaking of branches.

3. Root protection: Under direction of Project Arborist, hand dig trenches within CRZs, landscape requiring protection, and in areas with extensive roots. Leave intact and undamaged roots larger than 2 inches in diameter. Place utility conduit either under roots by tunneling or over roots using adequate sand bedding. The Project Arborist will determine adequacy of bedding. Do not tear or pull roots. Cut off roots cleanly as directed by Project Arborist when roots are exposed due to work activities. Eliminate all tears and breaks in root surfaces. During the time of exposure, keep roots moist with wet soil, mulch, burlap, or equivalent. During work within CRZ, and landscape requiring protection, maintain all elements of tree and landscape protection as specified herein including woodchip layer and watering.

4. Carefully plan and execute operations to avoid damaging all landscape requiring protection.

5. Use of heavy equipment: Under direction of Project Arborist, place heavy equipment outside of CRZ or on hard surface adequate to support equipment and prevent soil and root compaction. Perform work from outside the CRZ. Work at angles and directions that minimize compaction to roots of Trees and landscape requiring protection. Under the supervision of the Project Arborist, tie back all flexible limbs and overhead branches which may, in the opinion of the Project Arborist, be damaged by the passage or activity of equipment. No tree limbs may be removed without the written approval of the Resident Engineer.

6. Removal of existing pavements: Carefully remove existing pavement within CRZs to avoid root damage and only under direction of Project Arborist. Use heavy equipment with limitations as specified herein. As landscape is removed, the Project Arborist will identify existing subgrade and assist in establishing final grade or new pavement subgrade by providing direction for root protection.
Where new pavement is planned, Project Arborist will direct the cutting of roots 6 inches clear of planned paving edge.

D. Tree and landscape maintenance:
1. Provide maintenance as specified herein throughout the duration of the Contract to promote the health and vigor of all landscape requiring protection as defined by the Contract Documents and the accepted Landscape Protection Plan.
2. Perform all pruning, thinning and other maintenance under the direction of the Project Arborist.
3. Prune as necessary for safety, to promote the health of the tree, and to allow clearance for construction activities within the dripline or CRZ (whichever is greater) of all trees requiring protection. Do not move tree protection fence prior to consultation with the Project Arborist and approval by the Resident Engineer.
4. Fertilize all trees requiring protection, throughout the duration of the Contract. Under direction of Project Arborist, aerate and inject mycorrhizae and slow release fertilizer into the root zone surrounding all trees requiring protection. Perform injection with a soil injection needle attached to a spray gun approved by Project Arborist.
5. Water landscape requiring protection up to three times per week according to Project Arborist direction. Ensure continuous uninterrupted water supply to each area of landscape requiring protection throughout the duration of the Contract. Do not allow water to run off or cause erosion at any time during watering. As specified herein, develop and submit a Watering Schedule and Plan, which includes proposed source of water and application method, to be approved by the Resident Engineer prior to start of construction activities.
6. Maintain the woodchips at the specified depth. Should the depth of wood chips measure less than the specified depth at anytime, replenish the wood chips to bring to the specified depth. Do not allow the depth of wood chips in the CRZ to measure less than the specified depth for more than 48 hours.
7. Notify Resident Engineer 48 hours prior to all work to be performed within 20 feet of CRZs of trees requiring protection.
8. Remove weeds in planting areas throughout the duration of the Contract.

3.02 INSTALLATION

A. Landscape Protection Fencing and Signage:
1. Type 1 Fencing: Drive posts a minimum of 2 feet below existing grade and deep enough to remain rigid during subsequent excavating and grading.
2. Type 2 Fencing: Install fence on above ground precast concrete block type footings in locations as indicated by Contract Documents.
3. Take care not to compact soil or damage roots inside the fence line during placement of posts. Do not use heavy equipment for this operation.
4. Provide diagonal bracing to vertical posts at corners of enclosures and wherever needed to ensure rigidity of the fencing.
5. Install chain link fabric tight to grade at the bottom edge, and stretched uniformly between posts. Install top of fabric 6 feet above grade, minimum.
6. Install fabric to form continuous fencing as indicated on Contract Documents. Attach fabric to posts 12 inches on center with 11 gage wire ties securely fastened, or with bolted ring clips, and to top rail not over 3 feet on center.

7. Attach orange flag strips 12 inches long at 3 feet on center along the fence, 5 feet above grade.

8. Place landscape protection signs at every 30 lineal feet of protection fencing.

9. Place two tree value signs on each Tree Requiring Protection. Attach to trees with Project Arborist approved method.

10. Provide 1 locked gate at each fenced area.

B. Fence Maintenance:

1. Maintain fence in good condition at the specified location until Final Acceptance of site operations, except where directed otherwise in writing by the Resident Engineer. Immediately repair fencing when damaged, regardless of cause of damage.

2. Protection fencing may be removed temporarily for specific construction operations only under discretion of Project Arborist or Resident Engineer.

C. Use of area within protection fences and within 20 feet of all landscape requiring protection:

1. Do not use area within protection fence for any activity.

2. Notify the Resident Engineer 24 hours in advance of the need to move a tree protection fence.

3. Upon relocation of fence, continue all other protection efforts and maintenance of landscape requiring protection in accordance with approved Landscape Protection Plan and watering plan.

4. Alter no grades within the protection fence.

5. Control soil moisture within the protected area to prevent flooding of the soil and roots.

6. Prevent contamination of protected areas from leachate, cement, oil, fuel and lubricating oil, and all contaminants.

7. Do not store materials potentially harmful to roots within 20 feet of outside limit of protected areas. Potentially harmful materials include, but are not limited to: petroleum products, cement and concrete materials, cement additives, lime, paint coatings, waterproofing agents, form coatings, detergents, acids, and cleaning agents.

D. Repair and restore and landscape damage inflicted by construction outside the construction areas and designated access routes, which include damaged landscape removal, complete soil preparation, approved planting, and adequate irrigation to establish the replaced landscape.

3.03 REPAIR/RESTORATION OF DAMAGED TREES

A. Damages for loss or injury to trees requiring protection including loss or injury as a result of vandalism:
1. In the event of damage or loss to any tree due to Contractor's failure to protect and maintain said tree, Contractor shall pay to Sound Transit as liquidated damages a sum equal to:

   a. The value of each lost tree, as determined by the Project Arborist appraisal using the most current Guide for Establishing Values of Trees and Other Plants, issued by the Council of Tree and Landscape Appraisers,

   b. The cost to remove and dispose of the said tree, and

   c. $1,500 per tree in compensation for the efforts of Sound Transit in administering and overseeing the replacement.

2. In the event of injuries to the crown, trunk, branches, or root system of any tree that are the result of the Contract's failure to protect and maintain such tree, the Resident Engineer may elect to retain the tree and hold the Contractor liable for compensation.

3. Completely remove and dispose of any tree killed or irreparably damaged including those trees damaged or killed as a result of vandalism, natural acts, and diseases or as a result of Contractor's failure to protect or maintain said tree. Remove and dispose the entire tree including stump and roots to a depth of 2 feet below finished grade.

4. Replace at Resident Engineer's direction any tree lost or, in the opinion of the Resident Engineer, irreparably damaged as a result of failure of the Contractor to protect or to adequately maintain trees. Replacement conditions will not apply to plant losses due to abnormal weather conditions such as floods, excessive wind damage, drought, severe freezing, or abnormal rain, as determined by the National Weather Service. Trees, which fail to fully foliate in the spring following completion of construction operations, may be presumed to have been lost due to construction operations.

B. Locate and install replacement trees in accordance with the instructions of the Project Arborist and by direction of the Resident Engineer. The Resident Engineer may require lost trees be replaced in areas other than in their original location.

C. Warranty replacement trees as follows:

1. Make warranties in addition to and not in lieu of all other liabilities, which the manufacturers or the Contractor may have by law or by other provisions of the Contract Documents.

2. Be responsible for maintenance of all replacement trees during the Warranty Period. The Resident Engineer will periodically review and notify the Contractor of any areas needing attention.

3. Replace plants which, in the opinion of the Resident Engineer, are in unhealthy or unsightly condition, or that have lost their natural shape due to dead branches, excessive pruning, or excessive defoliation.

4. Replace unacceptable plants no later than the next succeeding planting season.

5. Replace unacceptable plants in accordance with original Specification. Cost is considered to be included in the Contract. Warranty all replaced material for a period of 1 year from date of replacement.
6. Any tree and shrub material that is 25 percent or more dead or disfigured will be considered dead and must be replaced at no charge. Plants are considered disfigured when excessive dead wood has been removed or when the symmetry, typical habit of growth, or sculptured form has been impaired by the removal of dead wood.

7. The above warranty is applicable to any growing conditions through which plants of like kind could be expected to survive and any deformity or cause of death which could be attributed to, or affected by, the physiological conditions of the plant. The warranty would not apply to plant losses due to abnormal weather conditions such as floods, excessive wind damage, drought, severe freezing, or abnormal rain, as determined by the National Weather Service.

D. Pruning of Damaged Trees:

1. Under the direction of the Project Arborist, cleanly cut off limbs and branches that have been broken to the nearest crotch in accordance with good horticultural practice. Sterilize equipment with alcohol prior and during trimming and pruning operation. Carry out all pruning of damaged trees to the approval of the Resident Engineer.

2. Maintain trees requiring protection in as good condition at completion of the work as at the commencement of the work. If such a condition does not exist at the completion of the work, assume responsibility to provide corrective measures or replacement with new material as directed by the Resident Engineer.

3. Pay for all costs for the repair of any damage to trunks or major limbs 3 inches in diameter or greater requiring, in the opinion of the Resident Engineer, the attention of a professional tree surgeon. Consider all costs incurred in the protection of trees requiring protection incidental to the Contract.

3.04 FENCE REMOVAL

A. Remove protection fencing and wood chips only at Resident Engineer’s direction. Fence removal is subject to all protection measures for landscape requiring protection being satisfied as stated in this Section and stated in the Landscape Protection Plan prepared by the Project Arborist.

END OF SECTION
SECTION 01 57 13
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for constructing and maintaining the surface water drainage and temporary erosion and sediment control system. Contractor is wholly responsible for control of water, including ground water, onto and exiting the construction site or staging areas under the conditions and limitations imposed by the National Pollutant Discharge Elimination System (NPDES) Permit No. WA 003192-5.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 01 12 19, Contract Interface.
2. Section 01 31 19, Project Meetings.
3. Section 01 41 26, Permits.
4. Section 01 57 19, Temporary Environmental Controls.
5. Section 01 57 24, Temporary Site Water Discharge.
6. Section 36 12 16 Asphalt Paving.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. Washington State Department of Ecology (DOE)

2. City of Seattle (COS)
   a. COS Critical Area Ordinance.
   b. COS Standard Specifications for Road, Bridge, and Municipal Construction.

1.03 DEFINITIONS

A. Wet season: October 1 through April 30.
B. Dry season: May 1 through September 30.

D. CSEMS: Construction Site Environmental Management Supervisor

E. SWPPP: Storm Water Pollution Prevention Plan.

F. COS Standard Specifications: City of Seattle Standard Specifications for Road, Bridge, and Municipal Construction.

G. TESC: Temporary Erosion and Sediment Control


1.04 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Construction Storm Water Pollution Prevention Plan (SWPPP) including Temporary Erosion and Sediment Control Plan(s).

C. Manufacturer Data and Test Results for all products.

D. TESC BMPs (Best Management Practices) inspection log as defined in Article 1.05D:
   1. Maintained on a daily basis.
   2. Kept on-site.
   3. Submit copies to the Resident Engineer weekly for the previous week.

E. Designee’s qualifications for Construction Site Environmental Management Supervisor (CSEMS).

F. Experimental BMP submittal requirements as outlined in Article 1.05F of this section.

1.05 QUALITY ASSURANCE

A. Be solely responsible for all damages, fines, levies, or judgments incurred as a result of Contractor, Subcontractor, or Supplier failure to comply with the requirements of this Section. All damages, fines, levies, or judgments incurred as a result of Contractor, Subcontractor, or Supplier failure to comply with the requirements of this Section will be deducted from payments due. Be solely responsible for all schedule impacts from damages, fines, levies, judgments, or stop work orders incurred as a result of Contractor, Subcontractor, or Supplier failure to comply with the requirements of this Section. The project schedule will not be changed to accommodate the time lost.

B. Implement the Construction SWPPP, including design of and all revisions to, and the construction, maintenance, replacement, and modification of the erosion and sedimentation control facilities, until Final Acceptance of current work, in accordance with Section 01 12 19, Contract Interface.

C. Employ Construction Site Environmental Management Supervisor (CSEMS) as defined in Section 01 57 19, Temporary Environmental Controls, with the following responsibilities:
a. Be currently certified as a Certified Professional in Erosion and Sediment Control (CPESC) offered by CPESC, Inc. (www.cpesc.org).

b. Be solely responsible for developing, maintaining, and modifying the Construction SWPPP for the life of the Contract and ensuring compliance with all requirements of this Section.

c. Have the authority to act on behalf of the Contractor and shall be available on call 24 hours per day through the duration of the contract.

d. Be available to accompany the Resident Engineer and Washington State Department of Ecology (DOE) personnel during weekly inspections of all BMP's at a time designated by the Resident Engineer.

e. Ensure that all TESC BMPs are installed, inspected, maintained and modified as conditions change for the duration of the contract.

f. Keep daily logs, and inspection reports as defined in Article 1.05D.

D. TESC BMP Daily Logs and inspection reports shall be updated by the CSEMS on a daily basis and will include the following:

1. Inspection date/time.

2. Weather information; general conditions during inspection and amount of precipitation since the last inspection.

3. A summary or list of all BMPs implemented, including observations of all erosion/sediment control structures or practices. Note locations of BMPs inspected, needing maintenance, failing to operate as designed, and where additional or different BMPs are required.

4. General comments and notes, including a brief description of any BMP repairs, maintenance or installations made as a result of the inspection.

5. Monitor and report stormwater discharges in accordance with Section 01 57 24, Temporary Site Water Discharge.

E. Meet the discharge requirements of Section 01 57 24, Temporary Site Water Discharge. Provide treatment methods, such as sedimentation systems, sand filtration, or other means, as necessary, to meet the discharge requirements.

F. Use of Experimental BMP's:

1. Obtain approval for all experimental BMP's from Resident Engineer for water treatment of water discharged to surface water prior to implementation.

   a. With approval requests, include a description of:

      1) The experimental BMP.

      2) Why the experimental BMP is being requested.

      3) Why the BMPs in the SMMWW are not adequate.

      4) Applicable construction techniques.

      5) The characteristics of the site or sites where the experimental BMP is proposed.
6) If chemical treatment is proposed, include bench test data which cites the optimum polymer dosage rate to achieve colloidal capture at a range of anticipated turbidities and the aquatic toxicity of treated stormwater on Daphnia and on Salmonid fishes. Determine effectiveness by bench testing using soils and water from the Site. Determine effluent toxicity using Standard Methods for the Examination of Water and Wastewater, Methods 8-10B and 8-04B, except temperature is ambient.

7) Engineering description of the chemical feed systems.

8) Design criteria for the experimental BMP and the expected results.

9) Maintenance procedures.

10) Cost estimates.

11) Monitoring procedures and duration.

12) An Ecology approved BMP that could be used if the experimental BMP fails.

1.06 SEQUENCING AND SCHEDULING

A. Obtain applicable permits, approval of stormwater discharge treatment methods, and have BMPs and necessary equipment in place prior to land disturbing activities.

B. Within 10 Days of the effective date of the Notice to Proceed, hold a meeting with the Construction Site Environmental Management Supervisor and the Resident Engineer to review and discuss in detail all requirements of this Section, how to meet them, and prepare a draft schedule for submittals, in accordance with Section 01 33 00, Submittal Procedure.

C. Prior to disturbing soil or demolition activities, become designated a co-permittee on Sound Transit’s NPDES construction Stormwater Permit WA 003192-5. Permit coverage requires the development of a site specific Construction Stormwater Pollution Prevention Plan in accordance with the Washington State Department of Ecology’s Stormwater Management Manual for Western Washington, Volume II-Construction Stormwater Pollution Prevention.

D. Coordinate with the requirements of Section 01 57 24, Temporary Site Water Discharge and Section 01 41 26, Permits.

E. The pre-construction meeting including a site inspection by the City is required before ground disturbance begins. See Section 01 31 19, Project Meetings.

F. Support Sound Transit on the submission of the Grading Season Extension application if excavation and fill placement will take place during the wet season.

1.07 CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A. Prepare a Construction SWPPP describing best management practices (BMPs) to prevent erosion and sedimentation, and to identify, reduce, eliminate or prevent stormwater contamination and water pollution from construction activities.

B. The Construction Stormwater Pollution Prevention Plan shall be in accordance with the requirements of the SMMWW, Volume II, Chapter 3. The Construction SWPPP consists
of two parts: a narrative and drawings. Both parts must contain information specific to the construction site.

C. SWPPP Drawings:

1. Drawings must include all the required elements described in the SMMWW, Volume II, Chapter 3.

2. Show by a series of time sequence shop drawings, how construction stormwater and erosion control BMPs will be installed, maintained, and removed.

3. A conceptual Temporary Erosion and Sediment Control Plan is included in the Contract Drawings “for information only”. Revise the TESC Plan to reflect the actual means and methods proposed and including alternative BMPs.

4. Prepare a separate Temporary Erosion and Sediment Control Plan for each location and its major construction activities, and as required by the Resident Engineer. Not all major activities will occur at the same time at each location and the plans for more than one major activity can be combined on a single Plan if the BMPs shown are appropriate to all major activities shown.

5. BMPs shown on the Construction SWPPP drawings are to be selected and used in accordance with SMMWW.

D. SWPPP Narrative:

1. The Narrative must include all the required elements described in the SMMWW, Volume II, Chapter 3.

2. Include a description of the inspection and monitoring plan for TESC BMPs over the life of the Project. Inspect all BMP’s daily, and ensure that the log of TESC Daily inspection reports are submitted to the Resident Engineer weekly, for the previous week.

3. Provide a narrative describing the training program for educating all personnel including subcontractors on environmental protection. At a minimum, train staff through regularly scheduled meetings to discuss environmental protection subjects as related to this project. This training may be added to existing weekly meetings (such as safety meetings). Emphasize issues such as sensitive receptors, spill prevention, chemical handling, and storage, emergency response, stormwater control facilities inspections, proper dewatering techniques, and concrete handling.

4. Include the name, telephone number, fax number, cell phone number(s), email address, and business address of the designated CSEMS and all Contractor personnel responsible for erosion and sediment control. Be responsible for updating this information as required.

E. The Construction SWPPP shall show how compliance with the specific requirements of Sound Transit’s individual NPDES Construction Stormwater Permit WA 003192-5 will be achieved.

F. Coordinate Construction SWPPP development and implementation with the requirements of Section 01 57 19, Temporary Environmental Controls and Section 01 57 24, Temporary Site Water Discharge.

G. The Resident Engineer will have Seattle Public Utilities (SPU) review and comment on the Construction SWPPP.
Resident Engineer's review of the Plan does not constitute approval of permanent drainage design. Approval of permanent drainage design is by reviewing agency(ies), e.g. City of Seattle.

PART 2 - PRODUCTS

2.01 SUMMARY

A. A complete list and descriptions of approved BMPs can be found in Volume II of the SMMWW and also in City of Seattle Volume 2, Construction Stormwater Control Technical Requirements Manual, Director's Rule 2009-004 SPU, 16-2009 DPD. The Contractor may choose other materials, BMPs, and methods provided they meet the applicable city, state and federal permits, and requirements.

2.02 MATERIALS

A. General: Materials used for Erosion and Sediment control BMPs shall be in accordance with the materials specified in the Stormwater Management Manual for Western Washington, Volume II, Chapter 4, unless alternately specified below.

B. Quarry Spalls: Meet the requirements of City of Seattle Standard Specifications, Section 9-13.7, Quarry Spalls, 4-inch to 8-inch.


D. Fertilizer: Conform to City of Seattle Standard Specification, Section 9-14.3.

E. Erosion Control Matting, Plastic covering and Stakes: Conform to City of Seattle Standard Specification, Section 9-14.5.


G. Polyacrylamides (PAM) for soil erosion protection: Consistent with BMP C126 in Chapter 4, Volume II SMMWW. Notify the Resident Engineer 14 Days prior to the start of construction if planning to use a chemical other than PAM to meet the water quality standard.

H. Asphalt Berm: As detailed in the Reference Drawings and supplemented with City of Seattle Standard Specifications Section 8-06. Asphalt: As specified in Section 32 12 16, Asphalt Paving.

I. Inlet Protection: Specifically designed for catch basins and inlets, made of a filter fabric insert with 48 inches by 36 inches adapter skirt, retrieval strap, overflow bypass, and sediment accumulator. Inlet protection by Silt Sack, Streamguard or approved equal.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clearly flag the boundaries of the clearing/construction limits as indicated on the Plan or as designated by the Resident Engineer by a continuous length of fencing or screening wall prior to construction.

B. Stockpile on-site sufficient BMP materials and supplies to protect the entire site.
C. Protect catch basin inlets to the permanent storm drainage system from sediment influx by use of filter fabric, catch basin insert, or similar filtering materials and methods.

3.02 INSTALLATION

A. Installation practices for Erosion and Sediment Control BMPs shall be in accordance with the City the Stormwater Management Manual for Western Washington, Volume II.

3.03 MAINTENANCE

A. If erosion is occurring, make modifications to the erosion control system to mitigate the erosion and its affects.

B. General maintenance activities:
   1. Repair or replace damaged or missing items immediately.

C. Maintain erosion and sediment control plans after excavation and grading. Maintain erosion and sediment control through Substantial Completion.

D. Provide necessary ditches, swales, and dikes to direct all potentially sediment-laden water towards and into sediment traps/basins or other approved treatment BMPs or devices.

E. Dust control:
   1. Use water sprinkling, temporary enclosures, and other methods to minimize dust and dirt migration in accordance with Section 01 57 19, Temporary Environmental Controls. Prevent runoff from all water used for dust control from entering into the storm sewer system. See Section 01 57 24, Temporary Site Water Discharge, for containment options and treatment measures. Do the water sprinkling so that water does not accumulate or run across grade.
   2. The application of any chemical dust suppressants must be approved by the Resident Engineer prior to use.

F. Immediately stabilize with the approved BMP methods (such as seeding, mulching, and plastic covering) all areas of exposed soils that will not be disturbed for 24 hours during the wet season or seven (7) Days during the dry season.

G. Address all areas needing BMP measures that do not require immediate attention within 15 Days of Contractor’s attention or notification from the Resident Engineer or CSEMS.

H. At a minimum, inspect all TESC BMPs daily and after any significant rain event (0.5 inch or greater). Repair as necessary to meet requirements of the SMMWW and/or NPDES permit.

I. Maintain and repair all BMPs as needed to ensure continued performance of their intended function. Conduct all maintenance and repair in accordance with the approved Construction SWPPP.

J. Operate and maintain BMPs in accordance with Volume II of the Stormwater Manual for Western Washington and the following:
   1. Remove sediment from behind sediment fence when sediment reaches 1/3 the height of the fence to prevent overtopping.
   2. Prevent sediments from being flushed to the downstream system during cleaning.
3. Remove sediment, trash, and debris from catch basin grate surfaces when blocking more than 20 percent of the grate surface.

4. Inlet and Catch Basin filter socks shall be cleaned or removed and replaced when sediment has filled one-third of the available storage, or the fill limits recommended by the manufacturer.

5. Immediately remove all sediment accidentally introduced into a catch basin.

6. Clean interceptor ditches of sediment and vegetation when accumulation exceeds three (3) inches in depth or when free movement of water through ditch is restricted.

K. Monitor triangular silt dikes for performance and sediment accumulations during and after each runoff producing rainfall. Remove sediment when it reaches one-half the height of the dike.

L. At a minimum of once per day, as specified in section 01 57 19 Temporary Environmental Controls, 3.01.D.2, or as directed by the Resident Engineer provide street sweeping services on streets and parking areas surrounding construction sites. Promptly clean up spills of transported material on public roads and parking lots by sweeping using an approved street sweeper machine. Handle and dispose of cleaning waste material and demolition debris in a manner that does not cause contamination of water. If the area is swept with a pick-up sweeper, the material must be hauled out of the area to an appropriate disposal site. Coordinate with traffic control requirements, Section 01 55 26, Traffic Control.

M. Remove all TESC measures within 30 Days after final site stabilization is achieved or after the temporary BMPs are no longer needed. Remove and dispose of in an approved site or stabilize trapped sediment on site. Permanently stabilize disturbed soil areas resulting from removal.

3.04 COMPLETION OF CONSTRUCTION

A. See Section 01 12 19, Contract Interface.

3.05 SYSTEM COMPLIANCE

A. The Resident Engineer and regulatory agencies will determine the effectiveness of the erosion control system. Immediately correct damaged and/or inadequate or ineffective TESC BMPs.

B. If the erosion control system is determined to be ineffective by the Resident Engineer or regulatory agencies, upgrade and modify erosion control system until effective, as determined by the Resident Engineer and regulatory agencies.

C. Refusal to modify and upgrade the erosion control system as required within five (5) Days of notice from the Resident Engineer, may result in the work being completed by a third party and the cost of the work being withheld from the Application for Payment.

D. Continued non-compliance with the erosion control requirements and water quality requirements may result in stoppage of work and monetary fines.

E. In the event that the Washington State Department of Ecology issues a Notice of Violation, Notice of Non-Compliance, or other Enforcement Action, the Resident Engineer may stop all construction activities until it has been determined to the satisfaction of the Resident Engineer that the project is in compliance. The Resident Engineer may require the Contractor to send additional staff to successfully complete the Stormwater Construction Best Management Practices (BMPs) field training as provided by the
Associated General Contractors (AGC) before construction activities can resume. The project schedule will not be changed to accommodate the time lost. Pay all costs associated with work stoppages, mitigation of the triggering event(s), and/or training.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies requirements for complying with applicable noise regulations, and noise and vibration limits.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 01 12 16, Work Sequence.

2. Section 01 41 26, Permits.

3. Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork.

C. The hours of construction are subjected to and limited by the City of Seattle requirements. Construction during all other times is prohibited unless a variance can be obtained. Refer to Section 01 12 16, Work Sequence, for hours of work.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American National Standards Institute (ANSI)

a. ANSI S1.4 Specification for Sound Level Meters

b. ANSI S2.4 Auxiliary Analog Equipment for Shock and Vibration Measurements

1.03 DEFINITIONS

A. Construction Site: For purpose of noise and vibration control requirements, the Construction Work Area limits. This includes Right-of-Way, property, and construction easements, used expressly for construction.

B. Noise Level Measurements: A-weighted and "slow" response readings from instruments complying with TYPE 1 or TYPE 2 requirements of the American National Standard Institute (ANSI) S1.4, Specification for Sound Level Meters.

C. A-Weighted Noise Levels: Decibels (referenced to 20 micro-Pascal) as measured with A-weighting network of standard sound level meter, abbreviated dBA.

D. Vibration Measurements: The use of a vibration transducer, amplifier, peak detector, and frequency band filters complying with ANSI S2.4.

E. Vibration: Velocity in microinches per second. Vibration levels are expressed as velocity levels in Decibels referenced to one microinch per second, abbreviated VdB.
F. Noise Sensitive Locations: Residential areas, institutions, hospitals, parks, and other locations so named herein.

G. Maximum Sound Level $L_{\text{max}}$: The maximum.

H. Recorded root mean square (RMS A-weighted sound level for a given time interval or event.

I. Equivalent Sound Level $L_{\text{eq}}$: The A-weighted level of a constant sound having the same energy content as the actual time-varying level during a specified interval. The $L_{\text{eq}}$ is used to characterize complex, fluctuating sound levels with a single number. Typical intervals for $L_{\text{eq}}$ are hourly, daily and annually.

J. Vibration Monitoring: Monitoring used to determine if the equipment and methods used to complete the work cause vibrations that equal or exceed threshold values. The data gathered provide onsite feedback of the effects of specific operations and procedures.

1.04 REGULATORY REQUIREMENTS

A. Revised Code of Washington (RCW)
B. Washington Industrial Safety and Health Act (WISHA)
C. City of Seattle Noise Control Ordinances
D. Code of Federal Regulations (CFR)
E. Environmental Protection Agency (EPA), State and local authorities.
F. Federal Occupational Safety and Health Act (OSHA)

1.05 SUBMITTALS

A. Noise and Vibration Control Plan: Within 45 Days of NTP, as specified herein.

B. Qualifications of the Acoustic Specialist:
   1. Membership in a recognized acoustical organization such as the National Council of Acoustical Consultants (NCAC), Institute of Noise Control Engineering (INCE), or Acoustical Society of America (ASA).
   2. Minimum 10 years experience performing similar work.

C. Noise and Vibration Monitoring Plan:
   1. Within 45 Days of NTP for initial Plan, as specified herein.
   2. Updates as required.
   4. Certificates of calibration for monitoring instruments, including updated certificates after repairs to instruments.

D. Weekly Noise and Vibration Measurement Reports: as specified herein.

E. Shop and Working Drawings, computations, material data and other criteria, for all noise abatement measures identified in the Noise and Vibration Control Plan. Have Contract Drawings and computations approved by an Acoustic Specialist.
1.06 RESPONSIBILITIES OF CONTRACTOR

A. Sound Transit has applied for a Technical Noise Variance for construction. This process is currently in application and final noise levels have not been defined.

B. Perform Work within the permissible noise and vibration levels, work schedule limitations, and procedures provided for in this Section, the Technical Noise Variance listed in Section 01 41 26, Permits, and applicable federal, state, county and City of Seattle codes, regulations, and standards

C. Other than those provided herein, be responsible for obtaining, at own expense, permits, variances, equipment certifications and other documents required by this Section and by applicable federal, state, county, and municipal codes, regulations and standards.

D. Use equipment with effective noise-suppression devices and employ other noise control measures such as barriers and curtains necessary to protect the public.

E. Schedule and conduct operations in a manner minimizes, to the greatest extent feasible, the disturbance to the public in areas adjacent to the construction activities and to occupants of buildings in the vicinity of the construction activities.

F. Compliance with the requirements of this Section may require the use of equipment with special exhaust silencers or enclosures, and construction of temporary enclosures or noise barriers around activities. Use haul routes and staging areas as shown on the Contract Drawings, to minimize noise at residential and other sensitive receptor sites. Noise produced by elevated equipment, including crane pulleys and hoses, must be minimized.

1.07 NOISE AND VIBRATION CONTROL PLAN

A. Requirements

1. Prepare a Noise and Vibration Control Plan which includes the following for construction activities that may occur at the construction site:

   a. Site Drawing - Prepare a scaled drawing of the construction site indicating the following:

      1) Contract name and number
      2) Contractor's name
      3) Date and hours of work operation
      4) Scale
      5) Direction of North
      6) Identify noise and vibration sensitive locations near the construction site
      7) Construction equipment locations used, designated by the code letter used in Column (a) in Part A of the Noise Control Plan Form, Exhibit A, Figure 1.
      8) Locations of the noise levels calculated for the nearest residential, commercial, and industrial areas as specified herein.
9) Locations and types of noise abatement measures that may be required to meet codes and regulations as indicated by the calculations.

b. Equipment Inventory - Prepare an inventory of equipment used by providing the following information in the indicated columns of Noise Control Plan Form, Figure 1.

1) Column (a) - Code letter in sketch to indicate position of equipment on site

2) Column (b) – Category or type of equipment

3) Column (c) - Equipment manufacturer and model, if known at the time of the Plan’s preparation

4) Column (d) - Unique identifier (ID), such as registration number, if known at the time of the Plan’s preparation.

5) Column (e) - Equipment horsepower

6) Column (f) - Estimated noise level at 50 feet, obtained from either the manufacturer or from approved field noise measurements of same equipment

7) Column (g) - Estimated date of first use on site

8) Column (h) Estimated date of last use on site

9) Noise Calculations - Prepare calculations of $L_{max}$ noise levels expected at the nearest residential and commercial property lines and identified noise-sensitive locations near the construction site, based on the equipment noise levels given in Part A of the Noise Control Plan Form. Determine the nearest property lines from the noise sensitive locations. Make the calculations for locations where noise emitted by applicable equipment causes the greatest noise level for each type of land use, if necessary. Provide the results on Part B of the Noise Control Plan Form, Figure 2, with calculations included below the results, and with the locations for the calculations indicated on the site sketch.

   a) Calculate $L_{max}$ according to the method outlined below:

   $$L_{max} \text{ (equipment)} = EL - 20 \log_{10} \left( \frac{D}{50} \right)$$

   where:

   $EL = $ Estimated equipment noise level at 50 feet, in dBA.

   $D = $ Distance from the equipment to property-line location, in feet.

   Then, combine the individual contributions of each piece of equipment to obtain the overall maximum construction noise level at each location as follows:

   $$L_{(overall)} = 10 \log_{10} \left( \text{SUM} 10 \left[ \frac{L_{max} \text{ (equipment)}}{10} \right] \right)$$
b) Compare the calculated $L_{(\text{overall})}$ values with the Contract limits specified herein.

c. Summary of Required Noise Abatement Measures as necessary.

2. Do not operate noise generating construction equipment at the construction site prior to Acceptance of the Noise and Vibration Monitoring Plan. Update and re-submit the Noise and Vibration Control Plan upon all major change in work schedule, construction methods, or equipment operations not included in the most recent Plan.

3. Prepared and certified by the Acoustic Specialist.

B. Noise Abatement Measures - If the results of the noise calculations indicate that noise level limits are exceeded, identify proposed noise abatement measures, their anticipated effects (dBA reductions), and a schedule for their implementation. Re-calculate the noise levels at the nearest sensitive receptor location property lines that include the anticipated noise reduction effects and submit the results on Part B of the Noise Control Plan Form. Include, as backup documentation to Part B of the Noise Control Plan, drawings, sketches, and suitable calculations that demonstrate anticipated noise reduction benefits and that proposed structures or facilities comply with applicable building code requirements.

C. Noise Reduction Methods - To the extent required to meet the noise limits specified, use reasonable efforts to include noise reduction measures listed below to minimize construction noise emission levels. Noise reduction measures include, but are not limited to the following:

1. Scheduling truck loading, unloading, and hauling operations so as to minimize noise impact near noise sensitive locations and surrounding communities.
2. Locating stationary equipment so as to minimize noise impact on the community.
3. Not leaving equipment idling when not in use.
4. Limiting the use of enunciators or public address systems, except for emergency notifications.
5. Maintaining equipment such that parts of vehicles and loads are secure against rattling and banging.
6. Limiting the time that steel decking or plates for street decking or covering excavated areas are in use.
7. Grading of surfaced irregularities on construction sites to prevent the generation of impact noise and ground vibrations by passing vehicles.
8. Scheduling Work to avoid simultaneous activities that both generate high noise levels.

D. Vibration Control – Provide measures that can be used to reduce vibrations in the event that level limits are exceeded. The measures include changes in construction techniques.

1.08 NOISE AND VIBRATION MONITORING PLAN

A. Requirements
1. Prepare a Noise and Vibration Monitoring Plan specifying the construction activities, monitoring locations, equipment, procedures, characterization of the noise produced with equipment usage, schedule of measurements and reporting methods to be used.

2. Hold a readiness review meeting conducted by the Resident Engineer.

3. Furnish noise and vibration monitoring data to the Resident Engineer on a weekly basis. Include measurements taken during the previous week.

4. In the event that the measured noise levels exceed allowable limits, immediately notify the Resident Engineer and immediately implement additional Noise Abatement Measures as specified in the Noise and Vibration Control Plan. Where necessary terminate the construction activity responsible for the noise limits exceedance until the specified Abatement Measures can be implemented.

5. If the measured levels exceed the noise limits specified in this Section, reduce the noise levels by appropriate abatement measures in order to comply with the noise level limits specified herein or terminate the construction activity responsible for the noise limits exceedance.

6. In the event that the measured vibration levels exceed allowable limits, immediately notify the Resident Engineer and immediately implement changes in construction techniques as specified in the Noise and Vibration Control Plan.

B. Measurement Locations

1. Submit a scaled plan indicating monitoring locations, including measurements to be taken at construction site boundaries and at nearby residential and commercial property lines to the Resident Engineer for approval. The vibration monitoring locations in the vicinity of the University of Washington are shown on the Contract Drawings. The measurement sites shown represent the closest points to vibration sensitive land uses to the construction equipment being operated. These locations may change during the Contract, and the Resident Engineer updates as required.

2. Noise measurement to be taken at construction site boundaries and at nearby residential and commercial property lines as defined above.

3. Prepare and submit a scaled plan indicating noise and vibration monitoring locations.


PART 2 - PRODUCTS

2.01 NOISE CONTROL MATERIALS

A. Noise control materials may be new or used. Used materials must be sound and free of damage and defects and are of a quality and condition to perform their designed function for the duration of construction of this Contract.

2.02 VIBRATION MONITORING EQUIPMENT

A. Provide portable seismographs for monitoring the velocities of ground vibrations resulting from construction activities. The seismograph has the following minimum features:
1. Seismic Velocity range: 0.005 to 10 inches per second with an accuracy of within 3 percent of the measured peak particle velocity or better at frequencies between 1 Hertz and 250 Hertz, and with a resolution of 0.005 inch per second or less.

2. Frequency response (within 3 dBA points): 1 to 250 Hertz.

3. Multi channel for vibration monitoring.

4. Two power sources: internal rechargeable battery and charger and 115 volts AC. Battery must be capable of supplying power to monitor vibration continuously for up to 30 days.

5. Capable of internal dynamic calibration.

6. Direct writing to printer and capability to transfer data from memory to a laptop computer or compact disc (CD). Instruments must be capable of producing strip chart recordings of readings on site within one hour of obtaining the readings. Provide computer software to perform analysis, produce reports of continuous monitoring, and to perform zero-crossing frequency analyses of waveform data. Ensure that all reports and analyses are capable of output to a laptop computer or CD.

7. Self-triggering wave form capture mode that provides the following information: plot of wave forms, peak particle velocities, frequencies of peaks.

8. Continuous monitoring mode must be capable of recording single-component peak particle velocities, and frequency of peaks with an interval of 1 minute or less.

B. Provide all recommended ancillary equipment as recommended by the manufacturer for a complete and functional system.

PART 3 - EXECUTION

3.01 NOISE LEVEL LIMITS

A. Noise levels limits may not be exceeded between the hours of construction specified herein.

B. Sound created by impact types of construction equipment, including but not limited to pavement breakers, jackhammers, sandblasting tools, or other types of equipment or devices that create impulse noise or impact noise or are used as impact equipment, as measured at the nearest property line or 50 feet from the equipment (whichever is greater), may exceed the maximum permissible sound levels presented in Table 1 in any one-hour period between the hours of 7 am and 10 pm on weekdays and 9 am and 5 pm on weekends only, but in no event is to exceed the following maximum noise level limits:

1. 90 dBA continuously;

2. 93 dBA for 30 minutes;

3. 96 dBA for 15 minutes;

4. 99 dBA for seven minutes;

5. In excess of 99 dBA are prohibited unless authorized by variance.
C. The levels should be measured at the nearest property line or at a distance of 50 feet from the equipment, whichever is greater. These limits are for equipment on construction sites, including but not limited to crawlers, tractors, dozers, rotary drills, loaders, power shovels, cranes, derricks, graders, off-highway trucks, ditchers, trenchers, compactors, compressors, and pneumatic-powered equipment.

3.02 VIBRATION LEVEL LIMITS

A. Measures applied to limit noise levels may in some cases limit vibration levels also. Measures specified above for noise levels are applicable.

B. For most areas, vibration monitoring will be considered for all activities that may produce vibration levels at or above a PPV of 0.5 inches-per-second (500,000 micro-inches/sec) whenever there are structures located near the construction activity. This includes vibratory sheet installation.

C. For all areas, conduct Construction activities so that vibration levels at a distance of 50 feet from construction limits or at nearest affected building (whichever is closer) do not exceed root-mean-square (rms.) unweighted vibration velocity levels in vertical direction over a frequency range of one to 100 Hertz as listed in Table 2.

D. Vibration levels at buildings affected by construction operations refer to vertical direction vibration on ground surface or building floor, or 50 feet from Construction Limits, whichever is closer.

E. Installation of Vibration Monitors:

   1. For monitoring in the vicinity of nearby structures or utilities, locate vibration sensors on the ground surface near the structures or utilities. Install geophones level and firmly mount on the surface slab of concrete or asphalt, or firmly anchor in undisturbed soil. Orient geophones towards the construction activity.

   2. For monitoring on structures, install wall mount kit to attach triaxial geophones to structure face or columns. Mount geophones level and orient towards the construction activity.

F. Conduct daily measurements of vibration during peak vibration generating construction activities. Vibration monitoring will be considered for all activities that may produce vibration levels at or above a PPV of 0.5 inches-per-second (500,000 micro-inches/sec) whenever a structure is located nearby the construction activity. Peak vibration generating construction activities include but are not limited to: vibratory sheet installation and pile driving, which is limited in the design.

3.03 CONSTRUCTION METHODS – EQUIPMENT

A. Minimize the use of impact devices, such as jackhammers, pavement breakers, and hoe rams. Where possible, use concrete crushers or pavement saws rather than hoe rams for tasks such as concrete deck removal and retaining wall demolition.

B. Ensure that pneumatic impact tools and equipment used at the construction site have intake and exhaust mufflers recommended by the manufacturers thereof, to meet relevant noise ordinance limitations.

C. Equip noise producing equipment, including jackhammers and pavement breaker(s), with acoustically attenuating shields or shrouds recommended by the manufacturers thereof, to meet relevant noise ordinance limitations.
D. Line or cover storage bins and chutes with sound-deadening material.

E. Provide mufflers or shield paneling for other equipment, including internal combustion engines, recommended by manufacturers thereof.

F. Blasting and impact pile driving are prohibited from use.

G. As required to meet the noise limits specified in this Section, use alternative procedures of construction and selection of proper combination of techniques that generate least overall noise and vibration. Such alternative procedures include the following:
   1. Use electric welders powered from utility main lines instead of internal combustion powered generators/welders.
   2. Mix concrete off-site instead of on-site.
   3. Employ prefabricated structures instead of assembling on-site.
   4. Drilled pile installation methods.

H. Use construction equipment manufactured or modified to dampen noise and vibration emissions, such as:
   1. Use electric instead of diesel-powered equipment.
   2. Use hydraulic tools instead of pneumatic impact tools.
   3. Use electric instead of air- or gasoline-driven saws.

3.04 CONSTRUCTION METHODS – OPERATIONS

A. Operate equipment and in particular slurry wall installation equipment and cranes so as to minimize banging, clattering, buzzing, and other annoying types of noises, especially near residential areas.

B. To the extent feasible, configure the construction site in a manner that keeps noisier equipment and activities as far as possible from noise sensitive locations and nearby buildings.

C. In no case are above restrictions limiting the responsibility for compliance with applicable federal, state and local safety ordinances and regulations and other Sections of these Contract Specifications.

D. Maximize physical separation, as far as practicable, between noise generators and noise receptors. Separation includes following measures:
   1. Provide enclosures for stationary items of equipment and barriers around particularly noisy areas on site.
   2. Locate stationary equipment to minimize noise and vibration impact on community, subject to verification by the Resident Engineer.

E. Minimize noise-intrusive impacts during most noise sensitive hours.
   1. Plan noisier operations during times of highest ambient noise levels.
   2. Keep noise levels relatively uniform; avoid excessive and impulse noises.
   3. Turn off idling equipment.
4. Phase in start-up and shut-down of site equipment.

5. Avoid simultaneous activities that both generate high noise levels.

F. Use construction truck routes for muck disposal as shown on the Contract Drawings.

1. Conduct truck loading, unloading and hauling operations so noise and vibration are kept to a minimum.

2. Do not operate trucks on streets that pass by schools during school hours.

3. If alternative haul routes are planned, submit haul routes and staging areas to the local jurisdiction, 14 days before required date. Use construction truck routes for muck disposal so that noise from heavy-duty trucks will have minimal impact at residential and other sensitive receptor sites.

4. Limit the time that steel decking or plates for street decking or covering excavated areas are in use.

5. Grade surface irregularities on construction sites to minimize the generation of impact noise and ground vibrations by passing vehicles.

G. Use warning broadband backup alarms on all equipment in operation at the site, at all times.

H. Limit the use of annunciators or public address systems, except for emergency notifications.

3.05 CONSTRUCTION METHODS – NOISE ABATEMENT MEASURES

A. Install noise abatement measures in locations specified in the Noise Control Plan adjacent to equipment as required to meet the noise limits specified.

3.06 NOISE AND VIBRATION MEASUREMENT PROCEDURES

A. Noise Measurement Procedure

1. Field calibrate the sound level analyzer using an acoustic calibrator, according to the manufacturer’s specifications, before each measurement.

2. Except as otherwise indicated, perform measurements using the A-weighting network and the SLOW response of the sound level meter.

3. Measure impulsive or impact noises using the C-Weighting network and the FAST response of the sound level meter.

4. Fit the measurement microphone with an appropriate windscreen at the location of the sensitive receptor at least four to six feet away from the nearest reflective surface.

5. Take noise measurements at the nearest property line and agreed noise sensitive locations at least once each week and after a change in construction activity or construction location. Measurement periods: a minimum of 20 minutes.

6. Ensure that construction noise measurements coincide with periods of maximum noise-generating construction activity, and take measurements during the
construction phase or activity that has the greatest potential to create annoyance or to exceed applicable noise regulations and restrictions.

7. If, in the estimation of the person performing the measurements, outside noise sources contribute significantly to the measured noise level, repeat the measurements with the same outside source contributions when construction is inactive to determine the background noise level.

8. Submit noise data to the Resident Engineer on a weekly basis using the Noise Measurements Report Form provided in Figure 3. Note the type of measurement (for example, baseline, on-going construction) on the form.

9. Clearly identify monitoring locations and sketch on the back of the Noise Measurements Report Form, Figure 3, along with the locations of and distances from any agreed noise-sensitive location.

10. Identify construction equipment operating and characterize the sound being generated during the monitoring period and the locations sketched on the back of the Noise Measurements Report Form, along with the locations and distances to any agreed noise sensitive location.

B. Vibration Measurement Procedures

1. Field calibrate the vibration monitoring equipment, according to the manufacturer's specifications, before each measurement.

2. Take vibration measurements at sensitive locations as indicated herein and on the Contract Drawings at least once each week and after a change in construction activity or construction location. Measurement periods: a minimum of 20 minutes.

3. Ensure that vibration measurements coincide with periods of maximum vibration-generating construction activity, and take measurements during the construction phase or activity that has the greatest potential to create annoyance or to exceed applicable vibration limits.

4. Submit vibration data to the Resident Engineer on a weekly basis using a Contractor-generated form. Note the type of measurement (for example baseline, on-going construction) on the form.

5. Clearly identify monitoring locations and sketch on the back of the vibration report form.

6. Identify construction equipment operating during the monitoring period and the locations sketched on the back of the vibration report form.
TABLE 1. MAXIMUM DAYTIME PERMISSIBLE SOUND LEVELS

<table>
<thead>
<tr>
<th>District of Sound Source</th>
<th>District of Receiving Property – $L_{eq}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Residential (dBA)</td>
</tr>
<tr>
<td>Residential</td>
<td>80</td>
</tr>
<tr>
<td>Commercial</td>
<td>82</td>
</tr>
</tbody>
</table>

TABLE 2. CONSTRUCTION VIBRATION LIMITS

<table>
<thead>
<tr>
<th>Vibration Type (Permissible Duration)</th>
<th>Vibration Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustained (≥1 hr/day)</td>
<td>0.01 in/sec (80 VdB re 10^-6 in/sec)</td>
</tr>
<tr>
<td>Transient (&lt;1 hr/day)</td>
<td>0.03 in/sec (90 VdB re 10^-6 in/sec)</td>
</tr>
<tr>
<td>Transient (&lt;10 min/day)</td>
<td>0.10 in/sec (100 VdB re 10^-6 in/sec)</td>
</tr>
</tbody>
</table>

END OF SECTION
QUARTERLY NOISE CONTROL PLAN - CONSTRUCTION ACTIVITIES
AT EACH CONSTRUCTION SITE (DUPLICATE AS NEEDED)

Contract No.: _______________  Contract Name: _______________  Contractor: _______________

Site: _______________  Date: ___________  Resubmit every three months _______________

(ATTACH SITE SKETCH)

PART A: EQUIPMENT INVENTORY

<table>
<thead>
<tr>
<th>Code (a)</th>
<th>Equipment</th>
<th>Noise Level At 50 Feet (f)</th>
<th>Date Begin (g)</th>
<th>Date End (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Category (b)</td>
<td>Model (c)</td>
<td>ID# (d)</td>
<td>HP (e)</td>
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FIGURE 1. QUARTERLY NOISE CONTROL PLAN FORM - PART A
# QUARTERLY NOISE CONTROL PLAN (DUPLICATE AS NEEDED)

Contract No.: ___________________________  Contract Name: ___________________________

Contractor: ___________________________  Site: ___________________________

Date: ___________________________  Land Use: ___________________________

Resubmit every 3 months.

**PART B: CALCULATED ONSTRUCTION NOISE LEVELS AT NEAREST RESIDENTIAL AND COMMERCIAL RECEIVERS FOR EACH CONSTRUCTION ACTIVITY**

<table>
<thead>
<tr>
<th>Nearest Noise Sensitive Receivers</th>
<th>Calculated Noise Level – $L_{max}$ (dBA)*</th>
</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>

* Equipment used for each construction activity is taken from Part A of the Noise Control Plan

## NOISE ABATEMENT MEASURES

## ANTICIPATED EFFECTS

CALCULATIONS - attach additional sheet(s) as needed.

**FIGURE 2. QUARTERLY NOISE CONTROL PLAN FORM - PART B**
NOISE MEASUREMENTS REPORT FORM

Measured By: ___________________________ of: ___________________________ (Company)

Monitoring Address: ___________________________________________________________ (Provide Sketch on Back)

Location No: ____________ Wind Speed: _________ MPH  Direction: ________

Location of Sound Level Meter: (No closer than 45 feet from equipment and 9 feet from building)

Monitoring was Conducted: ___________ feet from Equipment (______________________)

(Type(s): Leave Blank for Baseline)

Land Use:    ☐ Residential/Institutional  ☐ Business/Recreational  ☐ Industrial

Sound Level Meter: Make and Model: ________________  ☐ A - Weighted Sound Level (Slow)

Duration of Measurement:  (20 minutes to 1 hour)

<table>
<thead>
<tr>
<th>CALIBRATION LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leq</td>
</tr>
<tr>
<td>L50</td>
</tr>
<tr>
<td>L10</td>
</tr>
<tr>
<td>L1</td>
</tr>
<tr>
<td>Lmax</td>
</tr>
<tr>
<td>Allowable Noise Limit (Lmax)</td>
</tr>
</tbody>
</table>

Field Notes;

Check one of the following:

☐ Ongoing Construction       ☐ Post-Construction: _______________ ☐ Baseline Conditions

(Contract)

(Complete all that apply below)

Active Contract(s): __________________________________________

(List all contracts that contribute to measured noise)

Complaint Response: __________________________________________

(Describe: Include Log-In Number)

Abatement Follow-Up: _________________________________________

(Describe)

FIGURE 3: NOISE MEASUREMENTS REPORT FORM

END OF EXHIBITS
PART 1 - GENERAL

1.01 SUMMARY:

A. This Section specifies elimination or minimizing of air and water pollution generated by construction activities.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections not referenced below may also be related to the proper performance of this work.

1. Section 01 35 29, Health, Safety, and Emergency Response Procedures.
2. Section 01 57 13, Temporary Erosion and Sediment Control.
3. Section 01 57 15, Temporary Construction Noise and Vibration Control.
4. Section 01 57 24, Temporary Site Water Discharge.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents:

1. Revised Code of Washington (RCW)
   a. Chapter 70.105 Hazardous Waste Management.
   c. Chapter 90.48 Water Pollution Control Act.

2. Washington Administrative Code (WAC):
   a. WAC Chapter 173-240 Submission of Plans and Reports for Construction of Wastewater Facilities.
   b. WAC Chapter 173-303 Dangerous Waste Regulations.
   c. WAC Chapter 173-304 Minimum Functional Standards for Solid Waste Handling.
   d. WAC Chapter 173-340 Model Toxics Control Act - Cleanup.

3. Other Agency Requirements
   a. National Pollution Discharge Elimination System Permit (NPDES Permit).
   b. City of Seattle (COS) Critical Area Ordinance.
1.03 DEFINITIONS

A. Hazardous or Contaminated Waste – Material generated by the Contractor’s operations that is either Hazardous Material or Contaminated Material, as defined in Section 01 35 29, Health, Safety, and Emergency Response Procedures.

B. Suspect Materials – Material that is discovered in the construction process and is suspected to be contaminated, but has not been examined and identified as being contaminated.

C. PM10 – Particulate Matter 10 microns in diameter or less.

D. Bulk Fuel - Greater than 250 gallons.

1.04 SUBMITTALS:

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Contractor-Generated Hazardous and Contaminated Waste Management Plan: See Article 1.07

C. Stormwater Pollution Prevention Plan: As required under the Clean Water Act and related federal and state laws and regulations, within 21 Days of effective date of NTP. Coordinates plan with requirements of Section 01 57 24, Temporary Site Water Discharge.

D. Air Pollution Control Plan: Within 21 Days of effective date of NTP.

E. Contractor Erosion and Sediment Control Plan: Within 21 Days after effective date of NTP. Coordinate plan with requirements of Section 01 57 13, Temporary Erosion and Sediment Control.

F. Qualifications for Construction Site Environmental Management Supervisor or other qualified employee(s) approved by the Resident Engineer, to implement, manage, and enforce compliance with the requirements of these Contract Specifications.

G. Spill Control Plan: refer to Article 3.01E.2, herein.

H. Noise Control Plan and Noise Monitoring: In accordance with Section 01 57 15, Temporary Construction Noise and Vibration Control.

I. Citations issued in conjunction with this project.

J. Environmental Compliance Manual in accordance with the requirements of this Section.


L. Waste Disposal Report (end of project).

1.05 QUALITY ASSURANCE

A. Designate a Construction Site Environmental Management Supervisor and other qualified employee(s) approved by the Resident Engineer, to implement, manage, and enforce compliance with the following:


2. Site Water Discharge: Section 01 57 24, Temporary Site Water Discharge.
3. Air Pollution Control Plan.

4. Contractor Erosion and Sediment Control Plan(s): Section 01 57 13, Temporary Erosion and Sediment Control.

5. Spill Control Plan.


B. Qualifications:

1. Construction Site Environmental Management Supervisor:
   a. Certified Erosion and Sediment Control Lead (CESCL) as defined by Washington State Department of Ecology currently certified as a Certified Professional in Erosion and Sediment Control (CPESC) as provided by CPESC, Inc. (www.cpesc.org).
   b. Have a minimum five years of experience being responsible for construction site erosion and sediment control regulatory requirements, BMPs, TESC Plan development, and stormwater monitoring.

2. More than one person may be submitted to provide services required of the supervisor; however, only one person will be responsible for all activities.

1.06 AIR POLLUTION CONTROL PLAN

A. Address use of best management practices to contain dust so that no visible emissions beyond the site boundaries occur.

B. Address approach to prevent odors that interfere with public, including use of chemical products and exhaust emissions.

1.07 CONTRACTOR-GENERATED HAZARDOUS AND CONTAMINATED WASTE MANAGEMENT PLAN

A. Submit within 21 Days after effective date of Notice to Proceed (NTP) with required documents.

B. Plan to properly handle Contractor-generated Hazardous or Contaminated Wastes in accordance with applicable laws and regulations. Include:
   1. Indemnifications: Indemnify, defend and hold Sound Transit harmless against any costs (including attorney's fees and costs), demands, claims, damages, losses, or delay costs (“Claims”) arising from or associated with the management, abatement, removal, remediation, clean-up, transport, reuse, recycling, storage and disposal of any Contractor-Generated Hazardous or Contaminated Waste.
   2. Identify responsibility for the management, abatement, removal, remediation, clean up, transport, reuse, recycling, storage and disposal of Contractor-Generated Dangerous Waste in accordance with laws, rules, regulations and orders, including without limitation, WAC 173-303, and regulations of the waste disposal facility to be used.

1.08 ENVIRONMENTAL COMPLIANCE MANUALS

A. Prepare manual for the site.
B. Include the following information in the manual:

1. Permits that should be included, but not limited to are:
   a. Grading.
   b. NPDES permits.
   c. Noise variance.
   d. Sewer Discharge Permit.

2. TESC Submittals with status of either "No Exception Taken" or "Exceptions as Noted – Resubmission Not Required".

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PROTECTION

A. Air Pollution Controls

1. Criteria for Fugitive Dust:
   a. Do not cause or allow emissions of fugitive dust from transport, handling, construction, or storage activities to remain visible in atmosphere beyond property line of the emission source.
   b. Take precautions to minimize fugitive dust emissions from operations involving demolition, excavation, grading, clearing of land, and disposal of solid waste.
   c. Do not cause or allow particulate matter to exceed 50 milligrams per cubic meter (mg/m³) when determined as difference between upwind and downwind samples collected on high volume particulate matter samplers at the property line for a five-hour period during the time of active operations.
   d. Take precautions to prevent visible particulate matter from being deposited upon public roadways, sidewalks, or adjacent buildings facades as a direct result of operations. Precautions include removal of particulate matter from equipment before movement to paved streets or prompt removal of material from paved streets onto which such material has been deposited.

2. The following procedures and techniques can be used to meet the objectives of this Section. The list is not intended to be all-inclusive and the Contractor may use other procedures and techniques to meet the objectives.
   a. Load all trucks coming to the jobsite or leaving the jobsite with materials or loose debris in a manner that prevents dropping of materials or debris on streets. Cover loads of materials, debris, and soil transported from construction sites. Remove spillage resulting from hauling operations along or across public traveled ways immediately.
b. Cover loads of hot asphalt to minimize odors.

c. Wet materials in trucks or provide adequate freeboard to allow for cover of transported materials, as practical, to reduce PM10 and deposition of particulates during transportation.

d. At least once daily use a qualified street sweeper, in accordance with Section 01 57 13, Temporary Erosion and Sediment Control, to sweep adjacent streets and sidewalks that have heavy volumes of construction vehicles carrying debris and excavated materials. The Resident Engineer may require additional watering down and sweeping if in his/her opinion excessive debris and excavated materials are present on the adjacent streets and sidewalks.

e. Establish regular cycles and locations for cleaning trucks that haul soil from site.

f. Water down construction sites to reduce emissions of PM10 and deposition of particulate matter as required to suppress dust during handling of excavation soil or debris or during demolition of brick or concrete buildings. Do not sluice particulate matter into storm drains.

g. The application of any chemical dust suppressants must be approved by the Resident Engineer prior to use.

h. Promptly clean up spills of transported material on public streets and roads.

i. Prevent runoff of all water used for dust control from entering storm drains or waters of Washington State.

j. Use construction equipment designed and equipped to prevent or control air pollution in conformance with most restrictive regulations of federal, state, and local authorities. Maintain evidence of such design and equipment and make available for inspection by the Resident Engineer.

k. Establish and maintain records of routine maintenance program for internal combustion engine powered vehicles and equipment used for the Contract. Keep records available for inspection by the Resident Engineer.

l. Do not allow internal combustion engines to idle for more than 5 minutes.

m. Use electrically-powered equipment where needed to meet requirements.

n. Make equipment for fugitive dust control available at all times.

o. Wash windows and exterior walls of buildings within two blocks of the site at the direction of the Resident Engineer.

p. Provide dust control at all times, including holidays and weekends, as required to abate dust nuisance on and about the site, that is a result of construction activities.

q. Provide sufficient quantities and equipment for dust control to effectively prevent dust nuisance on and about the jobsite; and when weather
conditions warrant, have sprinkler equipment on hand at all times for immediate use for dust control.

r. Report all complaints from the public to the Resident Engineer.
s. If portions of the site are temporarily inactive or abandoned for whatever reason, provide dust control and abatement continuously during periods of inactivity.

B. Water Pollution Controls

1. Control use of all chemicals, lubricating oils, hydraulic fluids, greases and other such products, and prevent migration from the Work Site. Promptly clean up and properly dispose of materials contaminated by spillage or leakage of products. Comply with storage and containment requirements of these materials in accordance with Washington Stormwater Permit Regulations.

2. Store all containers of hazardous substances, including petroleum products, in covered secondary containment and protect from vandalism.

3. Refer to Section 01 57 24, Temporary Site Water Discharge.

4. Conduct fueling only in designated controlled locations with appropriate BMPs installed to contain and absorb potential spills. Bulk fuels may not be stored on the construction site or staging areas.

C. Pollution Abatement

1. Conduct operations in a manner to minimize pollution of the environment surrounding the area of work by every means practicable. Apply specific controls as indicated and as follows:

   a. Temporary Erosion and Sediment Control: Do not allow waste or eroded materials to enter natural or man-made waters or sewage removal systems. Refer to Section 01 57 13, Temporary Erosion and Sediment Control.

   b. Noise and Vibration Control: Refer to Section 01 57 15, Temporary Construction Noise and Vibration Control.

2. Maintaining Flow of Sewers and Drains:

   a. Provide for and maintain, at Contractor’s expense, the flow of all sewers, drains, building or inlet connections, and all watercourses that may be encountered during progress of the Work.

   b. Do not allow the contents of sewer, drain, or inlet connection to flow into trenches.

   c. Maintenance of sewers and drains may require, at the Contractor’s expense, the use of temporary pump stations with backup generators.

D. Mud Control

1. Take proper measures to prevent tracking of mud onto public streets, drives, parking lots, and sidewalks. Measures include, but are not limited to, covering muddy areas on the site with clean, dry sand, gravel, and trap rock.
2. Maintain all egress from the site and immediately remove mud tracked onto streets, sidewalks, or drives, and clean the affected area. Sweep all areas on adjacent streets within one block of the construction site using the following schedule:
   a. A minimum of once per day during construction work
   b. Twice per week for other work.
   c. The Resident Engineer may require additional sweeping if in his/her opinion excessive debris and excavated material are present.

3. Where trucks leave a muddy site and enter paved public streets, maintain a suitable truck wheel-washing facility in accordance with Section 01 57 13, Temporary Erosion and Sediment Control. Clean all trucks, or other vehicles leaving the site, of mud and dirt, including mud and dirt clinging to exterior body surfaces of vehicles.

E. Contractor-Generated Hazardous or Contaminated Waste Controls

1. In the event that the Contractor or the Resident Engineer reasonably suspects that the Contractor has generated, released, or discharged Contractor-Generated Hazardous or Contaminated Waste, the Contractor shall bear costs of sampling, monitoring tests, and other investigations to determine whether said waste is Solid Waste or Hazardous or Contaminated Waste. Perform the investigations in accordance with federal, state, and local requirements. Sound Transit reserves the right (but not the obligation) to perform its own physical and chemical analyses and tests on suspected Contractor-Generated Hazardous or Contaminated Waste. Contractor shall furnish samples, at their own cost, as directed by the Resident Engineer.

2. Spill Control Plan
   a. Spill Prevention, Control, Containment, and Countermeasures Plan (SPCCC)
      1) Adopt a Spill Control Plan and identify persons responsible for implementing the plan if a spill of a dangerous or hazardous waste should occur,
      2) Identify on a drawing for each Site: Staging, storage, maintenance and refueling locations and their relationship to drainage pathways, waterways, and other sensitive areas.
      3) Identify spill prevention and containment methods to be used at each Site.
      4) Identify site security measures, inspection procedures and personnel training procedures as they relate to spill prevention containment, response, management, and cleanup.
      5) Address: Equipment maintenance, refueling, and cleaning activities and on site storage areas for hazardous materials.
      6) Inspection of: Fuel hoses, lubrication equipment, hydraulically-operated equipment, oil drums, and other equipment and facilities regularly for drips, leaks, or signs of damage, and
maintain and store properly to prevent spills. Note: Maintain proper security to discourage vandalism.

7) Consider use of less toxic vegetable-based biodiesel and hydraulic oils as alternatives to petroleum-based fuels and oils.

8) Chemical storage:
   a) Store solid chemicals, chemical solutions, paints, petroleum products, solvents, acids, caustic solutions, and waste materials including used batteries to prevent the inadvertent entry of these materials into all waters, including ground water. Store materials in a manner that prevents spills due to overfilling, tipping, or rupture.
   b) Store all liquid products on durable impervious surfaces and within bermed containment capable of containing 110 percent of the largest single container in the storage area.
   c) Identify and implement reasonable steps to prevent releases of liquid products from malicious tampering or vandalism.
   d) Store liquid products under cover, such as tarpaulins or roofed structures.
   e) Clearly designate all waste storage areas, whether for waste oil or hazardous waste, as such and keep segregated from new product storage.
   f) Segregate non-compatible chemicals and securely store in separate containment areas that prevent mixing of incompatible or reactive materials.
   g) Stop and store all empty barrels that have not been cleaned in an upright position.

9) Handle all pollutants that occur on-site during construction and dispose of them in a manner that does not cause contamination of storm water or ground water.

10) Fuel Storage- No Bulk Fuel stored onsite.(see Definitions 1.03 D)
    a) All portable fuel storage tanks shall be specifically engineered to meet or exceed all national environmental and hazardous waste regulations.
    b) ULC certified and national fire code compliant.
    c) Durable all steel double wall construction
    d) Secondary shell provides up to 110% containment
    e) Weather and corrosion resistant exterior coating
    f) Interstitial space check port to help identify any possible fluid release
g) Maximum storage capacity of 250 gallons.

h) Spill Kit and Fire Extinguisher staged within 15 feet.

b. Spill Response Plan

1) Report all spills that occur regardless of the size or type of the spill to the Resident Engineer. Maintain a log of all spills.

2) If the spills of a hazardous substance could reach surface waters the following agencies must be notified (There are fines for failing to notify) National response center 1-800-424-8802 or www.nrc.uscg.mil and notify the regional Department of Ecology Office.

3) Some important components of a spill control plan are to stop the spill at the source and install protective covers over storm drain grates. If spill is flammable, call 911 and dispose of as directed by the local Fire Marshal.

3. In the event of release of Hazardous or Contaminated waste, immediately notify the Resident Engineer and take all appropriate measures, consistent with protecting the health and safety of site personnel, Sound Transit personnel, and the public, to stop the spread of all Hazardous and/or Contaminated Wastes.

4. Promptly clean-up and dispose of materials containing Hazardous or Contaminated Wastes resulting from the release to the satisfaction of the Resident Engineer and in accordance with the governing regulatory agencies and all applicable federal, state, and local laws, regulations, and permits. Report all reportable releases to federal, state, and local regulatory and emergency response agencies. Bear the cost of cleanup and disposal of Hazardous or Contaminated Wastes that are accidentally released during performance of the Work.

F. Suspect Materials

1. If suspect materials are encountered, control and contain the material until appropriate measures can be taken.

2. Stockpile material at location determined by the Resident Engineer and treat as if it is contaminated material until determined otherwise.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies permit compliance requirements, controls, treatment, monitoring, reporting, and inspection required during construction related to water discharged from construction sites.

B. The Construction Site Environmental Management Supervisor shall be responsible for all work specified herein. Refer to Section 01 57 19, Temporary Environmental Controls for The Construction Site Environmental Management Supervisor qualifications.

C. Related Sections: The work of the following sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

   1. Section 01 41 26, Permits
   2. Section 01 57 13, Temporary Erosion and Sedimentation Control
   3. Section 01 57 19, Temporary Environmental Controls
   4. Section 01 78 23, Operation and Maintenance Data
   5. Section 31 23 19, Dewatering

1.02 REFERENCES

A. This Section incorporates, by reference, the latest revisions of the following documents.

   a. 40 CFR Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants
   b. 40 CFR 261.21, Identification and Listing of Hazardous Waste, Characteristic of Ignitability

2. Washington Administrative Code (WAC):
   a. Chapter 173-50 WAC, Accreditation of Environmental Laboratories.
   d. Chapter 173-204 WAC, Sediment Management Standards.
3. Federal Register
   a. Vol. 57, No. 246, National Toxics Rule.

4. City of Seattle (COS)
   b. COS Standard Specifications for Road, Bridge, and Municipal Construction.

5. King County Code (KCC) – Industrial Waste Rules and Regulations
   a. KCC 28.84.060.


1.03 DEFINITIONS

A. Construction Site Environmental Management Supervisor: Section 01 57 19, Temporary Environmental Controls.

B. Dewatering Water: Groundwater extracted and pumped away from an active construction site by the dewatering system as defined in Section 31 23 19, Dewatering.

C. Dry Weather Discharge: No measurable precipitation in site rain gauge during previous 72 hours at time of discharge.


E. Groundwater: Water in a saturated zone or stratum beneath the land surface or a surface water body.

F. Process Water:
   1. Process Water discharges include, but are not limited to: Truck and wheel wash water, equipment wash water, petroleum products, chemical wastes, non-contact cooling water, and chlorinated water.
   2. All water which, during manufacturing or processing comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.
   3. Water that is used for sawcutting.
   4. Water in bottom of tunnel and station box excavation.
   5. Decant water, originating as either groundwater or added potable water, from excavated spoils that contain additives, conditioners including bentonite, cementitious materials, or pollutants.
   6. Water entering the excavation from or through walls or invert slab and including any working slab areas.
7. Site water in contact with and chemically affected by site operations which cannot be treated sufficiently on site to meet surface water discharge criteria.

G. Non-Compliance Event (or Events): Occurrence where surface water, groundwater or sanitary sewer water discharge or discharge to groundwater exceeds allowable discharge limits.

H. Sanitary Sewage: Consisting of domestic, commercial, or industrial wastewater.

I. Site Water:
   1. All water on the Site of work that requires discharge from the Site.
      a. Classified as either: Stormwater, Dewatering Water, Sanitary Sewage, or Process Water.

J. Stormwater: Water originating as precipitation that does not infiltrate into the ground or evaporate.

K. Surface Water:
   1. Lakes, Rivers, Federal Waters and Waters of the State.
   2. Wetlands, streams, and open drainage channels.

L. Wet Weather Discharge: All measurable precipitation in Site rain gauge during previous 72-hours at time of discharge.

M. Leachate: Water that has become contaminated by contact with material within the soil profile.

N. KCDNRP: King County Department of Natural Resources and Parks

1.04 SYSTEM DESCRIPTION

A. Design Requirements

1. Site Water Treatment
   a. Provide treatment for site water when necessary to meet discharge requirements.
   b. Provide provisions for maintenance of treatment systems.
   c. Design of treatment system shall be stamped by a Professional Engineer who is licensed to practice in the State of Washington.
   d. Design and implementation of pretreatment systems discharging to a public sewer or combined sewer shall be approved and inspected by King County Industrial Waste prior to commencement of discharges to the sanitary sewer system.

2. Solid Waste
   a. Handle and dispose of all solid waste material in such a manner as to prevent its entry into ground or surface waters of the State.
   b. Handle collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of
wastewaters so it is not resuspended or reintroduced to the final effluent stream for discharge to state waters.

3. Concrete Truck Washout Disposal:
   a. Washout concrete truck chutes, pumps and barrel only into Eco-pans
   b. Return unused concrete remaining in the truck and pump to the originating batch plant for recycling.
   c. Wash off hand tools only into Eco-pans
   d. Do not drain runoff from paved areas into the natural or constructed storm water conveyance until the measured pH of the discharge water is within the discharge criteria parameters.
   e. Contain wash water and waste concrete within a lined container, lined with 30 mil plastic liner or 6 inches of concrete or asphalt, when no formed areas or eco-pans are available. Contain concrete waste in a manner which does not violate water quality standards or solid waste regulations.

4. Leachate:
   a. Do not allow leachate from solid waste material to enter storm drainage systems and/or surface waters without providing all known, available, and reasonable methods of treatment, or allow leachate to cause violations of Chapter 173-201A WAC or Chapter 173-200 WAC.

5. Quantity Limitations:
   a. Allow no more Quantity of stormwater or groundwater to discharge from the site by any actions taken during construction into the storm drain system during and after construction than that amount of discharge currently leaving the site prior to construction.

6. Chemical Usage:
   a. Use chemicals according to the manufacturer's instructions.
   b. Do not use any chemical if its toxicity to aquatic organisms is not known.
   c. Chemical usage for stormwater treatment will require prior approval from the Washington State Department of Ecology. Submit the request for chemical treatment usage 30 Days prior to the anticipated usage date.
   d. Chemical usage for wastewater sanitary treatment as part of the pretreatment facility requires approval from KCDNRP prior to commencement of discharges to the sewer system.

B. Performance Requirements

1. Surface Water Discharges
   a. Comply with the water quality standards and requirements of the following:
      1) Chapter 173-201A WAC.
2) Chapter 173-204 WAC.


6) For facilities that discharge either directly or indirectly via a stormwater conveyance system to waters listed as impaired by the State under Section 303(d) of the Clean Water Act, comply with the State’s water quality standards of the named pollutants.

7) Do not discharge Process Water or domestic wastewater to Surface Water

8) Comply with the Effluent Limitations in Table 1.

### TABLE 1 - EFFLUENT LIMITATIONS: DISCHARGES TO SURFACE WATER

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Maximum Daily¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbidity¹</td>
<td>Do not exceed 5 NTU turbidity in the receiving water over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.</td>
</tr>
<tr>
<td>Turbidity (non-chemical treatment)²</td>
<td>50 NTU</td>
</tr>
<tr>
<td>Turbidity (chemical treatment)²,⁴</td>
<td>Do not exceed 5 NTU for the maximum daily average.</td>
</tr>
<tr>
<td>Total Petroleum Hydrocarbons³</td>
<td>5 mg/L</td>
</tr>
<tr>
<td>pH</td>
<td>In the range of 6.5 to 8.5 standard units with a human-caused variation within a range of less than 0.2 units.</td>
</tr>
</tbody>
</table>

¹ The maximum daily effluent limitation is defined as the highest allowable daily discharge. All discharges shall not cause a visible change in turbidity or color or cause visible oil sheens in the discharges or receiving water body.

² The method detection level (MDL) for turbidity is 1 NTU using a turbidimeter and Method Number 180.1 from 40 CFR Part 136 or Standard Methods for the Examination of Water and Wastewater.

³ The MDL for total petroleum hydrocarbons is 0.1 mg/L using Gas Chromatography and Flame Ionization Detector (FID) and Method Number WTPH-D Diesel (WTPH-D) from Washington State Department of Ecology Method WTPH-D. The quantitation level (QL) for TPH-D is 0.5 mg/L (5 x MDL).

⁴ Meet this standard when any chemical is added to the treatment process.

## 2. Combined or Sanitary Sewer Discharge

a. Comply with the water quality standards and requirements of the following:

1) Wastewater Discharge Permit, King County Department of Natural Resources and Parks, Industrial Waste Program
2) King County Code Title 28
3) Seattle Municipal Code Chapter 21.16, 22.800-22.808

b. Discharge quality

1) Monitor discharge for odor of solvent, gasoline, or hydrogen sulfide (rotten egg odor), oil sheen, or unusual color in discharge water.

2) If any of the waste discharge limits identified in Table 2 are exceeded, stop discharging, notify the Resident Engineer, and implement the Contingency Plan.

3) Discharge limits are listed in Table 2:

**TABLE 2 – PERMIT DISCHARGE LIMITS TO COMBINED OR SANITARY SEWER**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Daily Average (milligrams per liter (mg/l))</th>
<th>Instantaneous Maximum (mg/l)</th>
<th>Maximum Loading (pounds/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>1.0</td>
<td>4.0</td>
<td>1.4</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.5</td>
<td>0.6</td>
<td>0.3</td>
</tr>
<tr>
<td>Chromium</td>
<td>2.75</td>
<td>5.0</td>
<td>2.4</td>
</tr>
<tr>
<td>Copper</td>
<td>3.0</td>
<td>8.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Lead</td>
<td>2.0</td>
<td>4.0</td>
<td>3.34</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.1</td>
<td>0.2</td>
<td>0.14</td>
</tr>
<tr>
<td>Nickel</td>
<td>2.5</td>
<td>5.0</td>
<td>2.70</td>
</tr>
<tr>
<td>Silver</td>
<td>1.0</td>
<td>3.0</td>
<td>1.67</td>
</tr>
<tr>
<td>Zinc</td>
<td>5.0</td>
<td>10.0</td>
<td>8.34</td>
</tr>
<tr>
<td>Cyanide Amenable</td>
<td>2.0</td>
<td>3.0</td>
<td>NA</td>
</tr>
<tr>
<td>Nonpolar FOG</td>
<td>100</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Daily Minimum for 15 Continuous Minutes</th>
<th>Minimum Instantaneous</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>5.5</td>
<td>5.0</td>
<td>12.0</td>
</tr>
<tr>
<td>Settleable Solids (Imhoff Cone)</td>
<td>NA</td>
<td>NA</td>
<td>7 milliliters per liter</td>
</tr>
<tr>
<td>Lower Explosive Limit</td>
<td>NA</td>
<td>NA</td>
<td>5 percent</td>
</tr>
<tr>
<td>Closed Cup Flash Point</td>
<td>NA</td>
<td>NA</td>
<td>140 degrees F</td>
</tr>
<tr>
<td>Temperature</td>
<td>NA</td>
<td>NA</td>
<td>150 degrees F</td>
</tr>
<tr>
<td>Parameter</td>
<td>Daily Average (milligrams per liter (mg/l))</td>
<td>Instantaneous Maximum (mg/l)</td>
<td>Maximum Loading (pounds/day)</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
</tr>
</tbody>
</table>

1. At no time two successive readings on an explosive hazard meter at any location be more than five percent of the lower explosive limit. Ensure no single reading exceed ten percent of the lower explosive limit.


3. Discharge shall not cause the temperature of the sanitary sewer to exceed 104 degrees F. The temperature of the discharge shall not exceed 150 degrees F.

c. Do not discharge substances causing fire or explosion hazard, flow obstruction, excess oxygen demand or toxic vapors.

d. Do not discharge any organic pollutants that result in the presence of toxic gases, vapors, or fumes. Organic pollutants subject to this restriction include, but are not limited to, any organic compound listed in 40 CFR 433.11 (e) Total Toxic Organics (TTO) definition, acetone, 2-butanol (MEK), 4-methyl-2-pentanone (MIBK), and xylenes.

e. Implement good “housekeeping” in order to prevent a concentrated discharge of any pollutant.

f. Treat water for pollutant removal to meet the water quality standards. Do not use potable water, groundwater, stormwater or other materials for the purpose of diluting a waste to achieve discharge limits.

g. Provide and maintain separate process water discharge points to sewer. Each discharge point shall be independently regulated under the King County Industrial Waste Wastewater Discharge Permit.

h. The discharge-receiving sewer shall be kept clear of blockages at all times. Coordinate any cleaning of or access to SPU utilities with SPU.

1.05 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Storm Water Pollution Prevention Plan (SWPPP). See Section 01 41 26, Permits.

1. Update the SWPPP with site-specific construction work plans as necessary to reflect construction work area limit changes, the construction activities accompanying these changes, and all changes to BMPs and/or stormwater handling and treatment systems necessary to maintain compliance with the NPDES permit.

C. Sanitary Sewer/ Combined Sewer Discharge: Related Documentation

1. Treatment System design info, monitoring procedures, and operation and maintenance manuals for the treatment systems.

2. King County Wastewater Discharge Permit. See Section 01 41 26, Permits.

3. Quantity: Daily for each discharge location.


5. Contingency Plan.
6. Obtain Sanitary Sewer Discharge submittal approvals prior to start of Initial Construction Activities in conjunction with authority and approval of local jurisdictions.

D. Chemical Usage Documentation.

E. Qualifications of Accredited Independent Testing Laboratory and Construction Site Environmental Management Supervisor.

F. Permits obtained by the Contractor.

G. Operations and Maintenance Manuals: Submit operation and maintenance instructions and data for equipment provided under this Division, in accordance with the requirements of Section 01 78 23, Operation and Maintenance Data. Include recommended maintenance materials and spare parts list for installed equipment.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. Accredited Independent Testing Laboratory for testing water samples for pH, turbidity, Total Petroleum Hydrocarbons (TPH), and parameters with discharge limits in accordance with permit requirements.

2. Independent Testing Laboratory registered or accredited under the provisions of Chapter 173-50 WAC.

B. Fines

1. Be responsible for all fines from governing authorities incurred from non-compliance with regulations.

2. Any person who is found guilty of willfully violating the terms and conditions of NPDES Permits:

   a. Can be deemed guilty of a crime.

   b. Upon conviction thereof can be punished by a fine of up to $10,000 and costs of prosecution or by imprisonment in the discretion of the court.

   c. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

1.07 SEQUENCING AND COORDINATION

A. Within 10 Days of the effective date of the Notice to Proceed, hold a meeting with the Construction Site Environmental Management Supervisor and the Resident Engineer to review and discuss in detail all requirements of this Section, how to meet them, and prepare a draft schedule for submittals, in accordance with Section 01 33 00, Submittal Procedure.

1.08 STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

A. Prior to disturbing soil or demolition activities, a site specific Stormwater Pollution Prevention Plan is required in accordance with the Washington State Department of Ecology’s Stormwater Management Manual for Western Washington, Volume II-Construction Stormwater Pollution Prevention as required by the NPDES Permit.
1.09 SITE WATER DISCHARGE

A. Provide engineered Stormwater Management Plan for treatment and disposal of discharges to Surface Water, and Wastewater Pre-Treatment Plan for treatment and disposal of discharges to the Public Combined or Sanitary Sewer system, and Trucking Plan for Site Water to be hauled offsite.

1. Discharges to surface water must meet all state water quality requirements in accordance with the site’s NPDES Construction Stormwater Permit described in the SWPPP.

2. Discharges to public combined or sanitary sewer must be permissible in accordance with Seattle Municipal Code 21.16 and 22.800-22.808, and adhere to all requirements of the King County Industrial Waste Discharge Authorization.

B. Stormwater and Groundwater that is affected by site activities shall be collected, treated, and discharged to Surface Water in accordance with Seattle Municipal Code 22.800-22.808 unless expressly allowed by SPU and King County through the King County Industrial Waste Discharge Authorization.

1.10 SURFACE WATER DISCHARGE RELATED DOCUMENTATION

A. Provide Treatment Systems for the treatment of all discharges to surface water prior to discharge from the site:

1. Evaluate and design each proposed treatment system, including the following:
   a. The evaluation of potential pollutant loading from construction activities.
   b. Treatment process evaluation.
   c. Description of process used in treatment:
      1) Design criteria.
      2) Design flow rates.
         a) Expected water volumes to be discharged to surface water.
         b) Treatment plant capacity.
      3) Design loading, type of pollutant material and quantity.
      4) Chemical usage.
      5) Design parameters associated with each unit process.
      7) Description of emergency power generator to operate treatment plant during power failure.
   d. Pressure filter system required except as indicated herein.
   e. Capability of automatic flow and turbidity passed chemical addition.
   f. Use BMPs as a treatment system during Initial Site Construction.
2. Operational and maintenance requirements, in accordance with Section 01 78 23, Operation and Maintenance Data.

3. Obtain approval of Surface Water Discharge submittals prior to start of Initial Construction Activities in conjunction with authority and approval of local jurisdictions.

4. Contingency plan:
   a. For site water management in case of treatment system failure, a spill of hazardous substances, or other incident which introduces excess volume or unanticipated contaminants into the system.
   b. For treatment system improvements necessary to meet discharge requirements if existing treatment system fails to meet discharge requirements.

B. Monitoring and Reporting Results:
   1. Submit and certify daily as specified herein.
   2. Include any pollutant monitored more frequently than required herein.

C. Non-compliance Event Notification:
   1. Immediate notification of the Resident Engineer of the Non-compliance or becoming aware of a Non-compliance Event.
   2. Submit a written report of the violation describing the Non-compliance.
   3. In the report, include the following:
      a. Exact dates and times of the Non-compliance Event.
      b. Steps taken or planned to prevent reoccurrence of the Non-compliance.
      c. Water quality data in accordance with the requirements of the NPDES Permit.
   4. Submit the report within two days after the initial Event occurrence or one day after receiving laboratory results, whichever time is shorter.

D. Operations and Maintenance Manual:
   1. Be in accordance with Section 01 78 23, Operation and Maintenance Data.
   2. Design criteria including pertinent calculations used in designing, selecting, or verifying the suitability of the installed equipment.
   3. Pump curves: Manufacturer’s catalog curve.
   4. Installation and startup procedures: Manufacturer’s recommendations for installation, adjustment, calibration, and troubleshooting.
   5. Operating procedures: Manufacturer’s recommended step-by-step procedures for starting, operating, and stopping the equipment under specified modes of operation.
6. Preventive maintenance procedures: Manufacturer's recommended steps and schedules for maintaining the equipment.

E. Contingency plan for the following:

1. Non-compliance Event.
2. Discharge rates require reduction from the maximum.
3. Discontinued Discharge.
4. Treatment system improvements necessary to meet discharge requirements if existing treatment system fails to meet discharge requirements.
5. Additional BMPs to bring discharge into compliance.

1.11 SANITARY AND COMBINED SEWER DISCHARGE AND OFFSITE DISPOSAL DOCUMENTATION

A. Treatment and Disposal:

1. Submit a report outlining how discharges to the sanitary and combined sewer will be treated and/or disposed of:
   a. Report to be prepared by a licensed Professional Engineer registered in the State of Washington in accordance with Chapter 173-240 WAC.
   b. Include design criteria and calculations for all major equipment, including but not limited to pumps, tanks, dosing pumps, and mixers.
   c. Submit all modifications with the approval of the Professional Engineer when treatment system is modified.
   d. Method to convey or truck Site Water from the Site.
   e. Site water discharge to sanitary sewer is acceptable under the conditions of the King County Industrial Waste Wastewater Discharge Permit. See Section 01 41 26, Permits, and Article 1.09, herein.
   f. Discharge of Site sanitary sewage from Contractor sanitary facilities to the Sanitary Sewer System is acceptable.
   g. Trucking Plan:
      1) Required for all trucking of Process Water and Site Water not disposed of in the sanitary sewer.
      2) Provide name, address, and telephone number of firm responsible for trucking.
      3) Method of measuring discharge rate.
      4) Truck capacity or capacities.
      5) Training provided to truck operators in discharge procedures and spill response.
      6) In the event of a spill:
a) Emergency contact person to handle the spill.

b) Steps taken by truck operator.

g. KCDNRD approval of the pretreatment facility plan and a site inspection are required prior to commencing of any discharges to the sewer system.

B. Non-compliance Event Notification:

1. Immediately notify the Resident Engineer of the Non-compliance or becoming aware of a Non-compliance Event.

2. Submit a written report of the violation describing the Non-compliance. Report shall include the following:
   a. Exact dates and times of the Non-compliance Event.
   b. List of permits with parameters in non-compliance.
   c. List of parameters not in compliance with permit conditions.
   d. Steps taken or planned to prevent reoccurrence of the Non-compliance.
   e. Water quality data in accordance with the requirements of the NPDES Discharge Permit.

3. Submit the report within two days after the initial event occurrence or one day after receiving laboratory results, whichever time is shorter.

C. Contingency plan:

1. Waste discharge limits exceeded.


3. Discharge maximum rates require reduction from the maximum.

4. Discontinue discharge immediately upon notification by Resident Engineer.

5. For treatment system improvements necessary to meet discharge requirements if existing treatment system fails to meet discharge requirements.

1.12 CHEMICAL USAGE DOCUMENTATION

A. Document and submit chemicals used to treat water discharged to Surface Water, Combined Sewer, and Sanitary Sewer Systems.

B. Document the following:

1. Identification of chemical used.

2. Commercial source.


4. Quantities used.

5. Quantities of water treated.
6. Dosage rate.

C. Provide Certification as described in the article 1.13 below.

D. Maintain a daily log for all use.

E. Submit daily logs monthly no later than the third day of each month.

1.13 CERTIFICATION

A. Monitoring reports, non-compliance notifications, and chemical usage documentation shall have the following certification:

1. “I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

1.14 PERMITS OBTAINED BY SOUND TRANSIT AND THE CONTRACTOR

A. Notice of Intent for coverage under the existing Sound Transit NPDES Permit No. WA-003192-5. Contractor will be named as a co-permittee to Sound Transit’s existing individual construction stormwater NPDES permit.

1. Refer to Section 01 41 26, Permits, for additional requirements of the Permit.

2. Permit is an Individual Permit which requires requirements more stringent than a General Permit that typically applies to construction work.

3. Authorizes the discharge of stormwater and uncontaminated groundwater associated with construction activities to waters of Washington State in conjunction with authority and approval of local jurisdictions.

4. Does not authorize illicit discharges, including spills of oil or hazardous substances, nor does it relieve entities from obligations under State and Federal laws and regulations pertaining to those discharges.

5. Does not include water rights to allow beneficial use of groundwater or surface water.

6. Requires monitoring as specified herein.

7. Limits quantity of discharge as specified herein.

8. Maintain a copy of NPDES Permit at each construction Site office as part of the Reference Documents.

B. Wastewater Discharge Permit:

1. Refer to Section 01 41 26, Permits, for additional requirements of the Permit.

2. Obtained by Sound Transit for the North Link Project from King County at the request of the Contractor.
3. Authorizes discharge into the sanitary sewer/combined sewer at identified locations as indicated on the Contract Drawings.

4. Requires monitoring as specified herein.

5. Limits quantity of discharge.

6. Maintain a copy of the Wastewater Discharge Permit at each construction Site office, as part of the Reference Documents.

PART 2 - PRODUCTS

2.01 RAIN GAUGE

A. Minimum requirements:

1. Install and maintain a rain gauge until Notice of Substantial Completion is given.

2. Install with no obstructions in the area, described as a cone with a 45 degree vertical boundary.

3. For manual rain gauge: After reading the rain gauge, discard water from the previous day.

4. Accurate to within 0.10 inch.

5. If a plastic gauge is used:
   a. Gradations: at a minimum every 0.05 inches.

2.02 Monitoring Instrument

A. Use field equipment in-situ:

1. Temperature, turbidity, pH, dissolved oxygen (DO).

2. Rugged, small, portable and waterproof.

3. Meet the requirements in Table 3.
TABLE 3 - FIELD INSTRUMENT SPECIFICATIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
<th>Accuracy</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>DO</td>
<td>0 to 20 milligrams per liter (mg/L)</td>
<td>within 0.1 if DO is 8 mg/L or less within 0.2 if DO is greater than 8 mg/L</td>
<td>0.01 mg/L</td>
</tr>
<tr>
<td>pH</td>
<td>0 to 14 units</td>
<td>within 0.2 units</td>
<td>0.01 units</td>
</tr>
<tr>
<td>Temperature</td>
<td>negative 5 to 50 degrees C</td>
<td>within 0.10 degrees C</td>
<td>0.01 degrees C</td>
</tr>
<tr>
<td>Turbidity</td>
<td>0 to 1,000 Nephelometric Turbidity Units(NTU), with range selection of 0 to 9.99, 0 to 99.9 and 0 to 1000 NTU</td>
<td>within 2 percent of reading; within 3 percent if turbidity is 500 NTU or more</td>
<td>0.01 NTU on lowest range</td>
</tr>
</tbody>
</table>

4. Acceptable manufacturer:
   a. Hydrolab.
   b. YSI MS5.
   c. LaMotte 2020 can be used for turbidity.
   d. Approved equal.

PART 3 - EXECUTION

3.01 PREPARATION
   A. Post sign at all Sites with name and phone number of the Construction Site Environmental Management Supervisor.

3.02 FIELD QUALITY CONTROL
   A. Site Tests
      1. NPDES Permit Monitoring:
         a. General:
            1) Collect water samples for all point of discharge locations and receiving water upstream and downstream monitoring locations at the minimum frequencies indicated.
            2) Increase monitoring frequency whenever indicated.
         2. Collect water samples for all construction locations according to Table 4.
### TABLE 4 - NPDES MONITORING REQUIREMENTS FOR SURFACE WATER

<table>
<thead>
<tr>
<th>Category</th>
<th>Parameter</th>
<th>Units</th>
<th>Sample Point</th>
<th>Minimum Sampling Frequency</th>
<th>Sample Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stormwater</td>
<td>Turbidity</td>
<td>NTU</td>
<td>Point of Discharge</td>
<td>Rain Event(^2)</td>
<td>Grab</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Receiving Water Upstream Monitoring Locations</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Receiving Water Downstream Monitoring Locations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stormwater</td>
<td>pH</td>
<td>Std. Units</td>
<td>Point of Discharge</td>
<td>Rain Event(^2)</td>
<td>Grab</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Receiving Water Upstream Monitoring Locations</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Receiving Water Downstream Monitoring Locations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stormwater</td>
<td>Total Petroleum Hydrocarbons</td>
<td>Mg/L</td>
<td>Discharge Point</td>
<td>When oil sheen is visible in receiving waters or work area</td>
<td>Grab</td>
</tr>
<tr>
<td>Stormwater</td>
<td>Flow</td>
<td>gallons/day</td>
<td>Point of Discharge</td>
<td>Daily</td>
<td>Grab</td>
</tr>
<tr>
<td>Dewatering Water</td>
<td>Flow</td>
<td>gallons/day</td>
<td>Point of Discharge</td>
<td>Daily</td>
<td></td>
</tr>
<tr>
<td>Dewatering Water</td>
<td>Turbidity</td>
<td>NTU</td>
<td>Point of Discharge</td>
<td>Daily</td>
<td>Grab</td>
</tr>
<tr>
<td>Dewatering Water</td>
<td>Total Petroleum Hydrocarbons</td>
<td>Mg/L</td>
<td>Discharge Point</td>
<td>When oil sheen is visible on impoundment or discharge</td>
<td>Grab</td>
</tr>
<tr>
<td>Dewatering Water</td>
<td>pH</td>
<td>Std. Units</td>
<td>Point of Discharge</td>
<td>Daily</td>
<td>Grab</td>
</tr>
</tbody>
</table>

1. When stormwater and groundwater are combined, testing of both categories is required.

2. Within 24 hours of every 0.25-inch rainfall event, not to exceed three times per week.

3. **Rain gauge:**
   a. Read each Day (Monday through Sunday) at 9:00 AM local time and record in daily log.
4. Frequency of monitoring is modified in Table 4 after a Non-compliance Event. See Article 3.02A.14.f herein for frequency of monitoring after a Non-compliance Event.

5. Samples and measurements representative of the volume and nature of the monitoring parameters, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions affecting effluent quality.


7. Sample collection: Start at the most downstream location and work upstream.

8. Wear new, clean vinyl gloves when sampling at each discharge location.

9. Record instrument calibration records in logbooks at each discharge site and have them available for inspection. Record in waterproof, indelible, blue or black ink.

10. NPDES permit parameters other than those listed above will be monitored by Sound Transit (ST). Provide access to allow such sampling to occur.

11. The Resident Engineer will collect monitoring samples in addition to those listed in this Section and test for constituents both listed in this Section and additional constituents. If results from the sampling indicate a Non-compliance Event, the Resident Engineer will notify the Contractor.

12. Discharge Monitoring to Sanitary Sewer:

a. Monitor nonpolar fats, oils, grease (FOG), pH, and settleable solids at each Site where there is a discharge according to Table 5.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Volume</th>
<th>Sampling Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonpolar FOG</td>
<td>For any discharge</td>
<td>Once per month</td>
</tr>
<tr>
<td>pH and Settleable Solids</td>
<td>1 to 20,000 gallons per day</td>
<td>Once per day</td>
</tr>
<tr>
<td></td>
<td>20,000 to 30,000 gallons per day</td>
<td>Twice per day</td>
</tr>
<tr>
<td></td>
<td>30,000 to 50,000 gallons per day</td>
<td>Three times per day</td>
</tr>
<tr>
<td></td>
<td>Over 50,000 gallons per day</td>
<td>Four times per day</td>
</tr>
</tbody>
</table>

b. Record nonpolar FOG as follows:

1) Collect three grab samples of equal volume collected at least five minutes apart and analyzed separately.

2) Report total nonpolar FOG as average of the three samples.

3) If the average value is greater than 100 milligrams per liter, report the three individual sample concentrations.

c. Monitor the pH by grab samples at even time intervals during the day. If a pH violation occurs, make all future pH monitoring with a continuous inline meter.
d. Record the pH and settleable solids measurements as follows:
   1) Date, exact place, and time of sampling.
   2) Dates the analyses were performed.
   3) Person who performed the analyses.
   4) Analytical techniques or methods used.
   5) Results of all analyses.

e. Measure settleable solids by Imhoff cone.

f. Monitor discharge volumes daily with in-line flow meter.

13. Non-compliance Event:
   a. When not in compliance with discharge limits specified herein, take immediate action to stop the violation and notify the Resident Engineer.
   b. Collect a discharge sample and submit new data within one Day of becoming aware of non-compliance.
   c. When discharge pH is in non-compliance, take immediate steps to bring the discharge into compliance. If it is not possible to be in compliance, stop discharge.
   d. In the event of a concentrated solution spill, notify the Resident Engineer immediately and stop the discharge.
   e. Implement the Contingency Plan.
   f. Conduct monitoring twice daily after a violation is documented until three consecutive daily samples show the discharge(s) is in compliance.

14. Quantity Limitations:
   a. Implement the Contingency Plan if discharge maximum rates indicated above require reduction from the maximum or discontinue discharge immediately upon notification by Resident Engineer.

B. Inspection

1. Grant the Resident Engineer, City of Seattle, other jurisdictional agencies, and representatives from Ecology the rights of access to:
   a. Enter the Site where a discharge is located or where all submittals and monitoring logs are kept.
   b. View and copy submittals and monitoring logs.
   c. Inspect any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required.
   d. Sample or monitor any substances or parameters at any location for purposes of assuring Contract compliance.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:
   1. Existing and new product requirements.
   2. Procedures for selecting products.
   3. [Sound Transit-supplied products.]
   4. Manufacturers' instructions.
   5. Nameplates
   7. Delivery, storage and handling requirements.

PART 2 - PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.

B. Unforeseen historic items encountered remain the property of Sound Transit; notify Sound Transit promptly upon discovery; protect, remove, handle, and store as directed by Sound Transit.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to Sound Transit, or otherwise indicated as to remain the property of Sound Transit, become the property of the Contractor; remove from site and dispose of lawfully.

D. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. [Do not use products having the following characteristics;]
   1. Made outside the United States.
   2. Made using or containing CFCs or HCFCs.
   3. Made of wood from newly cut old growth timber.
C. Where all other criteria are met, Contractor shall give preference to products that:

1. Are extracted, harvested, and/or manufactured closer to the location of the project.
2. Have longer documented life span under normal use.
3. Result in less construction waste.

2.03 PROCEDURES FOR SELECTING PRODUCTS

A. General: The specified requirements for individual products indicated in the Contract are multiple in nature and may include generic, descriptive, proprietary, performance, prescriptive, proscriptive, compliance with standards, compliance with codes, conformance with graphic details, and other similar forms of requirements.

1. Provide products conforming to all specified requirements unless otherwise directed. Other products will be considered only if requested as substitution.
2. Contractor's options: Where an option or choice is indicated, provide only one of the options. The choice of an option is the Contractor's. Where submittals are required, state which option has been chosen.
3. An option is not a consideration of whether a product or method shall be provided, but which of the several indicated products or methods shall be provided.
4. Non-compliance of a named product: If it is known that a named product or product source does not comply with requirements or is no longer available, advise the Resident Engineer before proceeding.
5. Equivalent materials and equipment: Whenever a material or article is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, the specific item mentioned is understood as establishing type, function, dimension, appearance, and quality desired. Another manufacturer's product may be acceptable provided that it is not a "Designated Matching Product or a "no substitution" product, and provided that sufficient information is submitted as required by Section 01 33 00, Submittal Procedures, to allow the Resident Engineer to determine that products proposed are equal to those named.

B. Procedures: The Contractor's options for selecting products are limited by the specified requirements and governing regulations. Following are some of the various selection procedures for specified requirements:

1. Characteristics or Performance Requirements: Provide products that comply with the specific qualities indicated, and which are recommended or certified in writing by manufacturer for the specific use indicated. General performance of a product is implied where product is specified for specific performances.
2. Prescriptive Requirements: Provide products produced in accordance with the prescriptive requirements, using the specified ingredients and components, and complying with the specified requirements for mixing, fabricating, curing, finishing, testing, and similar operations.
3. Standards, codes, and regulations: Provide product that complies with the specified standards, codes, and regulations and with the other requirements.
4. Or Approved Equal: Where named products or sources are accompanied by the term "or approved equal" or other language of similar effect, provide one of the specified products, or submit a request for substitution for a product not named, in accordance with the General Conditions, which the Contractor judges to be of equal or better quality.

5. Product names: Unless otherwise indicated, products identified by name mean a manufacturer's product as recorded in published literature, of latest issue preceding the date of Contract Documents. Submit request for substitution in order to use products of a later or earlier model.

6. Visual Matching: Where matching an established sample is required, the Resident Engineer will make final judgment of whether a product proposed by Contractor matches the sample satisfactorily.

7. Visual Selection: Where product requirements include "... as selected from manufacturer's standard colors, patterns, textures..." or words of similar effect, the selection of manufacturing source and basic product, which complies with the requirements, is the Contractor's option, but the selection of color, pattern and texture is the Resident Engineer's responsibility.

C. Non-Conforming Products: Use of a product not conforming to specified requirements may only be approved by means of a request for substitution as specified elsewhere.

D. Precedence of Specification by Characteristics, Reference Standard, and Source: If it occurs that a product cannot be supplied to meet all requirements, the following order of precedence will be followed:

1. Characteristics: For product specified by characteristics or description, and also by reference standard or by source and name, the specified characteristics or description shall take precedence.

2. Reference standards: For product specified by reference to a published standard, and by source or name, the reference standard shall take precedence over the source.

E. Request for Substitutions: Refer to Section 01 25 00, Substitution Procedures.

2.04 [SOUND TRANSIT-SUPPLIED PRODUCTS]

A. See Section 01 64 00, Owner-Furnished Materials and Equipment, for identification of Sound Transit-supplied products.

B. Sound Transit's Responsibilities:

1. Arrange for and deliver Sound Transit reviewed shop drawings, product data, and samples, to Contractor.

2. Arrange and pay for product delivery to site.

3. On delivery, inspect products jointly with Contractor.

4. Submit claims for transportation damage and replace damaged, defective, or deficient items.

5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:

1. Review Sound Transit reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with Sound Transit.

3. Handle, store, install and finish products.

4. Repair or replace items damaged after receipt.

2.05 MANUFACTURERS’ INSTRUCTIONS

A. When the Contract Documents require that installation of work comply with manufacturers’ instructions, obtain and distribute copies of such instructions to parties involved in the installation and [-seven] copies to the Resident Engineer. Maintain one set at the site until installation is complete.

B. Handle, install, connect, clean, condition, and adjust products in strict compliance with the instructions and specified requirements. Should job conditions or specified requirements conflict with the manufacturers’ instructions, notify the Resident Engineer. Handle all equipment in strict accordance with the manufacturer’s written handling instructions.

C. Perform work in accordance with the manufacturer’s instructions. Do not omit any steps unless specifically modified or exempted by the Contract Documents.

2.06 NAMEPLATES

A. Except as otherwise indicated for required labels and operating data, attach or imprint manufacturer’s or producer’s nameplates or trademarks on exposed surfaces of the products either in occupied spaces or on the exterior of the work.

B. Labels:
   1. Locate required product labels and stamps on a concealed surface.
   2. Attach labels where required for observation after installation, on inconspicuous accessible surfaces in occupied spaces.

C. Equipment Nameplates:
   1. Provide a permanent nameplate on each item of service-connected or power-operated equipment. Indicate the manufacturer, product name, model number, serial number, capacity, speed, ratings, and similar essential operating data. Equipment nameplates shall be stainless steel.
   2. Locate nameplate on an accessible surface, which, in occupied spaces, is not conspicuous.

2.07 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra products of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt from Resident Engineer prior to final payment.

PART 3 - EXECUTION

3.01 TRANSPORTATION

A. Transport products in accordance with manufacturer’s instructions.
B. Pack and brace items while transporting to the site from the plant of manufacture to prevent damage. Protect all items from conditions, which might have a detrimental effect.

3.02 DELIVERY

A. Deliver materials in original containers or packages in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

1. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

2. Do not remove from containers or destroy labels until ready for installation unless approved by the Resident Engineer.

3. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

B. Designate receiving/storage areas for incoming materials so that they are delivered according to installation schedule and long-term storage at Project site and overcrowding of construction spaces is minimized.

1. Place materials convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

C. Verify that equipment and installation supplied under other contracts, but required for the work in this Contract, are compatible.

3.03 STORAGE

A. All equipment and materials shall be stored in accordance with the manufacturer's recommendations, or as specified in the Contract Documents to preserve their quality and fitness for the Work.

1. Stored equipment and materials, although determined acceptable for the Work upon delivery or during storage, must again be inspected by the Contractor before their incorporation into the Work.

2. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

B. Provide weatherproof, secure storage for materials and equipment at Project site. Coordinate location with Owner. Organize and arrange storage for accessibility for inspection, measurement of quantity or counting of units, and for efficient and timely installation.

1. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

2. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

3. Protect stored material from damage and from sunlight. Do not mark in a manner that will remain visible after installation or which will affect performance or appearance.
4. Protect stored products from damage and liquids from freezing.

5. For exterior storage of fabricated products, place on level supports above ground.


C. Store materials in a manner that will not endanger Project structure.

D. [Sound Transit-furnished materials or materials paid for before incorporation shall be stored in secure locations approved in writing by Sound Transit in a manner that will preserve their full value. Such materials shall be prominently labeled as property of Sound Transit and shall not be commingled with non-Sound Transit materials. If necessary, storage shall be in controlled environment buildings.]

E. [Off-Site Storage:]

1. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

2. Label with project name, project address, and Contractor name. Insure for full replacement value.

3. If requested by the Contractor and approved in writing by Sound Transit, Sound Transit may make payment to the Contractor for products stored off-site prior to their installation. Such payment will be approved by Sound Transit, only when Contractor has furnished evidence, satisfactory to Sound Transit, of compliance with conditions the General Conditions of the Contract and, in addition, documentation outlining type and location of storage facilities and a method of inventory suitable to account for all such materials and products until installed in the Work.

3.04 HANDLING

A. Handle products in accordance with manufacturer's instructions when off-loading equipment and materials at jobsite.

B. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

C. Handle all materials and equipment to be incorporated in the Work in a manner that will prevent misalignment of parts or the occurrence of damage of any kind.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY
A. This Section includes specifications for the acceptance, unloading, handling, storage, protection, and utilization of materials and equipment furnished by Sound Transit for installation by the Contractor, including installation supervisors, pursuant to the General and Special Conditions.

1.02 ABBREVIATIONS:
A. Sound Transit-furnished materials and equipment may be referred to herein and in other Sections, where applicable, by the abbreviations OFM (Owner Furnished Materials) and OFE (Owner Furnished Equipment) respectively.

1.03 SOUND TRANSIT-FURNISHED MATERIALS AND EQUIPMENT:
A. The materials and equipment to be furnished by Sound Transit for installation by the Contractor are specified in the Contract Documents.

1.04 CONTRACTOR'S RESPONSIBILITIES
A. Requirements: Assume custody of, and provide protection for OFE and OFM from the time of delivery and acceptance until Substantial Completion of the Work and the return of excess materials and equipment.

B. Protection: Protect OFE and OFM while in custody from theft, vandalism, loss, damage, and deterioration due to moisture and temperature during unloading, storing, handling, distributing, and installing the materials and equipment. Lost or damaged materials and equipment, as documented by Sound Transit, shall be replaced by the Contractor at no additional cost to Sound Transit.

C. Delivery Schedule:
1. OFE and OFM shall be delivered by the respective suppliers to the delivery sites indicated, within the dates indicated in the Contract Documents. OFE and OFM will be delivered to the delivery sites between the hours of 10:00 a.m. and 3:00 p.m., Monday through Friday.

2. The method and rate of material delivery shall be determined by the respective suppliers, and this information will be reported by Sound Transit to the Contractor at least 1 month before the initial delivery of each type of material.

3. Make all requests for modification to the delivery method, location, rate, or date(s) through the Resident Engineer. Should an agreement be reached to modify a delivery parameter, pay all additional costs due to the modification.

D. Unloading: Provide the labor, equipment, and materials necessary to unload, handle, stockpile, and store OFM and OFE. Unload and stockpile or store OFE and OFM within 4 hours of their arrival at the delivery site. Ensure that unloading and handling is in accordance with the respective supplier's requirements. A Sound Transit representative will verify the quantity and condition of materials delivered.
E. Storage Plan: Prepare a storage plan for each storage area where OFM and OFE are proposed to be stored or stockpiled. Make the plan sufficiently detailed to demonstrate that efficient handling environmental controls and security provisions have been provided, that supporting soils will not be overloaded, and that materials will not be overstressed due to bending or shear. Place no material or equipment directly on the ground. Provide cribbing. Provide and keep a current inventory of the materials on hand. Notify the Resident Engineer at least 30 days in advance of anticipated shortages.

F. OFM and OFE Acceptance: Inspect OFE and OFM at time of delivery by the respective suppliers to the delivery sites, and submit certification to the Resident Engineer showing the quantity of accepted materials and equipment. Set aside damaged materials and equipment, and immediately notify the Resident Engineer and the delivery carrier in writing of the damage and circumstances of discovery.

G. Inventory Records: Prepare and maintain perpetual inventory records of Sound Transit-furnished materials and equipment, and assign stock number, date of receipt from Sound Transit, and approximate date of construction placement. Ensure that all checkouts and returns of OFE and OFM or other transfer of materials and equipment between the Contractor and Sound Transit is accompanied by an inventory record form.

H. Excess Materials: Upon Substantial Completion of the Work, transport, unload, and stockpile, excess OFE and OFM to a delivery location within a 25-mile radius of the jobsite, as determined by the Resident Engineer.

1.05 INSTALLATION

A. Install OFE and OFM accurately and efficiently to avoid waste, such as that due to incorrect or inaccurate installations. Replace wasted materials and equipment, as documented by the Resident Engineer, at no additional cost to Sound Transit.

1.06 INSTALLATION INSTRUCTIONS, TRADESMEN, AND SUPERVISION

A. The Resident Engineer shall provide the Contractor with installation instructions and drawings from the manufacturers of OFE. In addition, the assembly, installation, and testing of the major and more complex items of mechanical equipment, electrical and electronic equipment, and communications and radio equipment shall be performed under the technical supervision of installation supervisors from the various manufacturers' organizations.

B. Be responsible for providing appropriate tradesmen experienced in the installation and operation of similar equipment.

C. Installation supervisors' services for OFE will be obtained by and at the expense of Sound Transit, and the installation supervisor will be made available, as specified.

D. Be responsible for coordinating the work and cooperating with the Resident Engineer in scheduling the time when each installation supervisor will be needed in order to best conform with the installation and testing schedules and still allow sufficient advance notice to the manufacturer for scheduling the most suitable installation supervisor.

E. Be responsible for work performed in the absence of the installation supervisor, or work which does not conform to such supervisor's instructions. Correct errors in resulting assembly or installation without additional cost to Sound Transit.

F. The Contractor shall not be held responsible for faulty manufacture of the equipment or for errors in the manufacturers' assembly drawings.
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

A. DESCRIPTION

1. This Section includes specifications for the following:
   a. Organization and mobilization of Contractor's forces, staffed and ready for commencing and prosecuting the work.
   b. Design, fabrication and transportation of construction plant and equipment to the site and setting up of same;
   c. Transporting various tools, materials, supplies, equipment and appurtenances to the site; and
   d. Erection of temporary buildings and facilities required for staging and construction operations.

2. Mobilization shall also include assembly and delivery to the site of plant, equipment, materials, and supplies necessary for the prosecution of work which are not intended to be incorporated in the work; the clearing of and preparation of the Contractor's work area; the complete assembly, in working order, of equipment necessary to perform the required work; personnel services preparatory to commencing actual work; and all other preparatory work required to permit commencement of the actual work on construction items for which payment is provided under the Contract.

B. SUBMITTALS

1. A layout of the construction sites including fences, roads, parking, buildings, staging, and storage areas, within 30 Days after the Notice to Proceed date.

C. DELIVERY

1. Delivery to the jobsite of construction tools, equipment, materials, and supplies shall be accomplished in conformance with local governing ordinances and regulations.

D. TOOLS AND SUPPLIES

1. Provide construction tools, equipment, materials, and supplies of the types and quantities that will facilitate the timely execution of the work.

2. Provide personnel, products, construction materials, equipment, tools, and supplies at the jobsite at the time they are scheduled to be installed or utilized.

E. PLANT LOCATION

1. Locate plant, or plants, appropriately close to the portion of the work for which it will be used.
F. DEMOBILIZATION

1. Upon completion of the work, remove construction tools, apparatus, equipment, unused materials and supplies, plant, temporary facilities, and personnel from the jobsite.

2. Restore all areas utilized for the Contractor’s temporary facilities and staging purposes to their original, natural state or, when called for in the Contract Documents, complete such areas as indicated.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY
A. This Section includes specifications for surveying of the work and for field measurement of work quantities.
B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 01 78 39, Project Record Documents.
   2. Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork.

1.02 SUBMITTALS
A. Procedures: Section 01 33 00, Submittal Procedures.
B. Qualifications.
C. Cut sheets for all open cut pipeline and pavement restoration work.
D. Survey field notes and all survey calculations.
E. Record Drawings (as-built drawings):
   2. In accordance with Section 01 78 39, Project Record Documents.
   3. In Adobe Acrobat 7.0 or later PDF format.
F. Settlement monitoring surveys per Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork.
G. Survey records upon request.

1.03 QUALITY ASSURANCE
A. Qualifications:
1.04 PROJECT CONDITIONS

A. Only the Construction Control monuments and benchmarks generally referred to as Construction Control Points (CCPs) will be provided by Sound Transit. Use Sound Transit surveys to control establishment of the lines and grades required for completion of the work. CCPs for vertical and horizontal control are indicated on the Contract Drawings.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONSTRUCTION

A. General:
   1. Perform all survey work by a Licensed Professional Land Surveyor registered in the State of Washington.
   2. Verify and maintain CCPs as shown on the Contract Drawings;
   3. Establish and maintain all secondary or additional survey control needed for the project;
   4. Establish and maintain all alignment, slope, grade, clearing limit, and grading limit stakes, hubs, or marks;
   5. Construct to dimensions, locations, lines, grades, and elevations as shown on the Contract Drawings or as specified;
   6. Perform all survey work in conformance with survey requirements imposed by State of Washington, City of Seattle or University of Washington on the work through a permit, development condition, law, or regulation;
   7. Develop and maintain detailed survey records that allow the survey work to be reproduced.

B. Lines And Grades
   1. Using the CCPs, develop and make additional surveys as needed for construction, such as secondary control, control lines, slope stakes, settlement markers, batter boards, stakes for pipe locations, and other working points, lines and elevations. Re-establish all benchmarks and survey control points destroyed.
   2. Maintain and preserve all monuments, stakes and markers outside the construction limits. In the event that monuments, stakes or markers are destroyed or damaged, replace them at no cost to the Owner. Provide new replacement monuments and boxes when removed or damaged during construction.
   3. Be responsible for all other stakes or markers required to establish the lines and grades for the completion of the work.
C. Surveys For Layout And Performance

1. Perform all surveys for layout and performance of the Work, reduce the field notes, and make all necessary calculations and drawings to carry out such work. Check the relative positions of all monuments and benchmarks each time monuments or benchmarks are used.

2. Be responsible for correctly locating all lines and grades required to perform the construction from the Construction Control Points furnished on the Contract Drawings.

3. Use instruments and other survey equipment that are accurate, suitable for the surveys required in accordance with recognized professional standards, and in proper condition and adjustment at all times. Instrument calibrations is to be carried out prior to the start of survey work and every 12 months thereafter. Furnish calibration reports upon request.

4. Record all surveys in field notebooks. Furnish a certified copy of the original pages of records to the Resident Engineer upon request. Furnish each field notebook to the Resident Engineer when filled or completed.

5. The Contractor’s surveys are a part of the Work and may be checked by the Owner at any time. Be responsible for lines, grades, or measurements which do not comply with specified or proper tolerances, or which are otherwise defective, and for the resultant defects in the Work. Conduct resurveys or check surveys to correct errors indicated by review of the field notebooks.

6. The Resident Engineer may require that work be suspended at any time when location and limit marks established by the Contractor are not reasonably adequate to permit inspection of the work.

7. In advance of the restoration paving, produce survey information to check the line and grade used for paving elevations and slopes.

8. Comply with the survey requirements for all monitoring as specified in Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork.

D. Surveys For Tunnels, Shafts And Underground Stations

1. Maintain control for line and grade within the tunneled sections.

2. Complete an optical survey and immediately provide survey results for the actual tunnel alignment, grade, and ring roundness on a weekly basis or at 300-foot intervals in the tunnel progress, whichever comes first. Immediately verify apparent changes in location and notify the Resident Engineer.

3. Adjust the published coordinates (horizontal and vertical) of these survey points as necessary and provide the revised coordinates to the Resident Engineer as soon as possible after verification of the location information.

4. Follow up the surveys with a Record Drawing, indicating the results of the survey and any deviation from the tolerances.

E. Surveys For Measurement For Payment

1. Perform surveys for all Schedule of Value items measured by surveying methods.
2. Perform all surveys, in the presence of the Resident Engineer who will witness the surveying operation by signing the field notes or keeping duplicate field notes. Reduce the field notes and calculate quantities for payment purposes. Provide a duplicate copy of the note reductions and calculations when requested by the Resident Engineer.

F. Surveys For Record Drawings (As-built Drawings)

1. Be responsible for performance of surveys as are required to accurately indicate the record (as-built) information for all major components of the Work or as required elsewhere in these Contract Documents.

G. Surveying Accuracy And Tolerances In Setting Survey Stakes

1. Perform all control traverse field surveys and computations, including surveys of main control lines to determine alignment of major structure components, to a precision of at least 1:20,000 after azimuth closure and adjustment.

2. Set survey stakes to the tolerances in Table 01 71 23 A, herein, unless otherwise specified to stricter tolerances elsewhere in the Contract Documents. Table 01 71 23 A does not otherwise relieve the Contractor of responsibility for measurements in compliance therewith.

3. Do not exceed the following tolerances in setting survey stakes:

<table>
<thead>
<tr>
<th>TABLE 01 71 23 A - SURVEYING ACCURACY AND TOLERANCES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Horizontal Survey Stake or Markers</strong></td>
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<tr>
<td><strong>Distance</strong></td>
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<tr>
<td>Horizontal markers on hubs and monuments on centerlines and offset centerlines</td>
</tr>
<tr>
<td>Intermediate stakes or markers on centerlines and offset centerlines for:</td>
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<tr>
<td>Rough excavation and embankment for roads and other work not otherwise provided</td>
</tr>
<tr>
<td>Trimming of excavation and embankment, unless otherwise provided</td>
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<tr>
<td>Structures, building construction</td>
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<tr>
<td>Equipment installation</td>
</tr>
<tr>
<td>Trimming or preparation of earth subgrade for roadways, trackway, concrete pipe, and other concrete structures</td>
</tr>
<tr>
<td>Trackway sub-ballast, roadway sub-base and base, steel pipe and other work not otherwise provided for</td>
</tr>
<tr>
<td>Roadway surfacing, steel reinforcement, concrete pipe and other formed concrete</td>
</tr>
<tr>
<td>Vertical Grade Stakes or Markers for:</td>
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<tr>
<td>Rough excavation and embankment for trackway, roads and other work not otherwise provided for</td>
</tr>
<tr>
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</tbody>
</table>
PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies protection and maintenance of underground and aboveground utilities, structures, fences, parking strips, sidewalks, driveways, streets, and other improvements which may be affected by the work, and specifies requirements for Contractor disposition of third party claims in a timely manner.

B. [Related Sections:]
   1. Section 01 56 39, Temporary Tree and Plant Protection.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. Revised Code of Washington (RCW)

2. Washington Administrative Code (WAC)
   a. WAC 296-155 Part N Excavation, Trenching, and Shoring.
   b. WAC 296-24-960 Working on or Near Exposed Energy Parts.

1.03 DEFINITIONS

A. Conflict: An existing major underground utility is considered to be in Conflict if:

1. It crosses or projects into the specified excavation at an elevation between the top and bottom of the proposed Facility.

2. When parallel to a proposed Facility within the zone-of-influence (1:1).

3. If the proposed Facility does not meet the above listed requirements, then no Conflict exists.

B. Facility: A real property entity consisting of one or more of the following: an underground or aboveground utility system or structure, pavement, or other improvement.

C. Major underground utility: A transmission, collection, or distribution line where it would be customary to expect that drawings would exist for the line and the utility owner would be aware of the line.

D. Minor underground utility: Services from a collection or distribution line such as irrigation lines less than four (4) inches, water service lines, building drainage pipes, and direct burial cable.
E. Utility Quality Level: An opinion of the quality and reliability of existing subsurface utility information. Each of the existing utility data quality levels is established by different methods of data collection and interpretation.

F. Utility Quality Level B: Information obtained through the application of appropriate surface geophysical methods to determine the existence and approximate horizontal position of existing subsurface utilities. This information was surveyed to applicable tolerances, reduced, and indicated on the Contract Drawings.

G. Utility Quality Level C: Information obtained by surveying and plotting visible above-ground utility features and by correlating this information to Quality Level D information. This information was reduced and indicated on the Contract Drawings.

H. Utility Quality Level D: Information derived from existing records or oral recollections. This information was interpreted and indicated on the Contract Drawings.

1.04 SUBMITTALS

A. Listing and schedule of all potholing.

B. Listing of all utilities/facilities to be physically protected and relocated.

C. Shoring plans for all affected structures and utilities.

1. Methods proposed are required to be reviewed and accepted by the affected utility prior to submittal, in accordance with Section 01 33 00, Submittal Procedures and Section 31 50 00, Excavation Support and Protection.

D. Qualifications for independent third party pre-construction inspectors for utilities and buildings.

E. Copies of all pre-construction inspections and surveys of utilities and buildings.

1.05 QUALITY ASSURANCE

A. Building Surveyor: Independent, third party inspection firm shall have a minimum of five (5) years performing work of similar nature.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 LOCATION OF EXISTING FACILITIES

A. General:

1. Data for underground utilities have been obtained, reduced/interpreted and indicated on the Contract Drawings.

2. The locations of existing major utilities, whether aboveground or underground, are indicated on the Contract Drawings.

3. Sound Transit does not guarantee the accuracy or completeness of the information indicated on the Contract Drawings.

4. Other aboveground or underground facilities not indicated on the Contract Drawings may be encountered during the course of the work.
B. Abide by all the applicable requirements of Chapter 19.122 RCW.

C. Utility Underground Notification Center:
   1. Call One-Call Utilities Locate Center (800-424-5555) for location of underground utilities. Notify other non-member utilities as necessary.
   2. Be responsible for damages to any utilities. Repair damage to the requirements of the utility owner prior to backfilling said utility.
   3. Those utility owners who do not locate their facilities in accordance with Chapter 19.122 RCW are liable for costs incurred by the Contractor for affects of the utility on the Contractor's work. Promptly notify the Resident Engineer prior to all work in the area of a utility where a utility owner fails to meet its obligations under Chapter 19.122 RCW.
   4. If underground facilities are discovered which are not indicated on the Contract Drawings, immediately notify the Underground Notification Center, and the Resident Engineer. Provide an as-built survey after notification and put discovered underground facilities on as-built drawings.
   5. Adjust work when location of utility is different than indicated on the Contract Drawings and materially impacts construction.

D. Coordinate efforts to locate existing underground utilities. A minimum of 30 Days prior to work in the location of a utility, review with the Resident Engineer the locations of existing utilities in relation to the work and evaluate areas of Conflict and potential Conflict.

E. Be responsible to excavate (pothole) and expose all major and minor existing utilities prior to the work to determine utility elevations.

F. Protect, modify, and relocate all existing utilities required to complete the work.

G. Be responsible for all relocations that may be affected as a result of the Contractor's means and methods prior to commencing work in the area.

H. Specific means and methods to be utilized by the Contractor are not known to Sound Transit. Be responsible for protection, modification, or relocation of existing utilities and facilities required to accommodate means and methods.

I. Sound Transit will not be liable for utility protection, modification, and relocation not indicated on the Contract Drawings and required by the Contractor due to its means and methods. Determine the requirements of the work required by the Contract Documents and make provision for protection, modification, and relocation required to perform the work.

J. Coordinate all protection, modification, and relocation work with the affected utility owner through the Resident Engineer. Perform work to the utility owners' requirements and standards.

K. Major underground utilities:
   1. Be responsible for all protection, affects, and damages for utility not in conflict with a new facility.
   2. When not indicated on the Contract Drawings and in conflict with a new facility, meet and agree with the Resident Engineer on how to proceed. Reimbursement for additional work will be in accordance with the General Conditions.
3. When not indicated on the Contract Drawings and no conflict with a new facility exists, no additional payment will be considered.

L. Minor underground utilities:
   1. Be responsible for all protection, affects, and damages on minor utilities.
   2. Sound Transit is not responsible for costs resulting from conflicts with minor underground utilities.

M. Remove, plug, or fill abandoned pipelines per the local jurisdiction’s requirements.

N. [Temporary Support Systems: Detail drawings of proposed methods to support, protect, and buttress utilities affected by the work.]

O. [Storm and sanitary sewers:]
   1. Existing live sewers shall remain in service, unless otherwise indicated.
   2. If interruption of sewers is required, provision shall be made for disposal of existing sewage flow.
   3. Immediately repair construction damage to the existing sewer system and manholes to a condition equal to or better than that existing prior to the damage.
   4. Repair all damage which results from the disturbance of the existing sewer.
   5. Remove water accumulating during the work from the new sewers and prevent it from entering existing lines until Substantial Completion.
   6. With the local authority having jurisdiction’s prior approval, flush existing pipes which were affected by the work to the point of the next upstream connection and clean and repair all pipelines or manholes affected by gravel, rocks, or other debris that has entered the existing system during construction.
   7. Connection to an existing manhole or sewer line shall not be made until approved by the Resident Engineer.

P. [Aboveground electrical, cable, and communication facilities:]
   1. Attention is called to all overhead items including, but not limited to, power and telephone lines, King County Metro transit power lines, traffic signals, traffic signal mast arms, overhead sign bridges, sign support span wires, signs, and street lights.
   2. Observe the location of these overhead facilities and plan and conduct work operations accordingly.
   3. Working with the utility owner, take precautions to protect and avoid damage to all overhead facilities.
   4. Relocate Facilities as required to meet the means and methods to be utilized.
   5. Observe and investigate the presence of Facilities that may be affected by the work.
   6. Consult with and rely on the information given by utility owners and operators to determine the extent of all hazards and measures required.
7. Determine the extent of all hazard created by the work in all areas and follow approved safety procedures during the work.

8. Support poles at risk of being undermined by the work.

9. Follow the requirements of WAC 296-24-960 for all energized primary conductors:
   a. For 50 kv lines and less, at no time shall personnel or equipment approach closer than 10 feet to all energized primary conductors.
   b. For greater than 50 kv, meet the requirements of WAC 296-24-960.

Q. [Underground electrical, cable, communication, and fiber optic Facilities:]
   1. Determine the protection necessary to proceed safely to protect these underground Facilities.
   2. Fiber optics:
      a. When not indicated on the Contract Drawings and in conflict with the new facility, meet and agree with the Resident Engineer on how to proceed.
      b. When not indicated on the Contract Drawings and no conflict with the new facility exists, no additional payment will be considered.

R. [Gas:]
   1. As required by the appropriate utility owner, protect, maintain, support in place, or relocate all gas mains crossing pipeline trenches and other elements of the work.
   2. Provide a minimum of 12 inches of clearance, measured from edge to edge, between gas mains or gas service lines and new facilities.
   3. If relocating either utility is not practical, provide a protective wrap for the entire distance where less than 12 inches of vertical clearance and less than 6 inches of horizontal clearance is provided.
   4. Wrapping material: either a split polyvinyl chloride (PVC) pipe or PVC wrapping of at least 0.04 inch in thickness, applied to either one of the pipes.
   5. Protect and maintain all temporary gas service slack lines during pipeline installation.
   6. Notify Puget Sound Energy through the Resident Engineer at least 30 Days in advance of excavation in the vicinity of the high pressure gas main.

S. [Water:]
   1. As indicated in the Contract Documents, protect, maintain, support in place, or relocate water pipelines affected by the work.
   2. Maintain water service along the alignment of work at all times.
   3. Existing thrust blocks are not indicated on the Contract Drawings. Assume that thrust blocks are present at all water line deflections of 11.25 degrees or greater.
   4. Notify the Resident Engineer immediately of all damage. Begin repairs immediately, and work continuously until water service is restored. Coordinate
repair options and all repairs with the utility owner through the Resident Engineer.

T. [Roadways:]
1. Take adequate precautions to protect existing sidewalks, curbs, pavements, utilities, adjoining property, and structures, and to avoid damage thereto.
2. Protect and replace traffic signage, paint striping, and channelization if damaged by the Contractor’s operation.
3. Unless otherwise indicated, maintain the existing illumination pattern for signs and roads at all times.
4. Install temporary roadway lighting as necessary.

U. [Traffic loops:]
1. Be responsible for coordinating with Sound Transit and providing alternative means to regulate traffic flow during the time that the traffic loop is affected by the work.

3.02 [SHORING AND BRACING]
A. Shore up, brace, under-pin, and protect as necessary, the foundations and other parts of existing structures adjoining the site of the work that may be affected by the work.
B. For all loss and damage because of settlements or the loss of lateral or subjacent support of adjoining property and from all loss and damage to adjoining and adjacent structures and their premises that may occur in the prosecution of the work:
C. Comply with the requirements of WAC 296-155-657, as applicable, and Section 31 50 00, Excavation Support and Protection.

3.03 [PRE- AND POST-CONSTRUCTION BUILDING SURVEYS]
A. Have an independent third party perform pre- and post- construction survey inspections.
B. Pre-construction surveys shall document interior and exterior inspections of conditions prior to construction activities, including but not limited to the following:
   1. Hand-written notes.
   2. Audio notes on tape.
   3. Color photographs and/or videos. See Section 01 32 33, Photographic Documentation.
   4. Inspection forms.
C. Document all visible cracks, defects or unusual conditions. Document and record all comments made by property owners during inspections.
D. Coordinate all pre-construction surveys with the Resident Engineer. Do not perform pre-construction surveys unless accompanied by the Resident Engineer.
E. Require third party to maintain the original inspection reports until Final Acceptance.
3.04 EMERGENCIES
A. Whenever work endangers the safety of life or property, including adjoining property or property in the immediate proximity of the work, take all reasonable and prudent actions to prevent threatened loss or injury.

3.05 [DISPOSITION OF THIRD PARTY CLAIMS]
A. Follow procedures required by the Owner Controlled Insurance Policy (OCIP).

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Description: The Contractor shall be responsible for all cutting and patching required to accomplish the Work.

1. Unless otherwise specified, requirements of this Section apply to mechanical and electrical work. Refer to Divisions 20, 22, 23, and 26 for additional requirements and limitations on cutting and patching of plumbing, mechanical, and electrical work.

1.02 SUBMITTALS

A. Written Request: Submit a written request for approval by the Resident Engineer prior to cutting and patching for approval to proceed; written request is required for any cutting or alteration which affects:

1. The work of Sound Transit or any separate contractor;
2. The structural value or integrity of any element of the Project;
3. The integrity or effectiveness of weather exposed or moisture resistant elements or systems;
4. Building aesthetic qualities for exterior areas or in occupied spaces; and
5. The efficiency, operation life, maintenance, or safety of operational systems.

B. Cutting and Patching Proposal: Written request shall include the following:

1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why if cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

C. Structural Elements: Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure to satisfy requirements.

D. Should conditions of work or schedule indicate change of materials or methods, submit written recommendations to Resident Engineer, including:

1. Conditions indicating change.
2. Recommendations for alternative materials or methods.
3. 3. Resubmittal as required for substitution.

E. Approval by the Resident Engineer to proceed with cutting and patching work does not waive the Resident Engineer’s right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

1.03 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load carrying capacity or load deflection ratio. Obtain prior approval from the Resident Engineer of the cutting and patching procedures proposed.

B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety. Obtain prior approval from the Resident Engineer of the cutting and patching procedures proposed.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Resident Engineer’s opinion, reduce the building’s aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching.

1. If possible retain the original Installer or fabricator to cut and patch exposed Work. If it is impossible to engage the original Installer or fabricator, engage another recognized experienced and specialized firm.

2. Remove and replace construction cut and patched in a visually unsatisfactory manner.

1.04 PAYMENT FOR COSTS

A. Contractor shall pay cutting and patching costs caused by ill-timed or defective work, or work not conforming to the Contract Documents.

B. Sound Transit will pay for work done on its written instructions, other than for defective, non-conforming work, or work that is part of the Contract.

C. Sound Transit will not pay for Work done on the instructions of the Resident Engineer, unless the Resident Engineer has authorized or ratified the instructions in writing.

1.05 WARRANTY

A. General: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. Use materials whose installed performance will equal or surpass that of existing materials.
PART 3 - EXECUTION

3.01 INSPECTION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

B. After uncovering work, inspect conditions affecting installation of new products.

C. Report unsatisfactory or questionable conditions to the Resident Engineer in writing and do not proceed with the Work until the Architect has provided further instruction.

3.02 PREPARATION PRIOR TO CUTTING

A. Temporary Support: Provide shoring, bracing, and support as required to maintain structural integrity of the affected portion of the Work.

B. Protection: Protect existing equipment during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.03 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer’s recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.

4. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Where removal of walls or partitions extends from one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.

4. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken area containing the patch, after the patched area has received primer and second coat.

5. Patch, repair, or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.04 CLEANING

A. General: Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Completely remove paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies requirements for cleanup during construction and final cleaning of the site prior to Acceptance, along with administrative and procedural requirements of construction waste management activities.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections not referenced below may also be related to the proper performance of this work.

1. Section 01 57 19, Temporary Environmental Controls.

2. Section 01 57 24, Temporary Site Water Discharge.

1.02 SUBMITTALS

A. Waste Management Plan: Within 21 Days of effective date of NTP.

1. Include proposed methods for salvage, recycling, reuse, and/or disposal of all types of excavated material.

2. Include proposed methods for construction, demolition and land clearing (CDL) waste salvage, reuse, recycling, and disposal during demolition including, but not limited to, one or more of the following:
   a. Contracting with a deconstruction specialist to salvage materials generated.
   b. Selective salvage as part of demolition Contractor's work.
   c. Reuse of materials onsite or sale or donation to a third party.

3. Include proposed methods for CDL waste salvage, reuse, recycling, and disposal during construction including, but not limited to, one or more of the following:
   a. Requiring Subcontractors to take their CDL waste to a recycling facility.
   b. Contracting with a recycling hauler to haul recyclable CDL waste to an approved recycling or material recovery facility.
   c. Processing and reusing materials onsite.
   d. Self-hauling to a recycling or material recovery facility.

4. Include the name(s) of all proposed recycling, material recovery, treatment, and disposal facilities receiving the CDL wastes, including facilities designated to receive “clean fill” material, muck, and all other excavated soils.
a. Include copies of all permits the receiving facility is required to maintain in order to accept the material anticipated to be treated, handled, or disposed of at the facility.

b. Demonstrate that the facility has been provided documentation regarding the nature (physical and chemical characteristics) of the material to be accepted.

c. Provide a contact name, address, email information, and phone number for receiving facility manager.

d. Indicate days and hours of operation for each facility proposed.

5. Handling Procedures:

a. Include methods that will be employed to ensure proper separation of recyclable wastes including sizes of containers, container labeling, and designated location(s) on Project site where materials separation will be located.

b. Provide details on proposed transportation methods for all waste streams, including but not limited to types of vehicles to be employed, all specialty permits required, trucking routes and anticipated vehicle miles per load.

6. Contact Information: Include in the Plan the name and contact information of the person designated as responsible for implementing the Waste Management Plan.

B. Waste Management Report: Submit report concurrent with the final application for payment.

1. Submit a cumulative Waste Management Report in a form acceptable to the Resident Engineer with the final Application for Payment with the following information:

a. A record of the type and quantity, by weight, of each material salvaged, reused, recycled, or disposed.

b. Total quantity of waste recycled as a percentage of total waste.

c. Copy of all receipts issued by a disposal facility for all CDL waste that is disposed in a landfill.

d. Copy of receipts issued by approved recycling facilities for co-mingled materials. Include weight tickets from the recycling hauler or material recovery facility and verification of the recycling rate for co-mingled loads at the facility.

2. Types and quantities, by weight, for materials salvaged for reuse on site, sold or donated to a third party.

C. Summary of Waste Generated: Submit with each application for progress payment.
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CLEANUP DURING CONSTRUCTION

A. Keep the entire site in a neat and orderly condition at all times during construction.
   1. Conduct a general cleanup of the site daily as a part of the work.
   2. Provide general daily clean-up and disposal service for removal of waste and rubbish from the jobsite.
   3. Clean material as necessary prior to incorporating into the work.

B. Dispose and/or recycle waste, trash, and debris in a safe, acceptable manner, in accordance with applicable laws and ordinances.
   1. Bury no waste material and debris on the site.
   2. Burning of trash and debris on the site is prohibited.

C. Remove materials and equipment from the site when no longer necessary.

D. Dust Control: Refer to Section 01 57 19, Temporary Environmental Controls.

E. Provide daily litter pickup within 1/2 block of the job site in all directions. Provide trash receptacles for worker’s lunches, cigarette butts, and other miscellaneous garbage.

3.02 FINAL SITE CLEANUP

A. Prior to final inspection, clean the entire site. Remove from the entire site all construction equipment and facilities, construction waste and unused materials, loose rock and stones, excess earth, and debris of any description resulting from the work.

B. Wash, scrub clean and use a street sweeper where necessary for all pavement and paved walks. Prevent run-off from entering into local storm water conveyance systems unless treated to acceptable limits as specified in Section 01 57 24, Temporary Site Water Discharge.

C. Remove mortar droppings from concrete work and pavement where they occur. Wash and scrub clean all exposed vertical surfaces of concrete. Clean all manholes. Prevent run-off from entering into local storm water conveyance systems unless treated to acceptable limits as specified in Section 01 57 24, Temporary Site Water Discharge.

D. Clear and clean drainage systems.

3.03 WASTE MANAGEMENT PLAN

A. Develop plan including analysis of proposed jobsite waste to be generated, identification of all waste types, estimation of quantity by weight and volume, methods of disposal, materials handling procedures, treatment options, and transportation methods and procedures. Include, at a minimum, separate sections for demolition, soil stabilization, construction, tunneling, dewatering and excavation wastes. Establish measurable goals for the recycling, salvage or reuse of materials.
B. Plan shall include proposed methods for CDL waste salvage, reuse, recycling, and disposal during demolition including, but not limited to, one or more of the following:

1. Contracting with a deconstruction specialist to salvage materials generated.
2. Selective salvage as part of demolition contractor’s work.
3. Reuse of materials onsite or sale or donation to a third party.

C. Plan shall include proposed methods for CDL waste salvage, reuse, recycling, and disposal during construction including, but not limited to, one or more of the following:

1. Requiring Subcontractors to take their CDL waste to a recycling facility.
2. Contracting with a recycling hauler to haul recyclable CDL waste to an approved recycling or material recovery facility.
3. Processing and reusing materials onsite.
4. Self-hauling to a recycling or material recovery facility.

D. Plan shall include the name(s) of all proposed recycling, material recovery, treatment, and disposal facilities receiving the Construction, Demolition and Landclearing (CDL) debris, including facilities designated to receive “clean fill” material, jet grout spoils, and all other excavated soils.

1. Include copies of all permits the receiving facility is required to maintain in order to accept the material anticipated to be treated, handled, or disposed of at the facility.
2. Demonstrate that the facility has been provided documentation regarding the nature (physical and chemical characteristics) of the material to be accepted.
3. Provide a contact name, address, email information, and phone number for receiving facility manager.

E. Handling Procedures:

1. Include methods that will be employed to ensure proper separation of recyclable wastes including sizes of containers, container labeling, and designated location(s) on Project site where materials separation will be located.
2. Provide details on proposed transportation methods for all waste streams, including but not limited to types of vehicles to be employed, any specialty permits required, and anticipated vehicle miles per load.

F. Contact Information: The Plan shall include the name and contact information of the person designated as responsible for implementing the Waste Management Plan.

3.04 WASTE MANAGEMENT REPORT

A. Submit a cumulative Waste Management Report in a form acceptable to the Resident Engineer with the final Application for Payment with the following information:

1. A record of the type and quantity, by weight, of each material salvaged, reused, recycled, or disposed.
2. Total quantity of waste recycled as a percentage of total waste.
3. Copy of all receipts issued by a disposal facility for all CDL waste that is disposed in a landfill.

4. Copy of receipts issued by approved recycling facilities for co-mingled materials. Include weight tickets from the recycling hauler or material recovery facility and verification of the recycling rate for co-mingled loads at the facility.

5. Types and quantities, by weight, for materials salvaged for reuse on site, sold or donated to a third party.

3.05 IMPLEMENTATION AND DOCUMENTATION OF WASTE MANAGEMENT PLAN

A. Designate one or more on-site parties as responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.

B. Distribute copies of the Waste Management Plan to the Job Site Foremen, all Subcontractors and Subconsultants. Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse and return methods to be used by all parties at the appropriate stages of the Project. Post a summary of the Plan at appropriate locations on the jobsite.

C. Designate and label specific areas at the jobsite to facilitate separation of materials for potential recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean:
   1. Provide containers for CDL waste that is to be recycled clearly labeled as such with a list of acceptable and unacceptable materials.
   2. The collection containers for recyclable CDL waste must contain no more than 10 percent non-recyclable material by volume.
   3. Provide containers for CDL waste that is disposed in a landfill clearly labeled as such.
   4. Include in material purchasing agreements a waste reduction provision requesting that materials and equipment be delivered in packaging made of recyclable materials, that vendors reduce the amount of packaging, that packaging be taken back for reuse or recycling, and to take back all unused product. Ensure that Subcontractors require the same provisions in their purchase agreements.
   5. Conduct regular visual inspections of dumpsters and recycling bins to remove contaminants. Document inspections in an inspection log to be kept at the jobsite.

D. Submit with each Application for Progress Payment a Summary of Waste Generated by the project. The Summary shall be submitted on a form acceptable to the Resident Engineer and shall contain the following information:
   1. Disposal Information:
      a. Amount (in tons) of material disposed from the Project (separate by receiving facility).
      b. Identity of the receiving facilities.
      c. Total amount of tipping fees paid.
d. Total disposal cost (including transportation and container rental).

e. Weight tickets, manifests, receipts, scale and truck tickets and invoices.

f. Certification from receiving facility that their permit conditions are met for materials being disposed.

2. Recycling Information:
   a. Amount (in tons).
   b. Receiving party.
   c. Transportation cost.
   d. Amount paid or received for the recycled material.
   e. Net total cost or savings of recycling each material.
   f. Manifests, weight tickets, receipts, scale and truck tickets and invoices.
   g. Measurement of progress in regard to goals established in the Waste Management plan.

3. Reuse and Salvage Information:
   a. List of items salvaged for reuse on project.
   b. Amount (in tons, yards, or other appropriate measure).
   c. Receiving party.
   d. Net savings (avoided tip fee or cost difference of item purchased new).
   e. Measurement of progress in regard to goals established in the Waste Management plan.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY
A. Be responsible for testing the equipment installed to demonstrate that the equipment will operate as planned and can be monitored or controlled remotely by Sound Transit’s Control System as shown on the Contract Drawings and specified herein.

B. In addition to requirements stated in Section 01 45 00, Quality Control, coordinate and perform testing of the mechanical and electrical equipment and devices it installs or procures.

C. Perform testing in conjunction with the System-wide Contractors to ensure the equipment and devices are properly connected to the power, communications, control equipment, and wiring to provide for remote monitoring and control of the equipment.

1.02 DEFINITIONS
A. Acceptance Test: Functional tests performed on completed components or assemblies submitted for Acceptance as described in General Conditions. Acceptance Tests of Work shall serve as the functional and performance Inspections, as defined in the General Conditions, of the completed components or assemblies submitted for Acceptance. Acceptance Tests shall not have a detrimental effect on the operational life of the article, but shall ensure that each production article is the equal of that which successfully passes the qualification tests.

B. Certified Test Report: A written and signed document approved by a qualified party that contains sufficient data and information to verify the actual properties of items and the actual results of required tests.

C. Factory Tests: Tests performed at the point of manufacture before shipping. These functions/tests shall verify that items to be shipped comply with the Test Plan and manufacturer’s test procedures approved by the Resident Engineer.

D. Installation Verification Tests: Tests that verify inspection of materials and equipment have been satisfactorily installed. Physical inspection, circuit continuity, insulation resistance, and power-on tests shall be included as required.

E. Systems Integrated Tests: Tests that are performed after completion of installation tests to demonstrate that the Systems elements perform satisfactorily when connected to interfacing Systems elements or subsystems.

F. System-wide Integrated Tests: Tests that are performed to ensure that Link contract elements function properly together. These tests involve interfaces such as vehicle/station tunnel clearances, track, wayside equipment, automatic train control, passenger station electrical and mechanical systems, communications systems, and control systems. System-wide Integrated Testing must be complete before Pre-Revenue Testing can commence.
G. Pre-Revenue Tests: Tests that are conducted to simulate revenue service operations during normal and abnormal conditions, including emergencies, and to verify proper training of operations staff. These tests involve elements of the Link system and are conducted by the Link Startup and Testing team with support from Contractor, Construction Management, and Systems Integration Team.

H. Material Tests: Tests performed to verify the basic strength of materials and/or fabrication and construction techniques, and includes tests of static, non-operating facilities.

I. Quality Records: Permanent quality records, which have significant value such as:
   1. Construction compliance to Contract Documents;
   2. Demonstrating capability for proper function and safe operation of critical item;
   3. Maintaining, reworking, repairing, replacing, or modifying the item;
   4. Determining the malfunction of an item;
   5. Providing required baseline data;
   6. Documenting the results of inspection and tests; and
   7. Audit and Surveillance Reports.

J. Test: The activity to determine the capability of an item to meet specified requirements by subjecting the item to physical or chemical analysis or environmental and/or operational conditions.

K. Testing: The determination or verification of the capability of an item to meet specified requirements by subjecting the item to a set of physical, chemical, environmental, or operating conditions.

L. Verification: The act of reviewing, testing, inspecting, checking, auditing, or otherwise determining and documenting to ensure that items, processes, services, and documents conform to these Specifications.

1.03 SUBMITTALS

A. Contractor Testing Plan – Draft: The Construction Work Plan (CWP) shall include the Contractor Testing Plan as required by Section 01 45 00, Quality Control. Within 360 Days after NTP, submit for approval a draft plan that includes:
   1. A list of equipment and systems requiring testing.
   2. CPM based schedule identifying tasks associated with testing.
   3. Procedures outlining the steps necessary to complete each test including the type of work, type of craft people required, supervision required, and resulting Certified Test Report.
   4. Sample templates of forms and Certified Test Reports for each type of test. Typical forms would include Interface Testing Diagrams and Data Interface Tables.
5. Safety and notification procedures to ensure the protection of persons in the vicinity of the testing. Include electrical power lockout procedures to energize and de-energize equipment as necessary during testing.

B. Contractor Testing Plan – Final: No later than 60 Days prior to the first test, submit for approval the final version of the Contactor Test Plan. In this final plan, address comments from the Resident Engineer. Replace sample templates with detailed forms and procedures for required tests.

C. Final Test Report: Compile Test Procedures and Certified Test Reports for tests performed in the Contractor Testing Plan and submit them to the Resident Engineer no later than 30 Days after completion of testing.

PART 2 - PRODUCTS (NOT USED)

PART 3 - PART 3 - EXECUTION

3.01 SYSTEM START-UP AND TESTING

A. Installation Verification Test: Design and implement this testing program to ensure that mechanical and electrical equipment operates and can be controlled locally, as designed.

1. Include in testing electrical and mechanical equipment, devices, and fixtures as described in the Contract Documents according to the approved Test Plans and procedures.

2. Include detailed descriptions of pre-operational electrical, mechanical, and instrumentation testing work.

3. Consider in the testing procedure each control device, item of mechanical and electrical equipment and local control circuits. Design in a stepwise, logical sequence to ensure that equipment has been properly serviced, aligned, connected, calibrated and adjusted prior to operation.

4. Be advised that failure to observe these precautions may place acceptability of the subject equipment in question, and Contractor may either be required to demonstrate that the equipment has not been damaged, or replace it as determined by the Resident Engineer.

5. Design testing procedures to duplicate as nearly as possible conditions of operation, and select testing procedures carefully to ensure that the equipment is not damaged.

6. Once the testing procedures have been accepted by the Resident Engineer, produce checkout, alignment, and calibration signoff forms for each item of equipment, which shall be used in the field by Contractor and the Resident Engineer jointly to ensure that each item of electrical and mechanical equipment has been properly installed and tested.

7. Before startup, properly service equipment and other items that normally require service in accordance with the maintenance instructions. Be responsible for lubrication of equipment throughout the entire “break-in” period.

8. If an item of equipment or a system does not operate properly, immediately replace or repair components until it operates properly.
9. Be responsible for a 30-Day start-up period, during which time electrical and mechanical equipment, fixtures, and associated devices shall be energized and operated under local controls.

10. Be present during the start-up period with adequate labor and support personnel to adjust equipment and troubleshoot system failures that might arise.

B. Systems Integrated Test: Support the testing program to ensure the correct exchange of signals between the Control System (supplied by the Communications Systems contractor) and monitored/controlled equipment.

1. In cases where equipment is interfaced to the Control System through a Contract Interface Terminal Strip, proceed with testing as follows:
   a. Contract Interface Terminal Strip is defined as a contiguous arrangement of terminal blocks dedicated to providing a wiring connection point between two or more contracts. These terminal strips will be arranged vertically with the left side of the terminal block for field connections. The right side of the block will be used for connection to the system-wide Control System by the Communications Systems.
   b. Provide an Interface Testing Diagram of each Interface Terminal Strip showing the physical arrangement of terminal blocks in the strip fully documenting connections. The sample diagram below shows the required layout and descriptive fields required on diagrams.

INTERFACE TESTING DIAGRAM

<table>
<thead>
<tr>
<th>FIELD</th>
<th>CONTROL SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable/Wire ID</td>
<td>1</td>
</tr>
<tr>
<td>Discrete</td>
<td>Cable/Wire ID</td>
</tr>
<tr>
<td>Cable/Wire ID</td>
<td>2</td>
</tr>
<tr>
<td>Discrete</td>
<td>Cable/Wire ID</td>
</tr>
<tr>
<td>Cable/Wire ID</td>
<td>3</td>
</tr>
<tr>
<td>Discrete</td>
<td>Cable/Wire ID</td>
</tr>
<tr>
<td>Cable/Wire ID</td>
<td>4</td>
</tr>
<tr>
<td>Discrete</td>
<td>Cable/Wire ID</td>
</tr>
<tr>
<td>Cable/Wire ID</td>
<td>5</td>
</tr>
<tr>
<td>Discrete</td>
<td>Cable/Wire ID</td>
</tr>
<tr>
<td>Cable/Wire ID</td>
<td>6</td>
</tr>
</tbody>
</table>

Name: Equipment: Function: Tested:

Ref Drawing

TERMINAL STRIP: 1
LOCATION:

C. Required descriptive fields are defined as follows:
1) **Reference Drawing** references the Contract Drawing(s) showing the other end termination of the field side wiring. As shown on the diagram, groups of wires may be referenced together.

2) **Discrete/Analog** identifies the type of signal on a pair of wires as discrete or analog. The arrow points to the right if the signal is from the field to the Control System (such as an input to the Control System). The arrow points to the left if the signal is from the Control System to the field (such as an output from the Control System).

3) **Cable/Wire ID** identifies the cable and individual wire. Whatever identification label is attached on the actual cable and wire, it shall be identical to the cable/wire ID on the diagram. If the individual wires in a cable are not labeled, the wire shall be identified by the color of the insulation.

4) **Terminal Block ID** identifies the individual terminal block label. On the sample diagram the terminal blocks are numbered 1, 2, 3. The label inside the terminal block rectangle on the diagram shall be identical to the actual terminal block label.

5) **Name** briefly describes the signal such as “Start Fan” or “Damper Closed”.

6) **Equipment** identifies the official ID name of the field equipment being interfaced. The Resident Engineer will define equipment names according to the standard Sound Transit naming convention.

7) **Function** describes the behavior of the signal in relation to the behavior of the field equipment. The description shall be specific, clear, and sufficient for testing the correct operation of the signal. For example, an acceptable description in the Function field for the “Start Fan” signal would be “Fan starts upon momentary contact closure.”

8) **Tested** is to be used as a signature field for Contractor to certify that the signal has been tested successfully on the field side of the terminal strip.

9) **Terminal Strip** identifies the number or name of the actual terminal strip in the panel or cabinet where it is located.

10) **Location** identifies the official ID name of the cabinet or panel containing the terminal strip. The Resident Engineer will define equipment names for cabinets or panels according to the standard Sound Transit naming convention.


c. Submit for approval a single diagram for each individual Contract Interface Terminal Strip approval in the Contractor Testing Plan - Final.

d. Use the diagrams as Certified Test Reports in the Systems Integrated Test to validate the functionality of signals to and from the field.
equipment. Initial and date each signal when the signal performs as stated in the Function field. After signals have been successfully tested, submit the completed diagram to Resident Engineer in the Final Test Report.

2. In cases where equipment communicates with the Control System through a serial or network interface to the (Systems contract-supplied) Control System, proceed as follows:
   a. Supply a Data Interface Table spreadsheet. Equipment with this kind of interface includes HVAC control panels, fire alarm control panels and uninterruptible power supplies.
   b. Provide a Data Interface Table for each individual piece of interfaced equipment with fields completed as described below. The sample below shows the required layout and data fields required on Data Interface Tables.

   **DATA INTERFACE TABLE**

<table>
<thead>
<tr>
<th>Interfaced Equipment</th>
<th>Equipment ID:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>Communication:</td>
<td></td>
</tr>
<tr>
<td>Point Name</td>
<td>Function</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
   
   c. The required fields are defined as follows:

   1) **Equipment ID** denotes the official ID name of the interfaced equipment (such as the equipment with the serial/network communication interface port.) Resident Engineer will define equipment names according to the standard Sound Transit naming convention.

   2) **Location** identifies the station or building and the room number or name where the interfaced equipment is located.

   3) **Communication** completely describes details of the communication interface including: cable connection point, baud rate, data bits, stop bits, parity, and protocol. For example, “TB2, 9600 baud, 8 data bits, 1 stop bits, parity - none, AFP200 protocol”. Simply specifying the communication as “RS-232” will be unacceptable.

   4) **Point Name** denotes a short description of the signal such as “Smoke 01”. Make each point name unique.

   5) **Field Device** identifies the equipment ID of the field device such as a smoke detector, pull box, or air compressor. Make this ID identical to the label of the device as shown on the Contract Drawings and/or detailed design drawings produced by
Function describes the state of this signal in relation to the field device. Make the description specific, clear, and sufficient for testing the correct operation of the signal. For example, an acceptable description in the Function field for the “Smoke Alm 01” signal would be “ON when smoke activates detector”.

Tested is used as a signature field for Contractor to certify that the signal has been tested successfully such that the signal updates correctly as described in the Function field.

Type identifies the type of signal (e.g., “bit” or “word”). The arrow points to the right if the data is sent from the Interfaced Equipment to the Control System (such as an input to the Control System). The arrow points to the left if the signal is from the Control System to the field (such as an output from the Control System).

Address defines the location of the signal as it is read or written by the Control System using the communication protocol.

d. Submit for approval a sample Data Interface Table in the Contractor Testing Plan – Draft.
e. Submit for approval a single Data Interface Table for each individual serial or network interface in the Contractor Testing Plan – Final.
f. Use the approved Data Interface Tables as Certified Test Reports to test the functionality of signals to and from the interfaced equipment. Initial and date each signal when the signal performs as stated in the Function field. After signals have been successfully tested, submit the completed tables to the Resident Engineer in the Final Test Report.

3.02 COORDINATION WITH COMMUNICATIONS SYSTEMS CONTRACTOR

A. Provide copies of Interface Testing Diagrams and Data Interface Tables to the Communications Systems contractor as soon as they are approved in the Contractor Testing Plan - Final. They are necessary for the Communications Systems contractor to design the Control System.

B. Continuity Testing: Provide signed-off Interface Testing Diagrams and Data Interface Tables to the Communications Systems contractor. To expedite Continuity Testing, supply individual Interface Testing Diagrams and Data Interface Tables within two days after points have been successfully tested and signed-off. The Communications Systems contractor will verify the continuity of signals between the Control System and the monitored / controlled equipment.

C. Control System Testing: Following the Continuity Testing, the Communications Systems contractor will verify the functionality of Control System software. The Control System Testing period will last 30 Days. This period begins when Systems Integration Testing has been completed.

D. During the Continuity Testing and Control System Testing periods, perform the following:
1. Jointly field test points in the Interface Terminal Strips with the Communications Systems contractor and verify the operation and monitoring of equipment as shown on the Contract Drawings, wiring diagrams, or Data Interface Tables.

2. Be present during this testing period with adequate labor and support personnel to adjust equipment and troubleshoot system failures that might arise. When a piece of mechanical or electrical equipment is found to be in conflict with specific criteria, have an experienced representative of the manufacturer make an adjustment to the item. If adjustments fail to correct the operation of a piece of equipment or fixture, remove the equipment or fixture from the Contract site and replace it with a workable replacement that will meet the specification requirements.

3.03 SYSTEM-WIDE INTEGRATED TEST SUPPORT

A. The Link Systems Integration Team conducts these tests with the assistance from Contractor, Construction Management, Operations, and the final design consultant. Systems will be tested together during System-wide Integrated Testing to ensure proper functionality, inter-operability, and reliability of systems necessary for operation.

B. Coordination with Sound Transit's Start-up Manager: The System-wide Integrated Testing period shall occur before Pre-revenue Testing. During the testing period, provide adequate supervisory mechanical and electrical support personnel to adjust equipment and troubleshoot system failures that might arise.

3.04 PRE-REVENUE TEST SUPPORT

A. The Link Systems Integration Team conducts these tests with the assistance from Contractor, Construction Management, Operations, and the final design consultant. Tests will be conducted for this Segment.

B. Coordination with Sound Transit's Start-up Manager: The System-wide Integrated Testing period shall be completed before operation. During the testing period, provide adequate supervisory mechanical and electrical support personnel to adjust equipment and troubleshoot system failures that might arise.

3.05 OPERATOR TRAINING

A. Prior to startup of new equipment, demonstrate to Sound Transit personnel the proper manner of operating the equipment, making adjustments, responding to alarms and emergency signals, and maintaining the systems. Provide training for equipment and systems. Conduct operator schools in accordance with the requirements specified in the Contract Documents. Work performed by the manufacturer's representative required for testing will not be considered as operator training even if the operators are present and witnessing the adjustments. Complete equipment testing before the on-the-job operator training begins.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section specifies requirements for performing all operations necessary for and incidental to closing out a Contract and assisting in the final inspection.

1.02 QUALITY CONTROL

A. Facilities: Maintain facilities in accordance with the Contract Documents until Final Acceptance of the Work. The following apply to interim facilities:

1. Inspect street and access roadway lighting and traffic signals: repair defects, and demonstrate operation to Sound Transit.

2. Inspect traffic signs and traffic control devices. Align and repair defects.

3. Clean and inspect paving, curbs and gutters, repair potholes and restore striping as required.

4. Inspect catch basins, lift station and valve chambers and demonstrate operation to Sound Transit.

5. Inspect all landscaping and irrigation, and make repairs or modification as required.


1.03 CLOSEOUT SCHEDULE AND PROCEDURE

A. Requirements Preparatory to Final Inspection:

1. [In accordance with the Shoreline Permit, provide a Site Restoration Plan per standards set forth in SMC 23.42.040.F.4 to DPD for review and approval within 180 Days of cessation of use of the site for construction activities. Plan to include: removal of all structures, equipment, refuse, fencing, and lighting.]

2. [Remove or prepare temporary facilities per Section 01 12 19, Contract Interface.]

3. Clean the site and all applicable appurtenances and improvements as specified in Section 01 74 00, Cleaning and Waste Management.

4. Properly mount operating instructions for equipment and post as specified or required.

5. Complete record drawings, specifications, and as-built surveys, and submit to the Resident Engineer as specified in Section 01 78 39, Project Record Documents. Also include the required closeout documents in the O&M Manuals described in Section 01 78 23, Operation and Maintenance Data.
6. Submit guarantees and warranties to Sound Transit, as specified in the Contract Documents.

7. Prepare and submit a report which provides detail on all waste and spoil generated in the course of the Project and which documents the ultimate destination of those wastes and spoils.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section specifies requirements for providing the following:

1. Submitting preliminary Operation and Maintenance (O&M) materials within 60 Days of approval of product data submittals.

2. Posted operating and maintenance instructions of all installed equipment and systems.

3. Preparation and submission of an O&M Manual of all installed equipment and systems.

[Include the following paragraph if needed and Section 01 79 00 Training is not included]

4. Instruction of operation and maintenance personnel in the operation and maintenance of all installed equipment and systems.

1.02 SUBMITTALS

A. Preliminary Operation and Maintenance (O&M) materials.

B. Posted Operating and Maintenance Instructions.

C. Operation and Maintenance (O&M) Manuals.

1.03 PRELIMINARY O&M MATERIALS

A. Within 60 Days of approval of product data submittals for each specification section within the divisions listed below, submit three hard copies and 1 CD of preliminary O&M materials.

1. Submit preliminary materials for the following divisions of the Work:

a. Division 08 – Openings.

b. Division 14 - Conveying Equipment.

c. Division 21 – Fire Suppression.

d. Division 22 – Plumbing.

e. Division 23 – Heating, Ventilating and Air Conditioning (HVAC).

f. Division 26 – Electrical.

g. Division 28 – Electronic Safety and Security.

h. Division 33 – Utilities.
1.04 POSTED OPERATING AND MAINTENANCE INSTRUCTIONS

A. Provide and install, where directed, a printed sheet under framed clear acrylic plastic, giving brief, concise operating and maintenance instructions for items of mechanical and electrical equipment, as necessary.

1.05 OPERATION AND MAINTENANCE MANUALS

A. Before the work will be considered for start-up and testing & commissioning, submit to the Resident Engineer [six (6)] complete bound sets of instructions of each equipment plant and its component parts, including manufacturers' certificates, warranty slips, parts lists, descriptive brochures, and maintenance and operating instructions, printed on 20-pound bond white paper, for all equipment and systems installed, properly tabbed and identified for easy reference.

1. Manufacturers' certificates.
2. Warranty slips.
3. Parts lists.
4. Descriptive brochures.
5. Maintenance and operating instructions for all equipment and systems installed.
6. Installation and start-up instructions.
7. Installation verification checklist.
8. Start-up checklist.

B. If subsequent modifications to the equipment require revised operation and maintenance procedures:

1. Revise the O&M Manual to show the equipment as installed.
2. Revise by issue of replacement pages to the final O&M Manual, or by reissue of the O&M Manual, at the Contractor's option. If replacement pages are issued, a Record of Revision (Table of Contents) needs to be issued recording revision dates.
3. Submit the revisions to the O&M Manual not later than 30 Days following revision of the equipment. Submittal of revisions will be subject to Standard Submittal review process, submitted as a subsequent revision to the previously approved revision.

C. Format:

1. Include a title page, contents page, frontispiece, and information covering description, installation, operation, preventive maintenance, corrective maintenance, overhaul, parts list, and list of recommended spare parts, and an appendix.
2. Include on the title page, the name and function of the equipment, manufacturer's identification number, and the Contract Specifications number and title.
3. List the contents of all sections and subsection titles of the Manual with reference to the page on which each starts and a list of included drawings.
4. Frontispiece shall be a recognizable illustration of the equipment described in the Manual.

5. Pages: 8-1/2 inches by 11 inches in size or folded to that size, and placed in a three-ring binder not filled more than 2/3 of its capacity.

D. Contents:

1. Descriptive information including drawings and diagrams, and a physical and functional description of the equipment, and major assemblies and subassemblies.

2. Cover the installation information and pre-installation inspection, installation, calibration, and preparation for operation, both for initial installation and for installation after overhaul.

3. Include the operation information, step-by-step procedures for starting, restarting, operating, shutdown, and emergency requirements. Include the information on performance specifications and operating limitations.

4. Include in the maintenance information, step-by-step procedures for inspection, operation checks, cleaning, lubrication, adjustments, repair, overhaul, disassembly, and reassembly of the equipment for proper operation of the equipment. Include a list of special tools that are required for maintenance with the maintenance information.

5. Provide the complete parts list and a list of recommended spare parts with all necessary information, including part numbers and catalog item numbers if applicable, for identifying parts. Identify parts or assemblies obtained from another manufacturer by the name of that manufacturer and its identifying part number. Supply the size, capacity, or other characteristics of the part if required for identification.

6. Include in the appendix safety precautions, a glossary, and, if available at time of submittal, copies of test reports and other relevant material not specified to be submitted.

7. Delete all information on material or equipment not used in the work from the O&M Manual.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SPECIAL SUBMITTED PROCEDURES:

A. Work with Sound Transit to review O&M manuals together in meeting environment.

B. Revise manuals in accordance with directions and comments from both meeting inputs and formal mark-ups (by reviewers).

C. Resubmit as required in accordance with Section 01 33 00, Submittal Procedures.
3.02 INSTRUCTION OF SOUND TRANSIT'S PERSONNEL FOR CONSTRUCTION CONTRACTS:

A. Before final inspection or Acceptance, instruct designated operating and maintenance personnel in the operation, adjustment, and maintenance of all equipment and systems. Provide [_____] hours of training for ST Operations and Maintenance personnel.

B. Explain to O&M personnel, in full and to their complete understanding, all procedures necessary to operate and maintain all equipment and systems on a continuing basis.

C. Review the contents of the O&M Manuals with O&M personnel in full detail to explain all aspects of the Manuals related to the operation and maintenance of all equipment and systems.

3.03 SOUND TRANSIT RESPONSIBILITY

A. Upon receipt of Contractor's receipt of Notice of Substantial Completion, Sound Transit will designate O&M personnel who will be responsible for operation, adjustment, and maintenance of all equipment and systems.

B. Sound Transit and O&M personnel will set a meeting, to introduce and to review their complete understanding, all procedures necessary to operate and maintain all equipment and systems on a continuing basis.

C. Sound Transit and O&M personnel will review the contents of the O&M manuals with Contractor's personnel in full detail as it relates to the operation and maintenance of all equipment and systems.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section specifies requirements for Project Record Documents including as-built drawings.

1.02 MAINTENANCE OF PROJECT RECORD DOCUMENTS

A. Maintain at the jobsite one copy of the following Contract Documents for record purposes:

1. As-built drawings (Full Size) based upon conformed Contract Drawings and subsequent Change Orders.

2. Shop Drawings: Submitted in accordance with Section 01 33 00, Submittal Procedures.

3. Record Contract Specifications.

4. Inspection Reports.

5. Laboratory Test Records.

6. Field Test Records.

7. Surveys, including as-built surveys.


B. Store documents used for record purposes in the field job office or other location approved by Sound Transit.

C. Provide files and racks for storage of documents.

D. Maintain documents in clean, dry, legible condition.

E. Do not use record documents for construction purposes.

F. Make documents available for periodic review by the Resident Engineer.

G. Make documents available for incremental review.

H. [Store documents electronically on the selected software, in accordance with Section 01 31 23.10, Internet-Based Document Management System].

I. Retain Project Record Documents in accordance with the General Conditions.
PART 3 - EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Contract Drawings:
   1. The Resident Engineer will furnish Contract Drawings for the purpose of as-built or record drawings. Immediately upon receipt, stamp drawings “As-Built.”
   2. Keep a complete set of prints, for this purpose only, at the jobsite at all times.
   3. During the course of construction, update weekly the as-built set and make it available to the Resident Engineer for monthly review.
   4. As identified by the Resident Engineer, make selected drawings available incrementally for reproduction. Incremental updates shall not exceed more than three requests for the duration of the Contract.
   5. Incorporate all as-built conditions into the as-built drawing set in red ink or red pencil.
   6. During the course of construction, identify actual locations to scale in red ink or red pencil on the as-built drawings. Show deviations from Contract Drawings in clear, concise, and legible detail. Where the Contract Drawings are not of sufficient size, scale, or detail, additional shop drawings or details shall be furnished on new full size drawings or attached by scotch tape (do not staple) without covering up any existing details, dimensions, and information in clear, concise, and legible detail.
   7. Do not permanently conceal any work until the required as-built information has been documented by the Contractor.

B. Change Orders:
   1. Incorporate Change Orders to Contract Drawings into the as-built drawings. Annotate the as-built changes into the revised Contract Drawing.
   2. Do not incorporate drawings deleted in their entirety by Change Orders as part of the record set. Mark these drawings “Deleted” or “Superseded,” and keep with as-built drawings to reflect status.

C. Shop Drawings:
   1. Submit one complete set of approved shop drawings, including manufacturers' printed catalog cuts and data, and maintain for record purposes.
   2. File shop drawings and maintain separate from Contract Drawings. File shop drawings in nine inch by 12-inch file folders to the greatest extent possible and index in accordance with the Contract Specifications.

3.02 RECORD CONTRACT SPECIFICATIONS

A. Contract Specifications:
   1. File the Contract Specifications for record purposes in a large, three-ring binder or binders.
2. Record Specification information, changes, and notes in red ink or red pencil in blank areas, such as page margins or the backs of opposite pages, or on separate sheets inserted in the binder.

3. Ensure the Record Specifications are complete and include all applicable Contract Documents other than Contract Drawings.

B. Change Orders:
   1. Incorporate Change Orders into the front of the record Contract Specifications in reverse numerical order. Use appropriate page dividers to identify Change Orders and to separate Change Orders from the Contract Specifications.
   2. In addition, if changes are made to the Contract Specifications by Change Order, make appropriate annotations on the affected page or pages of the Contract Specifications or adjacent thereto.

C. Incorporate RFIs into as-built specifications.

3.03 INCREMENTAL SUBMISSION OF DOCUMENTS

A. Upon request from the Resident Engineer, make available selected as-built drawings for reproduction. Accomplish reproduction by maintaining the original blackline copy with all red annotations (ink or pencil) reproduced in red on the reproduction print.

B. Incremental as-built drawings requested by the Resident Engineer shall be stamped “As-Built”, signed, and dated by Contractor.

C. Include a transmittal letter containing the following information:
   1. Date of submission.
   2. Project title and number.
   3. List of items covered in the incremental as-built submission.
   4. Contractor’s name and address.
   5. Certification that each document as submitted is complete and accurate.
   6. Signature of Contractor or its authorized representative.

3.04 SUBMISSION OF FINAL DOCUMENTS

A. At completion of the Work, and before requesting Final Acceptance of the Work, deliver record documents to the Resident Engineer.

B. For as-built drawings, submit the redline print (full size), [CAD As-Buils] with revisions incorporated on the prints in red ink or red pencil. [Conform drawings to Sound Transit’s CAD manual standards.]

C. Stamp final as-built drawings “As-Built,” sign, and date.

D. Ensure record documents are delivered neatly and efficiently filed and packaged in appropriate file storage cabinets or boxes, 12 inches by 15 inches in size. Roll as-built drawings and wrap with the transmittal letter affixed identifying contents.

E. Ensure boxes have covers and cutout handles, and the contents are accurately identified.

F. Submit record documents with a transmittal letter containing the following information:
1. Date of submission.
2. Project title and number.
3. Contractor's name and address.
4. Title and number of each record document. (Shop drawings may be grouped in basic categories or divisions of work and by box identification.)
5. Certification that each document as submitted is complete and accurate.
6. Signature of Contractor or its authorized representative.

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 01 79 10

TRAINING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section includes specifications for the instruction and training of Operations and Maintenance personnel in the management, operation, and maintenance of all furnished equipment and systems. Personnel will include representatives from Sound Transit and other jurisdictional agencies as required.

B. The Training Program shall train Sound Transit's maintenance and operations personnel in details of the furnished equipment and systems and enable them to operate, service, and maintain the systems such that the systems will perform and continue to perform in accordance with the requirements of this Contract.

C. Training Program

1. The Training Program shall consist of a logically related sequence of separate courses covering, as required, System Operation, Overall System Maintenance, and Equipment Operation and Maintenance.

2. The Training Program shall include classroom, hands-on, and/or field instruction, as appropriate, and all models, mockups, documentation, and aids to carry out the program.

3. The training shall start at such a time to ensure all operations and maintenance personnel are fully trained prior to the start of passenger service.

4. Class Sizes: Unless otherwise specified elsewhere in these Specifications, Sound Transit will be able to send up to thirty participants to each of the training courses specified.

5. Training Location and Classrooms. All training courses shall be conducted in facilities provided by Sound Transit. The facilities will be equipped with tables, chairs, and one cabinet with lock hasp. The Contractor shall provide video players and projectors as required.

6. The Contractor shall provide instructors who are fluent in English and provide literature and equipment necessary to train personnel.

7. Training on the actual system equipment and/or the spare equipment will be permitted; however, such use shall not interfere with the pre-revenue tests and demonstrations of the system.

8. The training shall not exceed 8 hours per day.

9. Operations and Maintenance Personnel Qualifications:

   a. The Contractor shall assume that the personnel to be trained have only the basic skills pertinent to their craft as outlined in Sound Transit's job descriptions for the involved personnel.
b. The Contractor shall assume that Operations and Maintenance personnel to be trained have no knowledge of features of the equipment or systems to be taught.

D. Training Courses

1. System Operations Training. The systems operation training shall be provided to Operations and Maintenance personnel with the operating procedures necessary to operate the systems provided as an integrated entity. This course shall include at a minimum the following training:

   a. Classroom courses to give course participants an understanding of the overall system operation.

   b. Hands-on courses to give course participants actual operation on the systems provided.

2. Overall System Maintenance Training. An overall system maintenance course shall provide the course participants with an overview of and hands-on experience with the systems functional capabilities and overall operation in order to properly troubleshoot and maintain the systems provided. The course shall provide participants with a working knowledge of the system equipment and its operation, interfaces, and use of test equipment for diagnosing troubles. The course shall provide sufficient theoretical background and hands-on experience in troubleshooting and repair procedures to permit participants to locate and repair system faults in a timely manner. The course shall use the system documentation and diagnostic manuals. The course shall cover all troubleshooting and debugging techniques available for use.

3. Equipment Operations and Maintenance Training

   a. As part of the Contract, the Contractor shall provide training in the operation and maintenance of all the equipment systems provided. The training shall provide Operations and Maintenance personnel with a thorough knowledge of the equipment and its operation, its interface with other equipment, and the capabilities and use of test equipment.

   b. The course shall provide participants with theoretical background and hands-on experience in troubleshooting, repair procedures, and preventive maintenance procedures. Courses shall include board level troubleshooting and repair. Courses shall also include component level repair where appropriate. Course participants shall operate actual in place equipment, and learn how to use test equipment and fixtures to troubleshoot problems and repair failures.

   c. The course shall enable Operations and Maintenance personnel to develop a self sufficient hardware maintenance team for all the Equipment. The course shall first be given in the classroom. Operations and Maintenance personnel shall then be given hands-on experience, where they will put the theoretical classroom training to practical use. The hardware training shall cover the following subjects, but shall not be limited to them if additional subjects are required for hardware maintenance personnel to be self-sufficient:

      1) Equipment operation.
2) Troubleshooting procedures, including field diagnostics and test equipment.

3) Interface with other equipment.

4) Preventative maintenance procedures.

5) Theoretical background of equipment.

4. Supplemental Training. The Contractor shall provide extended, duplicate, or additional training for the systems provided, as deemed necessary by the Resident Engineer, due to modification to the systems and equipment configuration made after completion of the scheduled training courses.

E. Training Materials: The Contractor and Subcontractors, or other equipment manufacturers, shall prepare training materials and submit them to the Resident Engineer for review and approval prior to the start of training. The training materials shall be Sound Transit-specific and prepared specifically for use as training aids.

1. Reference manuals, operating and maintenance manuals, and user's manuals shall be used as supplementary training materials. Principal documents used for training shall be tailored to reflect all Sound Transit equipment and specific user requirements.

2. The Operations and Maintenance Manual general version specified in Contract Specifications Section 01 78 23, Operation and Maintenance Data, shall be used as reference during training.

3. Materials used in the Training Program shall be of durable construction and shall become the property of Sound Transit.

4. Each course participant shall receive copies of training manuals and other pertinent material prior to the commencement of all courses.

5. Sound Transit will retain the master and two additional copies of all training manuals and materials as reference documentation.

6. Upon completion of each course, instructor's manuals, training manuals, and training aids shall become the property of Sound Transit unless such items are specifically exempted by the Resident Engineer. Throughout the Contract and warranty periods, it shall be the responsibility of the Contractor to supply Sound Transit with all changes and revisions to the training manuals and other documentation.

7. Sound Transit reserves the right to copy all training materials and aids for use in Sound Transit-conducted training courses.

8. The Contractor shall provide all special tools, equipment, training aids, and all other materials required to train course participants. The number of special tools and other training equipment shall be adequate for the number of participants attending the course.

9. The Contractor shall use actual hardware and photographs taken during the manufacturing process wherever possible. Actual hardware used for training must pass reinspection and acceptance testing prior to being placed in service.
10. Videotapes. The Contractor shall use prerecorded lectures as supplementary training material. These shall not serve as a replacement for a classroom instructor, or as the primary training vehicle.

   a. The Contractor shall provide such videotapes to Sound Transit for retention and playback by Sound Transit staff members as reference documentation.

   b. Sound Transit shall have the right to videotape any and all training courses presented by the Contractor. Sound Transit shall also have the right to use these videotapes to train personnel in the future.

F. Training Program Development Plan: A Training Program Plan shall be prepared in narrative form and shall be supported by such tables, charts, schedules, and graphs as are necessary to fully convey and describe the Contractor’s plan for accomplishing the training set forth herein. It shall be subject to Sound Transit’s approval. The Plan shall include resumes and qualifications of key instructors and the Contractor’s training staff for the approval. The Plan shall provide complete documentation to substantiate employee certification. The Plan shall contain, as a minimum, the following:

1. Program Objectives. The program objectives are precisely worded statements of the end-of-course performance expected of the students.

   a. Each program objective shall include:

      1) The knowledge, skills, and abilities that the students will acquire.

      2) The methods of evaluating achievement of the objective, i.e., written exam, skills test, or oral quiz.

      3) The conditions under which the evaluation will occur.

      4) The measurable level of performance required.

   b. Sample Program Objective. On completion of the Training Program, Operations and Maintenance Personnel will demonstrate, using actual equipment and written procedures in the training environment, the ability to perform Field Level Preventive and Corrective Maintenance to a level sufficient to support and maintain the System and Equipment in accordance with these Specifications.

2. A flow diagram indicating the logical progression of the training courses, including Course Title, Target Population, and Course Duration.

3. A Training Matrix for each course, describing each training day, including Course Title, Title of Lesson, Type of Instruction, Lesson Objectives, Method of Evaluating Achievement of each objective, Material and Equipment requirements, and Time to Teach each lesson.

4. Résumés showing the qualifications of all proposed instructors. The principal instructors shall have previous formal classroom instruction training and relevant experience with the provided systems equipment in an operating environment.

   a. Classes and instructions shall be presented in person by a qualified instructor.

   b. When prerecorded lectures are part of a training course, the instructor or a qualified substitute shall supplement the recorded material.
c. Instructors shall demonstrate a complete and thorough technical knowledge of the material in the course. These instructors shall be thoroughly familiar with handbooks, guides, tools, test equipment, and other aids used in troubleshooting and repairing the equipment.

5. A list of all Subcontractors or other equipment manufacturers to be used in the training program and a description of their responsibilities.

6. A list of each course’s prerequisites (e.g., knowledge of basic electronics).

7. Training Schedule
   a. The Contractor shall develop a complete, detailed training schedule, in consultation with Sound Transit, after Sound Transit’s receipt and review of the Contractor recommendations.
   b. The schedule shall show Training Program milestones in reference to Contract milestones. Each milestone shall be approved by Sound Transit prior to accomplishment of the next.

G. Instructor Guides: Instructor Guides are documents that detail the actions of the instructor during presentation of the program. There shall be one Instructor Guide for each training session. Each Instructor Guide shall be arranged in sections:

1. Section 1. Title: The title shall be short and descriptive. It must contain the lesson name and, if applicable, the target audience.

2. Section 2. Time to Teach: An estimated time to teach shall be designated for each Instructor Guide. This is an approximate period and may vary due to student number and knowledge level.

3. Section 3. Objective: Each Instructor Guide shall have one or more performance-based objectives each of which specifies:
   a. The end-of-course performance expected of the student.
   b. The conditions under which the behavior will occur.
   c. The measurable minimum level of performance considered acceptable.

4. Section 4. References: All sources of material presented in this Instructor Guide will be listed. This may include maintenance manuals, test equipment manuals, other documents that are accessible by the instructors at Sound Transit including materials developed by the Contractor for this Contract.

5. Section 5. Materials List: List all materials needed to teach the content in this Instructor Guide. This includes all training aids (such as overhead transparencies, charts, projectors, and size and type of facility), student handouts (such as books, drawings, and schematics), equipment (such as tools parts for disassembly).

6. Section 6. Introduction: The introduction shall cover at least the following areas:
   a. Introduction of the subject covered by the lesson;
   b. The lesson objectives;
   c. An outline of the lesson; and
d. A schedule of the lesson's activities.

7. Section 7. Presentation:

a. The presentation should be in outline form. Narrative is acceptable but not necessary. A suggested numbering system is:

A.

B.

1.

2.

a.

b.

(1)

(2)

(a)

(b)

b. The presentation portion of the Instructor Guide should be detailed enough to:

1) Serve as a written record of the specific facts and information.

2) Allow another instructor with knowledge of the area to teach the class.

3) Ensure that the subject delivery is consistent each time the lesson is given.

4) Allow replication of all evaluations, tests, and quizzes given in conjunction with this lesson.

8. The following materials shall be supplied with each Instructor Guide:

a. Microsoft PowerPoint presentation file on disk (if used);

b. Reproducible "A"-size copies of overhead transparencies used with the lesson (if used);

c. Slides, pictures, charts used in support of the lesson;

d. One complete student handout package; and

e. One copy of material referenced in the lesson.

H. Training Reports: A grading system shall be established by the Contractor and approved by Sound Transit to report the progress of each trainee during a course. Grading shall be kept strictly confidential and furnished only to personnel in Sound Transit that are designated by the Resident Engineer. The grading system shall identify all requirements for further training for each participant.
1. Training Reports shall be submitted in accordance with the Training Schedule. The Training Reports shall include graded tests (without names) with raw scores.

2. The Training Reports shall be furnished subsequent to the completion of each training session, but not later than 1 week after completion of the course. The report shall include a summary of the results of monitoring and evaluating as well as records of student attendance and performance.

I. Submittal Schedule and Quantity

1. Drafts of the Training Program Plan and Instructor Guides shall be submitted 6 months before the start of training. Final versions shall be submitted 1 month prior to the start of training. Training shall not commence until the Training Program Plan and Instructor Guides are approved by Sound Transit.

2. Training Reports shall be submitted 1 month after completion of training.

3. Quantity of Submittal.
   a. Three hard copies and one electronic copy (Microsoft Office document) of the draft and final versions of the Training Program Plan.
   b. Three hard copies and one electronic copy (Microsoft Office document) of the draft version, and thirty-five copies and one electronic copy (Microsoft Office document) of the final version for the Instructor Guide.
   c. Three hard copies of the training reports.

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SECTION 01 91 13
GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes:

1. General requirements for commissioning work.
2. Functional Completion requirements.
3. General requirements for management, coordination, scheduling, execution, and documentation of commissioning work.
4. General requirements for performance of commissioning testing and troubleshooting of equipment and systems.
5. General requirements for technician services requiring tools or the use of tools to perform the commissioning work, and to test, adjust or otherwise bring equipment into a full operational state.
6. Be responsible for testing equipment installed in the Contract to demonstrate that the equipment will operate as planned and can be monitored or controlled remotely by Sound Transit's Control System as shown on Contract Drawings and specified herein.

B. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Drawings and general provisions of the contract, including General and Special Conditions and Division 01 specification Sections, apply to this Section.
8. Section 08 08 00, Commissioning of Openings.
9. Section 11 08 00, Commissioning of Equipment
10. Section 14 08 00, Commissioning of Conveying Equipment.
11. Section 21 08 00, Commissioning of Fire Protection.
12. Section 22 08 00, Commissioning of Plumbing.
13. Section 23 08 00, Commissioning of HVAC Systems.
14. Section 25 08 00, Commissioning of Integrated Automation.
15. Section 26 08 00, Commissioning of Electrical Systems.
16. Section 32 08 00, Commissioning of Exterior Improvements.

1.02 DEFINITIONS

A. Authority Having Jurisdiction (AHJ): The governmental agency or subagency which regulates the construction process and enforces the codes and regulations.

B. BMS: Building management system.

C. Commissioning: A quality process of documentation, training, adjustment, testing, and verification, performed specifically to provide documented confirmation that building systems function in compliance with Sound Transit’s project requirements. Commissioning work is specified herein and in other Related Sections NN 08 00.

D. Commissioning Activity (or Activity): Level 1, Level 2, Level 3, and Level 4 work including installation verification, static tests, start-up, component tests, equipment tests, system tests, intra-station system interface tests, inter-station system interface tests, and pre-revenue tests.

E. Commissioning Authority: Consultant to Sound Transit. Not included in the Work. Provides expertise to evaluate the results of the Contractor’s commissioning work.

F. Commissioning Coordinator: Employee or subcontractor of the Contractor.

G. Sound Transit’s witness: The Commissioning Authority, Sound Transit’s Project Manager, or Resident Engineer-designated witness authorized to authenticate reported test data and to sign completed commissioning test data forms.

H. Functional Completion: The completion and certification of all specified commissioning work, including, but not limited to, resolution of all unacceptable conditions and resolution of all issues discovered in the execution of same and retesting until acceptable results are obtained. The date Functional Completion is achieved shall be established in writing by Sound Transit.

I. Commissioning Issues Log: A shared database created by Sound Transit in accordance with Section 01 31 23.10 Internet-Based Document Management System.

J. Commissioning tests: Commissioning activity tests specified under “PART 3 EXECUTION” in Related Sections NN 08 00, including Level 1, Level 2, Level 3, and Level 4.

K. Commissioning Test Demonstration: Re-performance of a completed commissioning test after acceptance of submittal of commissioning activity data with results that meet acceptance criteria, performed in the presence of Sound Transit’s witness to verify accepta-
ble performance, in accordance with Acceptance Criteria specified under “PART 3 EXECUTION” in Related Sections NN 08 00.

L. Demonstrate: When used in a commissioning activity specification or commissioning test procedure, demonstrate means, “re-perform commissioning test in the presence of Sound Transit’s witness.”

M. Commissioning activity procedure: Detailed, step-by-step instructions for performing commissioning activities; the means and methods of performing commissioning activities.

N. Commissioning Plan: Written plan of how the Contractor’s commissioning work will be accomplished. The plan describes how the Contractor will accomplish commissioning responsibilities, identifies who is responsible for commissioning work, what tools and materials will be required, and includes the commissioning schedule.

O. Deferred activities: Deferred activities are commissioning activities identified in Related Sections NN 08 00 as “Occupancy Test,” “deferred test” or “Seasonal Test.”

P. Delayed activities: Delayed activities are commissioning activities that cannot be completed before the date of Functional Completion for reasons beyond the Contractor’s control.

Q. Installation Verification: Level 1 commissioning activities numbered nnnn-IV-nn. Procedures to confirm material and equipment installation in accordance with Contract provision.

R. Sections NN 08 00: Reference to commissioning requirements sections 08 08 00, Commissioning of Openings, 14 08 00 Commissioning of Conveying Equipment, 22 08 00 Commissioning of Plumbing, 23 08 00 Commissioning of HVAC Systems, 25 08 00 Commissioning of Integrated Automation, and 26 08 00 Commissioning of Electrical Systems.

S. Static test: Level 1 commissioning activities numbered nnnn-ST-nn. Tests of the integrity of installed piping, ductwork or wiring.

T. Start-up: Level 1 commissioning activities numbered nnnn-SU-nn. Procedures used to bring equipment or systems from a state of complete installation to powered operation.

U. Component Test: Level 1 commissioning activities numbered nnnn-C-nn. Tests of the controllability, functionality and calibration of individual instrumentation and control devices, including, but not limited to input and output hardware, relays and signal converters, and standalone instruments that directly indicate the condition of a variable. Input control devices; includes hardware used to sense the input variable and accurate mapping and representation of the device at the controller. Output control devices; includes hardware controlled by the output signal and accurate mapping and representation of the device at the controller.

V. Equipment Test: Level 1 commissioning activities numbered nnnn-E-nn. Tests of the controllability, functionality and capacity of individual assemblies or items of equipment, including, but not limited to items identified in equipment schedules.

W. System Test: Level 1 commissioning activities numbered nnnn-S-nn. Tests of the controllability, functionality and coordination of individual systems. System; assembly of multiple components and items of equipment, and connecting hardware and wiring.

X. Intra-station System Interface Test: Level 2 commissioning activities numbered nnnn-IS-nn. Tests of the controllability, functionality and coordination of multiple systems provided within this Contract. Tests to demonstrate that _____ systems elements perform satisfactorily when connected to interfacing systems elements or subsystems.
Y. Inter-station System Interface Test: Level 3 commissioning activities numbered nnnn-IIS-nn. Tests of remote monitoring and control by Link Central Control or by other control external to the work of this Contract of the systems provided within this Contract. Tests that are performed to ensure that Link contract elements function properly together. These tests involve interfaces such as vehicle/station tunnel clearances, track, wayside equipment, automatic train control, passenger station electrical and mechanical systems, communications systems, and control systems.

Z. Pre-Revenue Tests: Level 4 commissioning activities that are conducted to simulate revenue service operations during normal and abnormal conditions, including emergencies, and to verify proper training of operations staff. These tests involve elements of the Link system and are conducted by the Link Startup and Testing team with support from Contractor, Construction Management, and Systems Integration Team.

AA. Activity Level: Designation of commissioning activity levels; Level 1, Level 2, Level 3, and Level 4.

1.03 COORDINATION

A. Coordination with Sound Transit's witness: Coordinate Sound Transit's witness commissioning participation schedule via the Resident Engineer.

1. Notify the Resident Engineer of commissioning schedule changes at least five (5) Days in advance for commissioning activities requiring the participation of Sound Transit's witness.

2. If Sound Transit's witness is required to be present for a scheduled commissioning activity at the wrong time, either due to cancellation or rescheduling by the Contractor, without having been given timely notification of the schedule change, the Resident Engineer will deduct the cost of Sound Transit's witness time and expenses from the Final Payment to the Contractor. Cost of Sound Transit's witness includes hourly compensation for travel time and time at the site (minimum two hours) plus actual travel expenses, including transportation, meals, and lodging.

1.04 SYSTEM DESCRIPTION

A. Purpose:

1. The purpose of the commissioning process is to provide Sound Transit assurance that the systems have been installed in the prescribed manner and will perform in accordance with Sound Transit's project requirements. Commissioning is intended to enhance the quality of system start-up and aid in the orderly transfer of systems to use by Sound Transit.

B. Commissioning work includes, but is not limited to:

1. Scheduling and coordination of commissioning work.

2. Preparation of submittals.

3. Installation verification of materials and equipment to be commissioned.

4. Providing electric power, water, instrumentation and tools, supplies and materials, and technicians required for commissioning tests and Commissioning Test Demonstrations.

5. Disposal of water and other materials used in the performance of commissioning activities.
6. Performing commissioning activities including commissioning tests to verify readiness for Commissioning Test Demonstrations. Correcting issues and repeating commissioning activities when results do not meet Acceptance Criteria. Commissioning activities, specified elsewhere, include:

a. Level 1 commissioning activities:
   1) Installation verification
   2) Static tests
   3) Start-up procedures
   4) Component tests
   5) Equipment tests
   6) System tests

b. Level 2 commissioning activities:
   1) Intra-station system interface tests

c. Level 3 commissioning activities:
   1) Inter-station system interface tests

d. Level 4 commissioning activities:
   1) Pre-revenue tests

7. Performing Commissioning Test Demonstrations of a sample of commissioning tests to verify acceptable performance. Reporting Commissioning Test Demonstration data and issues. Correcting issues and repeating Commissioning Test Demonstrations when results do not meet Acceptance Criteria. Commissioning Test Demonstrations, specified elsewhere, include, but are not limited to:

a. Level 1 commissioning activities:
   1) Component tests
   2) Equipment tests
   3) System tests

b. Level 2 commissioning activities:
   1) Intra-station system interface tests

c. Level 3 commissioning activities:
   1) Inter-station system interface tests

8. Reporting of commissioning activity data and issue resolutions.

9. When the commissioning work is complete, requesting a certificate of functional completion from the Resident Engineer, identifying seasonal activities or other activities accepted for deferral until specified seasonal or other conditions are available.
10. Submitting the certificate of functional completion with the request for acceptance of Substantial Completion. Substantial Completion will not be issued unless the certificate of functional completion has been submitted in accordance with provisions of the General and Special Conditions.

C. General:

1. Furnish labor and material to accomplish building commissioning as specified herein.

2. In the event that a Commissioning Test Demonstration fails, determine the cause of failure. Effect timely resolution of issue and then repeat the demonstration. If a Commissioning Test Demonstration must be repeated due to failure caused by Contractor work or materials, reimburse Sound Transit for billed costs for the participation in the repeated demonstration of Sound Transit’s Representative, Resident Engineer, Commissioning Authority and Sound Transit’s staff.

3. Commissioning work shall be managed and coordinated by a qualified Commissioning Coordinator, as specified herein, including:

   a. Coordinate with subcontractors with respect to their responsibilities and contractual obligations for commissioning.
   
   b. Obtain, assemble and submit commissioning documentation.
   
   c. Attend periodic on-site commissioning meetings.
   
   d. Develop and maintain the commissioning schedule. Integrate commissioning schedule into the construction schedule. Update schedule at specified intervals.
   
   e. Prepare with assistance from subcontractors as needed, and submit, commissioning activity procedures and data forms.
   
   f. Report any inconsistencies or issues in system operations. Enforce contract compliance or recommend to Sound Transit’s Representative modifications to system design that will correct or enhance system performance.
   
   g. Coordinate witnessing of Commissioning Test Demonstrations by Sound Transit’s witness. Verify that commissioning activities have been completed with acceptable results and that equipment and systems are ready before scheduling Commissioning Test Demonstrations.
   
   h. Ensure that necessary test instrumentation is available during commissioning activities, and that those instruments meet quality and calibration requirements and are in good working order.
   
   i. Be present during Commissioning Test Demonstrations to direct and coordinate execution of tests.
   
   j. Prepare and submit specified commissioning reports.
   
   k. Track and report commissioning issues until resolution and retesting is successfully completed.
   
   l. Retain original records of all commissioning activities, organized as required for the commissioning report. Provide Sound Transit’s Representative access to these records upon request throughout the Contract Period.
m. Assemble and submit commissioning report to Sound Transit’s Representative for acceptance by Commissioning Authority.

4. The requirement for and responsibilities of the Commissioning Coordinator are indicated herein.

5. Unless noted otherwise, commissioning activities, as specified under “PART 3 EXECUTION” in Related Sections NN 08 00, apply to all equipment and systems identified under “System/Equipment to be Tested.”

D. Management and Coordination of commissioning work: Provide overall management and coordination of commissioning work as specified herein.

E. Commissioning Team: The commissioning process will require cooperation of the Contractor, subcontractors, vendors, Resident Engineer, Commissioning Authority, and Sound Transit. The commissioning team includes the following.

1. Contractor:
   a. Project Manager.
   b. Commissioning Coordinator.

2. Subcontractors:
   a. As required by the Contractor.

3. Vendors:
   a. As required by the Contractor.

4. Commissioning Authority:
   a. Commissioning Project Manager.
   b. Commissioning Project Engineers.

5. Sound Transit Representative(s).
   a. Project Manager

6. Construction Management
   a. Resident Engineer
   b. Project Engineers

7. Architect:
   a. Mechanical consultant.
   b. Electrical consultant.

F. The Contractor verifies installation, provides scheduling and coordination of commissioning work, starts up equipment, performs commissioning activities, resolves issues, performs retests as needed, and provides documentation of the commissioning work.

G. Contractor or their designated subcontractor or vendor: Perform start-up on their respective work, operate the equipment and systems during commissioning activities and Commissioning Test Demonstrations, and assist in the start-up, commissioning tests and
Commissioning Test Demonstrations of equipment and systems with which their work interfaces.

H. The Contractor or their designated subcontractor or vendor verifies and documents the functional readiness of systems before performing the Commissioning Test Demonstrations in the presence of Sound Transit's witness.

I. The Commissioning Authority provides Sound Transit an unbiased, objective view of the systems’ installation, documentation, operation, and performance. The Commissioning Authority, or other Resident Engineer-designated Sound Transit's witness, witnesses Commissioning Test Demonstrations and reviews completed commissioning activity data forms for acceptance.

1.05 COMMISSIONING AUTHORITY

A. This information is provided for Contractor's information only. The Contractor is not responsible for hiring the Commissioning Authority.

B. The Commissioning Authority is a specialty consultant to Sound Transit, responsible for the building commissioning process.

C. The duties of the Commissioning Authority include, but are not limited to, the following:

1. Review and recommend acceptance of the Contractor’s Commissioning Coordinator candidate qualifications.

2. Review and recommend acceptance of the Contractor’s commissioning submittals, and shop drawings.

3. Review and recommend acceptance of specified commissioning documentation.

4. Observe and issue site activity reports on the quality of work in progress pertaining to material, equipment and systems included in the scope of the commissioning work. Track issues for acceptable resolution.

5. Participate in commissioning meetings.

6. Witness, verify and recommend acceptance of satisfactory completion of commissioning activities. Sound Transit may appoint other staff or consultants to witness some commissioning activities in lieu of the Commissioning Authority.

7. Track documentation and resolution of commissioning issues. Facilitate and lead Consultant and Contractor efforts to resolve commissioning issues.

8. When commissioning work has been completed, recommend issuance of a certificate of functional completion to Sound Transit.

D. The Commissioning Authority is expected to communicate as follows:

1. The Commissioning Authority will formally communicate with the Contractor via accepted project channels. It is expected, however, that the Commissioning Authority will communicate and coordinate informally directly with the Contractor and the Commissioning Coordinator. As Sound Transit’s commissioning consultant, it is expected that the Commissioning Authority will communicate directly with the Resident Engineer and consultants, as may be appropriate.

2. The Commissioning Authority will keep Sound Transit, Resident Engineer and Contractor advised regarding the status of commissioning work, progress, problems that may develop, solutions to problems, systems performance and schedules.
1.06 SUBMITTALS

A. Commissioning Coordinator Qualifications: within 30 Days after Notice to Proceed.

B. Commissioning Coordinator Letter of Authority: within 10 Days after acceptance of the Commissioning Coordinator qualifications.

C. Commissioning Plan: within 90 days of Notice to Proceed.

D. Commissioning Schedule: within 90 days following the date of the Limited Notice to Proceed. Submit updated and revised commissioning Schedule monthly thereafter.

E. Level 1 commissioning activity procedures and data forms: within 60 Days after acceptance of shop drawing and product data submittals.
   1. Installation Verification Checklists
   2. Static test procedures and data forms
   3. Start-up requirements procedures and data forms
   4. Component commissioning tests
   5. Equipment commissioning tests
   6. System commissioning tests

F. Level 2 commissioning activity procedures and data forms: within 60 Days after acceptance of shop drawing and product data submittals.
   1. Intra-station system interface commissioning tests

G. Test equipment identification list: include in submittals of commissioning procedures.

H. Three-week look-ahead schedules: Three weeks prior to the beginning of commissioning activities, submit a three-week look-ahead schedule. Thereafter, submit updated three-week look-ahead schedule weekly until the date of Functional Completion.

I. Commissioning activity reports:
   1. Installation verification report: Prior to start-up of a system, submit installation verification report.
   2. Commissioning activity data: Within three (3) Days after completion of each commissioning activity, submit the following for completed commissioning activities.
      a. Commissioning activity data forms, signed and dated.
      b. Data trend logs: For tests for which data trend logs are specified for individual commissioning activities, provide data trend logs, as specified under “PART 3 EXECUTION” in Related Sections NN 08 00.
   3. Commissioning Issues Reports: Daily on days in which commissioning activities are conducted with results that are not acceptable, log Commissioning Issue Reports to shared database for said commissioning activities for which acceptable results were not achieved during the day. Reference example Commissioning Issue Report in Attachments in this Section.
4. Weekly progress report: Weekly, during weeks in which commissioning activities are conducted. Include information for commissioning activities conducted since the preceding report:
   a. Commissioning activity number, including identification of components, assemblies, equipment or systems.
   b. Activity date.
   c. Submittal date.
   d. Apparent activity status: Acceptable or not acceptable results, in the opinion of the Commissioning Coordinator.

5. System alarm logs: Maintain at the jobsite one copy of daily system alarm logs. Record system alarm logs daily at the start of days following a day in which Level 1 or Level 2 commissioning tests or Commissioning Test Demonstrations were performed.

J. Commissioning report: At the completion of commissioning work.

K. Request for certificate of functional completion: When the commissioning work, or portion thereof designated and accepted by Sound Transit, is complete.

1.07 QUALITY ASSURANCE

A. Qualifications: Commissioning Coordinator

   1. The individual proposed to serve as the Commissioning Coordinator shall have the following minimum qualifications.
      a. Extensive experience in start-up and troubleshooting complex mechanical and electrical controls systems of similar complexity to those contained in these documents, and their interface with other building equipment and systems. Knowledge of commissioning procedures.
      b. Excellent working knowledge of complex environmental and electric power control and facility management systems. Demonstrated capability of understanding control vendor's operating system and control code. Demonstrated capability of troubleshooting control code and recommending necessary modifications.
      c. Competency in system design and intent.
      d. Experience writing commissioning activity procedures similar in complexity and level of detail required by this Contract.
      e. Knowledge of selection, application, and use of field calibration grade equipment and instrumentation for measuring equipment and system performance.
      f. Knowledge of the test and balance of air and hydronic systems.
      g. Excellent communication and writing skills, organizational skills and ability to work well with management and trades contractors.
      h. Experience with managing, scheduling and coordinating complex acceptance and verification work of multiple subcontractors. Demonstrated ability to coordinate and schedule work of multiple contractors, integrated
with other construction activities. Provide samples of work products that demonstrate day-by-day coordination and scheduling skills.

i. Availability to perform the work in accordance with the project schedule.

j. Professional grade Full Member of the Building Commissioning Association (BCA) working for a BCA Full Member Provider Firm. Sound Transit reserves the right to waive the BCA Membership requirement based on the experience and qualifications of the submitted candidate if a substitution request is submitted pursuant to the conditions of the contract. A list of BCA Full Members may be found on the BCA web site at http://www.bcxa.org, or by calling the BCA office at 877-666-BCXA (877-666-2292).

1.08 COMMISSIONING MEETINGS

A. Attend commissioning meetings in accordance with Section 01 31 19, Project Meetings.

1.09 SCHEDULING

A. Commence commissioning work as early in the construction period as possible. Commissioning activities shall commence as soon as materials, components, equipment or systems to be tested are installed and functional. Commissioning of a particular system may proceed prior to final completion of other systems. The intent is to minimize the number of operational issues discovered at the end of the construction period. Immediately correct issues.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. Provide test equipment and instrumentation required to execute commissioning activities. Unless noted otherwise, test equipment and instrumentation remain the property of the Contractor.

B. Test equipment and instrumentation required to perform the commissioning work shall be of industry standard quality for testing and calibration.

C. Test equipment and instrumentation are further specified in Related Sections NN 08 00. Test equipment and instrumentation includes consumable supplies such as material used to generate test smoke.

D. Test equipment and instrumentation shall meet the following standards:

1. Testing instruments calibrated by an Independent Testing Laboratory in accordance with Section 01 45 00, Quality Control.

2. Be of sufficient quality and accuracy to test and measure system performance within the tolerances required to determine acceptable performance.

3. Be calibrated at the manufacturer’s recommended intervals with calibration tags permanently affixed to the instrument being used.

4. Be maintained in good repair and operating condition throughout the duration of use on this project.

5. Be recalibrated/repaired if dropped or damaged in any way since last calibrated.
2.02 PROPRIETARY TEST INSTRUMENTS

A. Provide proprietary test instruments or tools required by the equipment manufacturer. Provide and operate the proprietary test instruments or tools as required for commissioning work.

B. Identify proprietary test instruments or tools required in the test equipment identification list. Include a separate list of proprietary test instruments in the Operations and Maintenance manuals.

C. Proprietary test instruments or tools become the property of Sound Transit upon completion of commissioning the Work.

D. Test instruments and tools are proprietary if they are required by the equipment manufacturer for testing, calibrating, servicing, or maintaining equipment provided under this contract, and if the test instruments or tools are available exclusively through said manufacturer or their authorized representative.

PART 3 - EXECUTION

3.01 SEQUENCING

A. For any particular assembly, system, or area of work, commissioning activities shall proceed in the following order. Complete testing at the lower number level prior to starting the next higher number level.

1. Exception: Level 1 component tests shall be performed prior to Level 1 start-up if the proper function of the component impacts the performance of the start-up. For example, perform component tests on control dampers and fire dampers in the metal ducts connected to a fan prior to start-up of the fan.

B. Level 1 commissioning activities:

1. Installation verification
2. Static tests
3. Start-up procedures
4. Component tests
5. Equipment tests
6. System tests

C. Level 2 commissioning activities:

1. Intra-station system interface tests

D. Level 3 commissioning activities:

1. Inter-station system interface tests

E. Level 4 commissioning activities:

1. Pre-revenue tests

F. Readiness: Verify the functional readiness of equipment and systems included in commissioning by performing commissioning tests prior to performing the Commissioning
Test Demonstrations. A high rate of Commissioning Test Demonstration failures indicates that the Contractor has not adequately verified the readiness of the systems. Notify the Resident Engineer if acceptable results cannot be achieved due to conditions beyond the Contractor’s control or responsibility.

3.02 FIELD QUALITY CONTROL

A. Quality Control: Quality control is the Contractor’s responsibility. Installation verification checklists and commissioning activities are quality control tools designed to improve the functional quality of the project.

B. Quality Assurance: Commissioning test demonstrations assess the effectiveness of the Contractor’s quality control process.

C. Sound Transit’s witness: Sound Transit's witness will be present to witness commissioning activities requiring the signature of Sound Transit's witness, including Commissioning Test Demonstrations. Sound Transit will designate Sound Transit's witness to observe the commissioning activities. Sound Transit's Project Manager will coordinate attendance by Sound Transit's witness with the Contractor's published commissioning Schedule. Sound Transit's witness will provide no labor or materials in the commissioning process. The only function of Sound Transit's witness will be to observe and comment on the progress and results of commissioning.

D. Control of Inspection, Testing, and Monitoring Equipment: Comply with provisions of Section 01 45 00, Quality Control, for test equipment and instrumentation used for the work of this Section.

3.03 LEVEL 1 AND LEVEL 2 COMMISSIONING ACTIVITIES:

A. Perform and document results of the following level 1 and level 2 commissioning activities. Technical requirements are specified in Related Sections NN 08 00.

1. Level 1 commissioning activities:
   a. Installation verification
   b. Static tests
   c. Start-up
   d. Component tests
   e. Equipment tests
   f. System tests

2. Level 2 commissioning activities:
   a. Intra-station system interface tests

B. Demonstrate the following commissioning activities at the time of the initial commissioning activity specified in the preceding paragraph. A separate Commissioning Test Demonstration activity is not required.

1. Level 1 commissioning activities:
   a. Installation verification
   b. Static tests
c. Start-up

C. Provisions of this paragraph apply to all Level 1 and Level 2 commissioning activities.

1. Submit Level 1 and Level 2 commissioning activity procedures and data forms.

2. Level 1 and Level 2 commissioning activity technical requirements are specified in Related Sections NN 08 00.

3. Execute and document commissioning activities to establish that equipment and systems perform in accordance with specified acceptance criteria.

4. Use accepted commissioning activity checklists, procedures and data forms to execute and document commissioning activities. Perform commissioning activities in strict accordance with accepted commissioning activity procedures. Execute and complete each step of the accepted commissioning activity procedures in the order listed.

5. Record data observed during performance of commissioning activities on accepted data forms immediately when the results are observed.

6. Record and report activity results that are not within the range of acceptable results on commissioning Issue report forms in addition to recording and reporting the results on data forms. See Commissioning Issues below.

7. Upon completion of a commissioning activity, sign the completed data form. Submit a copy of the completed data form. Commissioning activities for which data forms are incomplete, not signed, or which indicate performance that does not comply with acceptance criteria shall be rejected. Commissioning activities for which data forms are rejected shall be repeated and results resubmitted.

8. Test Results: In the event that a commissioning activity result does not meet acceptance criteria, the result becomes a commissioning issue.

   a. Immediately complete part 1 of commissioning issue report form and enter information on commissioning issues log database.

   b. Determine the cause of issue and establish responsibility for corrective action.

D. Level 1 Installation Verification

1. Verify, by use of installation verification checklists, that equipment and systems are installed in accordance with the manufacturer’s recommendations and the contract documents.

2. Utilize installation verification checklists to improve the quality of work not yet completed by identifying work practices or materials that do not comply with Contract Documents as the work progresses.

3. Distribute installation verification checklists to Contractor's installers or their designated subcontractors’ or vendors' installers before they start work. Ensure installers understand the checklists.

4. Individuals having direct knowledge of the work reported shall complete installation verification checklists.

5. Contractor's installers or their designated subcontractors’ or vendors' installers shall perform installation verification using accepted installation verification checklists. Individuals installing the work shall possess copies of installation veri-
fication checklists with them as they perform the work. Individuals installing the work shall fill out and sign installation verification checklists for each area or major element of work to control the quality of work as it progresses.

6. For the purpose of installation verification, an area of work shall be a floor within a station or distinct section of a station.

7. For the purpose of installation verification, major element of work shall be a scheduled piece of equipment and associated materials and appurtenances.

8. Installation verification checklists showing evidence of being filled out consistent with the progress of the work shall be available from the individuals installing the work for review by the Commissioning Authority during periodic site visits.

9. Installation Issues: Record as an installation issue any work found to be incomplete, inaccessible, at variance with contract documents, non-functional, or otherwise not in accordance with installation verification checklists, as indicated by negative responses on installation verification checklists.
   a. Record installation issues on the installation verification checklist at the time they are identified.
   b. Record corrective action and how future work should be modified to avoid repetition of the same issue before signing off the installation verification checklist.
   c. Retain completed installation verification checklists on site for review.
   d. Record installation verification issues via an Installation Issue Report Form on shared database. See Attachment A. Installation Issue Report Form format shall be acceptable to Resident Engineer.

10. Readiness verification: Prior to the beginning of start-up for a piece of equipment or system, conduct a final installation verification on the piece of equipment or system to determine readiness for start-up. Report conditions, which, if left uncorrected, would adversely impact the ability of systems or equipment to operate satisfactorily or to meet Acceptance Criteria.
   a. Review for completion executed installation verification checklists for each area of work and each major element of work.
   b. Verify compliance with Contract Documents, or recommend modifications to system design that will correct or enhance system performance.
   c. Submit an installation verification report for each item of equipment or system to be started up.
   d. If any work is found to be incomplete, inaccessible, at variance with contract documents, or non-functional, make note of issues and resolve issues before system start-up work proceeds. Report issues and resolutions in the installation verification report.
   e. Evaluate system readiness for start-up.

E. Level 1 Static Tests

1. If static tests will be performed on sections of an installation, submit a drawing of the entire installation upon which testing progress shall be recorded. Use highlighting or other means to identify portions which have been tested, noting test dates and clearly delineated end points of portions.
F. Level 1 Start-up

1. Start-up verifies that equipment is installed, cleaned, serviced, adjusted, energized, and placed into service in accordance with manufacturers' installation and start-up requirements in addition to other requirements specified herein.

2. Provide start-up by factory personnel if required in other Sections of the Work.

G. Level 1 Component Tests: Component tests verify installation, calibration, adjustment and response under a variety of conditions important to the required performance of associated equipment and systems.

H. Level 1 Equipment Tests: Equipment tests verify internal control, response to external control signals, and capacity and modulation under various loads.

I. Level 1 System Tests: System tests verify capacity, control, and coordinated response of materials, components and equipment that comprise a system to a variety of conditions and loads in accordance with specified sequences of control.

J. Level 2 Intra-Station System Interface Tests: Intra-station system interface tests verify capacity, control, and coordinated response of systems within the station, including communication signals and responses between the various systems under a variety of conditions and loads.

K. False Load Commissioning Tests:

1. Some Level 1 and Level 2 commissioning activities require application of false loads to verify responses to conditions not available naturally prior to commencement of revenue service.

2. If required, false load commissioning tests are specified in Related Sections NN 08 00, and are clearly identified as such.

3. Where false load testing is specified, provide temporary equipment, power, controls, wiring, piping, valves, and other necessary equipment and connections required to apply the specified load to the system. False load system shall be capable of steady state operation and modulation at the level of load specified. Equipment and systems permanently installed in this work shall not be used to create the false load without written approval of the Resident Engineer.

L. Seasonal Commissioning Tests: Seasonal commissioning test requirements are specified in Related Sections NN 08 00, and are clearly identified as such.

1. Some Level 1 and Level 2 commissioning activities require execution when natural loads are available to verify responses to conditions not available naturally prior to commencement of revenue service.

2. Where seasonal commissioning activities are specified, coordinate participation of necessary Contractor personnel and of the Commissioning Authority or other Sound Transit's witness. Seasonal commissioning activities are disruptive of normal occupant activities and facility operation. Seasonal commissioning activities shall be scheduled and coordinated to minimize occupant and facility impact. Obtain acceptance of the proposed schedule from the Resident Engineer.

3.04 LEVEL 1 AND LEVEL 2 COMMISSIONING ACTIVITY COMMISSIONING TEST DEMONSTRATIONS

A. Commissioning Test Demonstrations are required for:

1. Level 1 commissioning activities:
a. Component tests
b. Equipment tests
c. System tests

2. Level 2 commissioning activities:
   a. Intra-station system interface tests

B. Commissioning Test Demonstrations shall be performed on a sample basis for Level 1 Component, Equipment, and System Commissioning Tests, and for Level 2 Intra-station system interface tests. The lot size for the Commissioning Test Demonstration shall be determined based upon grouping all Equipment/Components of a similar purpose and common configuration. Examples of similar Equipment/Components categories include Air Handling Units, Tunnel Ventilation Fans, Pumps, Air Temperature Sensors, Fire/Smoke Dampers, Air conditioning units, Switchboards, Transformers, Motor Starters, receptacles, etc. The sample size for the Commissioning Test Demonstrations shall be determined using ANSI/ASQ Z1.4 2003 with a General Inspection Level of I and an Acceptable Quality Limit (AQL) of 1.5. Upon determination of the sample size, the samples shall be selected randomly by Sound Transit Witness at the time of the Commissioning Test Demonstration. The Commissioning Plan shall contain a detailed list of the Commissioning Test Demonstrations with lot and sample quantities for each category.

C. Test results that do not meet Acceptance Criteria (test failure) within a Commissioning Test Demonstration shall be considered a rejection of the sample. If the quantity of sample rejections exceeds that permitted by Table II-A of ANSI/ASQ Z1.4, additional Commissioning Test Demonstrations shall be performed. Additional Commissioning Test Demonstrations shall be randomly selected by Sound Transit Witness from the balance of the lot with a sample size equivalent to the initial sample size. If the required sample size after a test failure exceeds the remainder of the lot, the entire untested lot shall be demonstrated.

D. Upon completion of a Commissioning Test Demonstration, sign the completed data form and obtain Sound Transit's witness' signature at the time of the Demonstration to authenticate the reported results. Commissioning Test Demonstration data forms not signed by the Contractor and Sound Transit's witness at the time of the completion of the activity shall be rejected. Commissioning Test Demonstrations for which data forms are rejected shall be repeated and results shall be resubmitted.

1. Exception: Failure of Sound Transit's witness to attend: If Sound Transit's witness fails to attend a scheduled Commissioning Test Demonstration, the Contractor shall proceed with the scheduled activity. Upon completion of the activity, the Contractor shall sign the data form, and shall note the absence of Sound Transit's witness at the scheduled time and place.

E. If a Commissioning Test Demonstration fails, due to conditions found to be the Contractor's responsibility, reimburse Sound Transit for billed costs for the participation of the Resident Engineer, Commissioning Authority or other Sound Transit's witness, and Sound Transit's staff in the repeated execution of activities. Billed costs may include, but are not limited to, time, telephone, travel expenses, and per diem allowances for meals and lodging incurred as a direct consequence of the additional activities. Such expense may exceed the rate identified in Section 01 77 00, Closeout Procedures, because personnel in addition to the Resident Engineer may be involved.

3.05 LEVEL 3 INTER-STATION SYSTEM INTERFACE TEST

A. Coordinate with system contractors.
B. Provide control interface documentation and operate equipment and systems in support of Level 3 inter-station system interface tests.

C. Provide support of the integrated control system development and testing. Support includes adjusting equipment, answering questions, and troubleshooting problems that arise during control system installation and testing.

D. Level 3 inter-station system interface tests generally are dependent upon completion of work by systems contractors. Coordinate and schedule tests accordingly.

3.06 LEVEL 4 PRE-REVENUE TEST SUPPORT

A. During the Level 4 pre-revenue testing period, provide adequate supervisory mechanical and electrical support personnel to adjust equipment and troubleshoot system failures that might arise.

3.07 COMMISSIONING ISSUES

A. Commissioning activity results that are not within the range of acceptable results are commissioning issues.

B. Resolve commissioning issues promptly.

1. Do not delay Commissioning Test Demonstrations to correct commissioning issues during Commissioning Test Demonstrations.
   
a. Exceptions will be allowed if the cause of the issue is obvious and resolution can be completed in less than five minutes. If corrections are made under this exception, the unacceptable conditions shall be noted on the commissioning test data form and a commissioning Issue report shall be issued. A new commissioning test data form, marked "retest," shall be initiated after the resolution has been completed.

C. Track and report commissioning issues until resolution and retesting are successfully completed. Maintain a current record of commissioning issues on commissioning issues log on shared database.

D. Prepare commissioning issue report forms for commissioning activities for which acceptable results were not achieved. Enter commissioning issue reports into commissioning issues log on shared database.

E. Provide a commissioning issue report for each issue. Do not report multiple issues on the same commissioning issue report.

1. Exception: If an entire class of devices is determined to exhibit the identical issue, they may be reported on a single commissioning Issue report. (For example, if all return air damper actuators that are specified to fail to the open position are found to fail to the closed position, they may be reported on a single commissioning Issue report. If a single commissioning Issue report is used for multiple devices, each device shall be identified in the report, and the total number of devices at issue shall be identified.

2. Prepare Part 1 of commissioning issue report forms when the issue is identified. Enter Part 1 of commissioning issue report forms on commissioning issues log within 24 hours of the time the issue is identified. Identify:
   
a. Commissioning Issue report number. Assign unique, sequential numbers to individual Issue reports when they are created, to be used for tracking.
   
b. Action distribution list
c. report date  
d. Test number and description  
e. Equipment identification and location.  
f. Briefly describe observations about the performance which was associated with failure to achieve acceptable results. Identify the cause of failure if such is apparent.  
g. Diagnostic procedure or plan to determine the cause if the cause is not readily apparent.  
h. Diagnosis of fundamental cause of issues as specified below if the cause is not readily apparent.

3. Complete and submit Part 2 of commissioning issue report form when the issue has been resolved. Enter Part 2 of commissioning issue report forms on commissioning issues log shared database within 24 hours of the time the issue is reported resolved. Include:

a. Identify the fundamental cause of unacceptable performance as determined by diagnostic tests and activities.  
b. Identify corrective action taken to resolve the issue, and the dates and initials of the persons making the entries.  
c. Identify the schedule for retesting.  
d. Signed and dated by the person(s) who performed actions.

F. Schedule and repeat, at no additional cost to Sound Transit, Commissioning Test Demonstrations for sample failures. Repeat the entire test procedure and additional samples as required.

3.08 COMMISSIONING ISSUES LOG SHARED DATABASE

A. Sound Transit will create a commissioning issues log on a shared database for use by the Contractor and Sound Transit.

B. Contractor shall enter commissioning issues information and status on commissioning issues log on shared database.

3.09 REPAIR/RESTORATION

A. Diagnosis of Fundamental Cause of commissioning Issues

1. Where the fundamental cause of a commissioning issue is not readily apparent, perform, at no additional cost to Sound Transit, diagnostic tests and activities required to determine the fundamental cause of issues observed. For issues which are determined to result from design errors or omissions, or other conditions beyond the Contractor’s responsibility, submit a request for change order for the cost of diagnostic tests and activities for such issues.  

2. Record each step of the diagnostic procedure prior to performing the procedure. Update written procedure as changes become necessary.  

3. Record the results of each step of the diagnostic procedure.
4. Record the conclusion of the diagnostic procedure with regard to the fundamental cause of the issue.

5. Determine and record corrective measures.


B. Retesting:

1. Repeat at no additional cost to Sound Transit, the complete commissioning test procedure for each Commissioning Test Demonstration for which acceptable results are not achieved. Obtain Sound Transit's witness signature on Commissioning Test Demonstration retest data forms. Repeat Commissioning Test Demonstration until acceptable results are achieved, and perform additional sample testing as specified above. Except for issues that are determined to result from design errors or omissions, or other conditions beyond the Contractor's responsibility, compensate Sound Transit for direct costs incurred as the result of repeated and additional Commissioning Test Demonstrations to achieve acceptable results.

2. If unacceptable Commissioning Test or Commissioning Test Demonstration results are determined to result from design errors or omissions, or other conditions beyond the Contractor's responsibility, the Contractor shall be entitled to compensation for associated repeated Test demonstration(s).

3. For each repeated Commissioning Test Demonstration, submit a new commissioning test data form, marked "Retest".

3.10 COMMISSIONING COORDINATOR QUALIFICATIONS:

A. Submit the resume and statement of qualifications of the individual proposed to serve as the Commissioning Coordinator. Sound Transit reserves the right to interview the Commissioning Coordinator candidate in person prior to accepting placement in the position. Final acceptance of the Commissioning Coordinator will be by Sound Transit. Include the following with the qualifications submittal:

B. In addition to the submittal requirements listed here, the submittal shall provide evidence of compliance with each of the qualifications items listed under QUALITY ASSURANCE below.

1. Present employment:
   a. Company name and address.
   b. Present title and job description.
   c. History of employment (include dates and positions held).
   d. Description of work that demonstrates development of qualifications required for the Commissioning Coordinator.
   e. Significant projects.

2. Relevant work experience:
   a. Company name and address.
   b. Position held: title and job description.
c. Description of work that demonstrates development of qualifications required for the Commissioning Coordinator.

d. Significant projects.

3. Education and technical training.

3.11 COMMISSIONING COORDINATOR LETTER OF AUTHORITY:

A. Distribute to subcontractors and submit to Sound Transit a letter of authority to the Commissioning Coordinator, signed by a principal of the General Contractor's firm. Letter shall authorize the Commissioning Coordinator to:

1. Make inspections required for commissioning.

2. Coordinate, schedule, and manage commissioning activities of the Contractor, subcontractors and suppliers.

3. Obtain documentation required for commissioning from the Contractor, subcontractors and vendors.

4. Report directly to the Principal of the General Contractor's firm regarding issues, delayed resolution of issues, schedule conflicts, and lack of cooperation or expertise on the part of subcontractors or suppliers.

3.12 COMMISSIONING PLAN

A. Submit commissioning plan. An example commissioning plan is included herein. Commissioning plan shall include:

1. Overview of the commissioning work, developed specifically for the project.

2. Commissioning team members: Organization, position or title, name, contact information.

3. Roles and responsibilities for commissioning team members throughout the project. Roles differentiate portions of the commissioning work with which commissioning team members are involved. Responsibilities detail specific tasks to be completed by the individual members. Identify which parties will be responsible for producing the various commissioning procedures, reports, Sound Transit notifications and forms required.

4. Organizational chart showing lines of communication and authority of the Commissioning Coordinator relative to key General Contractor positions and to subcontractors.

5. Procedures to follow whenever commissioning work results do not meet Contract requirements.

6. Matrix of commissioning activities, organized to identify commissioning activities by section, commissioning activity identification and description, subject area or equipment or system, target date and responsibility.

7. Commissioning activity logic schedule organized to identify description of work by specification section and major equipment or system, commissioning activity identification and description, unique schedule tag, predecessor commissioning activities schedule tags and descriptions.

8. Commissioning schedule, integrated with the construction schedule.
9. Tabular summary of field commissioning activity information, including for each:
   a. Which Contractor personnel and subcontractors will participate,
   b. Instrumentation required,
   c. Which parties will provide instrumentation.

3.13 COMMISSIONING SCHEDULE:

A. Submit commissioning schedule in accordance with Section 01 32 13 Scheduling of Work.

B. Commissioning schedule shall include:

1. Start date and duration for the following commissioning work.
   a. Submittals.
   b. Submittal of operations and maintenance manuals preliminary submittals.
   c. Installation verification.
   d. Commissioning activities, Levels 1-4.
   e. Commissioning Test Demonstrations, Levels 1 and 2.
   f. Functional completion

2. Schedule shall include a line item for each commissioning test or activity specific to the equipment or systems involved. For example, separate schedule line items would be required for:
   a. “2370-SU-04 start-up: AHU-1,”
   b. “2370-SU-05 start-up: Cooling Tower,”
   c. “2390-S-06: AHU-1 Economizer Control,”
   d. (Note: Unacceptable schedule line item detail is exemplified by, “start-up,” “AHU-1,” “commissioning test’s,” or “training.”)

3. Identify CPM schedule predecessor milestones and dependent activities for commissioning work.

4. Identify commissioning work predecessor milestones, prerequisites, and dependencies in monthly statused CPM schedule submittals.

5. Identify commissioning work activities in monthly CPM schedule update submittals.

6. Identify commissioning work predecessor milestones, prerequisites, and dependencies in three-week look-ahead schedule submittals.

C. Commissioning Schedule Integration: Integrate commissioning work into the Contractor's construction schedule. Detailed integration of commissioning work with the Contractor's construction schedule is critical to maintaining project schedule milestones.

1. Include commissioning work in monthly updated Contractor's construction schedule and Short Interval Schedule submittals.
3.14 THREE-WEEK LOOK-AHEAD SCHEDULES:

A. Three-week look-ahead schedules shall identify the following for each commissioning activity for the following three weeks:

1. Activity date
2. Activity start time and anticipated duration
3. Staging location for participants and witnesses to meet
4. Contractor personnel required

B. Three-week look-ahead schedules will be used to notify and coordinate participation of Sound Transit's witnesses.

3.15 CONTROL INTERFACE WIRING DIAGRAMS:

A. Submit control interface wiring diagrams. Control interface wiring diagrams are diagrams of communication or signal wiring interfaces between systems.

B. Where control interfaces are required between equipment or systems provided under separate Sections of the Work, or between equipment provided by different manufacturers, the control interfaces shall be documented in control interface wiring diagrams.

C. This Article is not intended to require redundant control interface wiring diagrams. If control interface wiring diagrams specified elsewhere meet the requirements of this Article, reference to the specific diagrams included in such other submittals will satisfy the requirements of this Article.

D. Exceptions:

1. Control interface wiring diagrams are not required for electrical power wiring to equipment.
2. Control interface wiring diagrams are not required for control interfaces between components or assemblies provided by a single manufacturer or within a single Section of the work if those interfaces are clearly documented in shop drawings, record drawings, and operations and maintenance manuals.

E. Obtain information necessary for development of control interface wiring diagrams from Divisions 23, 25, and 26 contractors and suppliers.

F. Control interface wiring diagrams are required for interfaces between the following equipment and systems. These requirements are minimums. Additional control interface wiring diagrams may be required. Coordinate with Systems Contractors to ensure all necessary diagrams are developed and provided.

1. HVAC controls (BMS).
2. Automatic transfer switch.
3. Normal and emergency power controls.
4. Lighting controls.
5. Telecommunications; wired and wireless for BMS and fire alarm.
6. Intercommunications; telephone and intercom for elevator cab phone.
7. Closed circuit television for elevator cabs
8. Door Access and Security
9. Sound Reinforcement Systems
10. Uninterruptible power system (UPS)
11. Elevator controls
12. Escalator controls

G. Control interface wiring diagrams shall include:
   1. General panel layout for panels in which the wiring connections are to be made, identifying the location of the terminal strip or connectors. Identify panel labeling and location in the building.
   2. Terminal strips or connectors in detail, identifying the terminations and wires with the same markings used on the hardware. Identify which Contractor, Subcontractor or supplier is responsible for providing terminal strips or connectors, and for terminating wire pairs.
   3. Identification of the function of each interface, e.g. “Sump high level alarm.”
   4. Identification of electrical characteristics of the signals, for example, “0-10 Vdc,” or “Dry Contacts.”
   5. If the interface is a set of dry contacts, identify whether contacts are normally open or closed.

3.16 LEVEL 1 INSTALLATION VERIFICATION CHECKLISTS

A. For level 1 installation verification requirements specified in Related Sections NN 08 00, submit installation verification checklists. Include complete manufacturer's instructions and installation verification checklists for installation.

B. Installation verification checklists shall address the following quality issues:
   1. Equipment compliance with accepted submittals in all respects, including: make and model, configuration, efficiency, size, capacity, utility connection requirements.
   2. Equipment was not damaged in shipping or installation.
   3. Installation in accord with construction documents and accepted submittals, including:
      a. Location per contract drawings and shop drawings
      b. Configuration
      c. Support from structure
   4. Access clearance to equipment in accordance with manufacturers' instructions, and to allow service, repair, removal and replacement without the need to disassemble or remove other equipment or building elements.
5. Access coordinated with other building elements and equipment, including ceiling and wall access panels, in a manner consistent with OSHA and WISHA fall protection regulations and safe work practices.

6. Connection of services of the correct characteristics

7. Correct labeling and identification of equipment and components, including, for example, control components, piping, valves, starters, gauges, thermometers.

8. Installation in accord with manufacturers' recommendations and good practice, including manufacturer's installation checklists

9. Documentation of prestart-up activities performed, including manufacturer's factory tests, fluid quality analysis, shaft alignment, and other manufacturer's prestart-up activities, as appropriate.

C. Organize installation verification checklists into the following sections:

1. Header: Each page: Project identification, installation verification checklist number and title, version information, short description of specific work area, system or equipment for which the checklist applies, page number/total number of pages, first/repeat check, space for date of check.

2. Cover Sheet: A cover sheet, or cover section shall include the following, minimum:
   a. Objectives: Statement of the objectives to be accomplished by use of the checklist, references to cogent documents, list of attachments.
   b. Systems and equipment to be verified: List specific items to which the checklist form applies. Note that a single checklist form typically applies to multiple similar items, each of which shall be identified in this paragraph.
   c. Test Equipment: Identify tools and test equipment required to complete the installation verification checklist.
   d. Checklist Results: Instructions for documenting and resolving negative results, similar to examples of acceptable checklists.

3. Checklist Sheet: Checklist sheets or sections shall include the following, minimum:
   a. Delivery Checklist: Verification of receipt of material in accordance with contract requirements and accepted submittals, and verification of the condition of the materials upon receipt.
   b. Installation Checklist: Verification that material was installed in accordance with contract requirements and accepted submittals, manufacturer's standard installation requirements, the ability of the installation to meet commissioning test requirements, and safe access for testing, maintenance, operation, repair, and replacement, minimum. Tailored to the specific materials and equipment submitted and accepted for installation. Include manufacturer's checklist forms.
   c. Pre-Start Checklist: Verification that material is ready for start-up, including connection to utilities and controls, and proper adjustment.
   d. Negative Responses: Space to record negative response details and resolution.
e. Signature Block: Space for signatures of contractor and Sound Transit witness, including company, name, signature and date.

3.17 INSTALLATION VERIFICATION REPORTS

A. Installation verification reports shall contain:

1. Executed installation verification checklists for the system, signed by the Contractor or their designated subcontractors or vendors.

2. Summary of installation issues and corrective actions.

3. Findings of the final installation verification, including evaluation of system readiness for start-up.

3.18 LEVEL 1 STATIC TEST PROCEDURES AND DATA FORMS

A. For level 1 static tests specified in Related Sections NN 08 00, submit static test procedures and data forms.

B. Static test procedures: Step-by-step instructions to describe use of instrumentation, configuration of the installation being subjected to the test, date and time of the test, and times for steps as appropriate. Identify raw measurement units and how to convert raw measurements to units specified in the acceptance criteria.

C. Static test data forms: Data forms to record results of each step of the test procedure, including, but not limited to test instrumentation identification and calibration information, test conditions at the start and end of the test, start and end times, raw test data, and corresponding values in the units specified for the test acceptance criteria. Include signoff blocks for individuals performing the tests and witnesses. Signoff blocks include spaces for printed name, organization, date and signature.

3.19 LEVEL 1 START-UP REQUIREMENTS PROCEDURES AND DATA FORMS

A. For level 1 start-up requirements specified in Related Sections NN 08 00, submit start-up procedures and data forms.

B. Include manufacturer’s complete standard instructions and procedures and forms, minimum, in submittal of start-up procedures and data forms.

C. Tailor start-up procedures to the specific equipment submitted and accepted for installation.

D. Start-up test data forms: Data forms to record results of each step of the start-up procedure, including, but not limited to checkout, alignment, and calibration. Include signoff blocks for individuals performing the tests and witnesses. Signoff blocks include spaces for printed name, organization, date and signature.

3.20 LEVEL 1 AND LEVEL 2 COMMISSIONING TEST PROCEDURES AND DATA FORMS

A. For level 1 and level 2 commissioning tests specified in Related Sections NN 08 00, submit test procedures and data forms.

B. Test procedures and data forms shall comply with manufacture’s operation and maintenance requirements. Include the following documentation with test procedures and data forms submittal:

1. Operation and maintenance documentation. Provide equipment manufacturer’s technical documentation relevant to provided equipment to which Level 1 and Level 2 commissioning activities apply. Documentation shall be specifically ori-
ent to the equipment provided. Exclude material pertaining to equipment that is not to be installed under this contract. Include wiring diagrams complete and specific to the equipment provided. Cross reference test procedures and data forms to operation and maintenance documentation. Index manufacturer’s operation and maintenance documentation for unambiguous cross reference. See Section 01 78 23, Operation and Maintenance Data. Include, minimum:

a. Installation instructions and checklists.

b. Start-up instructions, procedures and data forms.

c. Operation and maintenance procedures.

2. Control interface wiring diagrams.

C. Applies to submittals of procedures and data forms for the following commissioning activities:

1. Level 1 commissioning activities:

   a. Component tests
   
   b. Equipment tests
   
   c. System tests

2. Level 2 commissioning activities:

   a. Intra-station system interface tests

D. Commissioning test procedures define the step-by step procedures to be used to execute commissioning tests. Commissioning test procedures are specific to the make, model, and application of the equipment and systems being tested. Test procedures shall include:

1. Commissioning activity identification and name.

2. "Objectives" section to describe the purpose of the test.

3. "Systems and Equipment to be Tested" section to enumerate the subjects of the test.

4. "Prerequisites" section to list other commissioning activities that must be completed with acceptable results prior to starting the test.

5. "Minimum Participants" section to list organizations whose representatives are required to be engaged in execution of the test, and those who must be available on site but not specifically engaged in the test unless called.

6. "Test Equipment" section to identify materials, supplies, tools and instrumentation required during the test, identified by reference to the test equipment identification list nomenclature.

7. "Test Procedure" section to identify the specific steps required to execute the tests. Test procedures shall comply with the following criteria:

   a. Repeatability: Instructions for each step shall be sufficiently complete and unambiguous to allow the test to be repeated with essentially identical results.
b. Specificity: Direct action for a specific device or item of equipment, referring to the item by its contract document or shop drawing nomenclature such that there is no question during execution of the test regarding which device is referenced. If a valve for which there is no valve number on the contract drawings must be closed, for example, refer to it by the valve tag number applied by the Contractor.

c. Clarity: Written in clear simple statements appropriate to the skill level of the trades person or technician executing the test.

d. Modularity: Each step shall direct a single action such that each action can be checked off as complete, with corresponding parameters noted on the data form.

E. Commissioning test procedures shall include test data forms to record test results at each step of the test procedure. Test data forms are the official records of the results of commissioning test results. Test data form may be integrated with the test procedure such that each test procedure step is followed by test data, or may be an attachment to the test procedure. Test data forms shall include:

1. Commissioning activity identification and name to match the corresponding test procedure.

2. Equipment or system identification.

3. Check box to indicate a Commissioning Test Demonstration, and whether it is the first demonstration or a re-test.

4. Test date and time.

5. Instrumentation section to record instruments used, including instrument identification and calibration date.

6. Test parameters spaces to record how the system or equipment was configured or operated, interspersed with data entry spaces for changes in configuration or operation, numbered to match test procedure step numbering, with short description, and space to record parameters.

7. Test data entry spaces, numbered to match test procedure step numbering, with short description, range of acceptable results, the units of measurement, and space to record results.

8. Signoff blocks for individuals performing the tests and witnesses. Signoff blocks include spaces for printed name, organization, date and signature, which shall be used in the field by Contractor and Sound Transit's witness jointly to validate reported test data.

F. Example test procedures and data forms are included in Related Sections NN 08 00.

3.21 TEST EQUIPMENT IDENTIFICATION LIST:

A. Provide a list of instruments and test equipment that will be used in the commissioning tests. Sort instruments and test equipment according to intended use. Obtain acceptance of the test equipment identification list prior to executing commissioning tests. Instruments and test equipment not included in the accepted test equipment identification list shall not be used. Test equipment identification list shall comply with Control of Inspection, Testing, and Monitoring Equipment provisions of Division 01 Section, Quality Control. Additionally, test equipment identification list shall include:
1. Test equipment identification number: Identify equipment by a unique alphanumeric identifier to be referenced in submitted procedures.

2. Range.

3. Accuracy.

4. Resolution.

5. Intended use.

3.22 COMMISSIONING TEST DATA

A. Submit completed commissioning test forms. Provide data indicated on the data forms. Include:

   1. "As-tested" system configuration,
   2. Data and observations, including data trend logs, recorded during the tests
   3. Dated signatures of individuals performing and witnessing tests.

3.23 WEEKLY PROGRESS REPORTS

A. Submit weekly progress reports. Weekly progress reports shall Include:

   1. Equipment or system tested, including commissioning activity number, equipment tag number and location
   2. Activities scheduled but not conducted in accordance with schedule
   3. Commissioning issues log
   4. Schedule changes for remaining commissioning activities, if any.

3.24 DATA TREND LOGS

A. Submit data trend logs with associated commissioning test data, as specified under “PART 3 EXECUTION” in Related Sections NN 08 00. Where data trend logs are required, they shall be initiated and running prior to the time scheduled for the Commissioning Test Demonstration.

3.25 SYSTEM ALARM LOGS

A. Submit system alarm logs daily at the start of days following a day in which commissioning tests or Commissioning Test Demonstrations were performed. System alarm logs shall include a printout of the control system alarm log.

3.26 COMMISSIONING REPORT

A. At the completion of commissioning work, submit commissioning report of the commissioning work of the Contractor including, but not limited to:

   1. Installation verification reports.
   2. Accepted commissioning test procedures
   3. Commissioning activity data forms, completed and signed.
   4. Commissioning Test data forms, completed and signed.
5. Commissioning Test Demonstration data forms, completed and signed.
6. Progress reports.
8. Commissioning Issue reports showing resolution of issues.
9. Correspondence or other documents related to resolution of issues.
10. Other reports required by commissioning work.
11. List any unresolved issues and the reasons they remain unresolved.

B. Commissioning Report Format and Organization:

1. Commissioning report shall be submitted in electronic data pdf format on compact disc.
2. Label compact disc with the report title, volume number, project name, contractor’s name, and date of report.
3. Provide a table of contents and an index to each activity.
4. Provide major tabs for each Related Section NN 08 00.
5. Provide minor tabs for each commissioning activity.
6. Within each minor tab, include the following:
   a. Activity specification,
   b. Installation verification reports,
   c. Accepted commissioning activity procedures,
   d. Commissioning activity data forms, competed and signed,
   e. Commissioning Test data forms, competed and signed,
   f. Commissioning Test Demonstration data forms, competed and signed,
   g. Commissioning Issue reports, showing resolution of issues, and all correspondence or other documents related to resolution of issues pertaining to a single commissioning test. Group data forms, commissioning Issue reports showing resolution of issues, and all correspondence or other documents related to resolution of issues for each test repetition together within the minor tab, in reverse chronological order (most recent on top).

3.27 REQUEST FOR CERTIFICATE OF FUNCTIONAL COMPLETION:

A. Request for certificate of functional completion shall state that the commissioning work, or portion thereof designated and accepted by Sound Transit, is complete. Commissioning work of designated phases of the Work shall be completed as a condition of completion for that phase.

B. Deferred activities may be completed after the date of Functional Completion. Deferred activities shall be identified in the Request for certificate of functional completion as follows.
1. Identify the deferred activity by number and title.

2. Provide a target schedule for completion of the deferred activity.

C. Obtain Sound Transit acceptance of a list of activities proposed for delayed execution (delayed activities), including proposed schedule of completion of each delayed activity, before submitting request for certificate of functional completion. Include the following in the request for certificate of functional completion.

1. Identify the delayed activity by activity number and title.

2. Written acceptance of the list of activities proposed for delayed execution, including proposed schedule of completion of each delayed activity.

D. Acceptance of the Request for certificate of functional completion is required prior to acceptance of Substantial Completion.

E. Upon written notice that commissioning work, or portion thereof designated and accepted by Sound Transit, is complete, the Commissioning Authority will review with the Resident Engineer and Sound Transit the status of commissioning work completion. Following review, Sound Transit will either prepare a certificate of functional completion, or will advise the Contractor of work that shall be completed or corrected before the Certificate will be issued. Repeated review due to incomplete work on the part of the Contractor will be performed at Contractor's expense for Commissioning Authority's, Resident Engineer's, or Resident Engineer's consultant's, or Sound Transit's time, as billed to Sound Transit. Such expense may exceed the rate identified in Section 01 77 00, Closeout Procedures, because personnel in addition to the Resident Engineer may be involved. Commissioning work is complete when the work specified in this and other Related Sections NN 08 00, has been completed and accepted, including but not limited to:

1. Completion and documentation of commissioning activities.

2. Completion of Commissioning Test Demonstrations and acceptance of test results.

3. Resolution of issues, as verified by retests performed and documented with acceptable results.

4. Completion and acceptance of submittals and reports.

F. Commissioning work shall be completed, including resolution of issues and retesting to achieve acceptable results prior to issuance of certificate of functional completion.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies demolition, removal, and disposal of surface and subsurface structures and related ancillary components.

B. Work specified also includes removal, relocation, and disposal of selected improvements as indicated, located within street right-of-way or area of existing improvements, where care must be exercised to prevent damage to existing utilities or portion of improvements that are to remain.

1. Protect trees outside of the limits of construction and as indicated in the Contract Documents.

2. Remove monitoring wells in accordance with WAC 173-160 Minimum Standards for Construction and Maintenance of Wells, and Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork.

C. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections not referenced below may also be related to the proper performance of this work.

1. Section 01 31 14, Coordination with Others
2. Section 01 35 29.20, Health, Safety, Security and Emergency Response Procedures
3. Section 01 45 00, Quality Assurance/Quality Control
4. Section 01 50 00, Temporary Facilities and Controls
5. Section 01 56 39, Temporary Tree and Plant Protection
6. Section 01 57 19, Temporary Environmental Controls
7. Section 01 74 00, Cleaning and Waste Management
8. Section 01 78 39, Project Record Documents
9. Section 02 65 00, Underground Storage Tank Removal
10. Section 02 82 33, Removal and Disposal of Asbestos Containing Materials
11. Section 02 83 33, Removal and Disposal of Material Containing Lead
12. Section 02 84 33, Removal and Disposal of Polychlorinate Biphenyls
13. Section 02 88 33, Removal and Disposal of Mercury Containing Components
14. Section 03 05 15, Portland Cement Concrete
15. Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork
16. Section 31 11 00, Clearing and Grubbing
17. Section 31 20 00, Earth Moving

1.02 REFERENCES
A. This Section incorporates by reference the latest revision of the following documents:
   1. American National Standards Institute (ANSI):
      a. ANSI A10.6 Safety Requirements for Demolition Operations
   2. City of Seattle (COS):
      a. Standard Specifications for Road, Bridge, and Municipal Construction

1.03 DEFINITIONS
A. Structure: Residential and commercial buildings, including but not limited to walls, slabs, beams, foundations, footings, piles, foundation systems, pavements, curbs and ramps, loading docks, stairs, canopies, and sidewalks integral to the structure.

1.04 SUBMITTALS
A. Procedures: Section 01 33 00, Submittal Procedures, for submittal requirements and procedures.
B. Demolition, Disposal and Salvage Construction Work Plan: Provide a demolition plan and schedule describing the proposed sequence, methods, and equipment for demolition, removal, and disposal of structures, including salvage if required. Include description of proposed haul routes.
C. Permits:
   1. Demolition
   2. Hauling and debris disposal
   3. Groundwater discharge
   4. Street Use
D. Utility Severance Certificates: Certificates of severance of utility services.
E. Private Property Owner's Release: If material demolished and removed from the site will be deposited on private property, submit two copies of written releases not more than 15 days before the start of work. Releases shall absolve Sound Transit from responsibility concerning the depositing of material on private property, and shall be signed by the owners of property on which the material will be deposited.
F. Permit from Underground Service, if applicable.
G. As-built drawing(s) of surveyed locations and depths of disconnected utilities, walls, buried shoring elements, and foundations left on site. Refer to Section 01 78 39, Project Record Documents.
H. Rodent Control Inspection and Extermination Statement.
I. Letter verifying re-establishment of survey markers and monuments, signed by a land surveyor licensed in the State of Washington.

1.05 SITE CONDITIONS

A. Existing structures and utilities may contain asbestos, lead, PCB or mercury. Hazardous Material-related work is not included in the scope of this Section. Hazardous Material-related work and other matters related to the discovery of asbestos and other hazardous substances are specified in Section 02 82 33, Removal and Disposal of Asbestos Containing Materials; Section 02 83 33, Removal and Disposal of Material Containing Lead; Section 02 84 33, Removal and Disposal of Polychlorinate Biphenyls; and Section 02 88 33 Removal and Disposal of Mercury Containing Components.

B. Unknown Conditions:
   1. The Contract related documents may not represent all surface and subsurface conditions at the site and adjoining areas. Verify the actual conditions before commencing work, including extent of materials remaining in buildings on site.
   2. Perform surveys and potholes to locate existing drainage and utilities.
   3. Prepare drawings to depict existing utilities.
   4. Protect existing utilities and drainage from damage.

1.06 DEMOLITION, DISPOSAL AND SALVAGE CONSTRUCTION WORK PLAN

A. Describe the proposed sequence, methods, and equipment for demolition, salvage, removal, and disposal of structure(s). Include description of proposed haul routes and indicate access points to work areas.

B. Describe proposed disposal of materials from the demolition, including plans that will maximize recycling and reuse of materials.

C. Prepare in accordance with Section 01 45 00, Quality Assurance/Quality Control.

PART 2 - PRODUCTS

2.01 MATERIALS, EQUIPMENT, AND FACILITIES

A. Backfill: Section 31 20 00, Earth Moving.

B. Products for patching, extending and matching: Same type as those in existing facility, and in accordance with City of Seattle Standard Specifications for Road, Bridge and Municipal Construction.

PART 3 - EXECUTION

3.01 PERMITS
A. Obtain all special permits and licenses and give all notices required for performance and completion of the demolition and removal work, hauling, and disposal of debris, and other permit requirements identified in this Section.

3.02 PROTECTION

A. Preservation of Reference Markers

1. Record the locations and designation of survey markers and monuments prior to their removal. Provide three reference points for each survey marker and monument removed, established by a land surveyor licensed in the State of Washington.

2. Store removed markers and monuments during demolition work, and replace them upon completion of the work. Re-establish survey markers and monuments in conformance with the recorded reference points.

B. Protection of Persons and Property:

1. Erect and maintain temporary bracing, shoring, lights, barricades, signs, and other measures as necessary to protect the public, workers, and adjoining property from damage from demolition work, all in accordance with applicable codes and regulations.

2. Barricade and post with warning lights open depressions and excavations occurring as part of this work when accessible through adjacent property or through public access. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

3. Protect utilities, pavements, and facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by the demolition operations.

4. Replace or compensate the owner for any tree or shrub permanently damaged outside the construction limits in accordance with Section 01 56 39, Temporary Tree and Plant Protection.

C. Protection of Utilities:

1. Protect active sewer, water, gas, electric, fiber optic and co-axial telecommunications, and other utilities found or otherwise made known to the Contractor before or during demolition work. If utility is damaged, immediately notify the Resident Engineer and the utility owner for corrective action. Use of ‘safety watches’, due to damage of utilities, by utility owner is at the Contractor’s expense. Refer to Section 01 31 14, Coordination With Others.

2. Make arrangements for the disconnection and termination of all water, sewer, gas, electric, telephone, cable television and other facilities that are connected to the building, in conformance with the requirements of the municipalities and companies owning or controlling them. Refer to Section 01 31 14, Coordination With Others.

3.03 PREPARATION

A. Rodent Control and Extermination: Secure a registered sanitarian in the State of Washington to conduct a survey for evidence of current rodent activity and initiate a control program by a health department certified pest control operator if the survey
indicates that it is necessary. Include in the Control Program the following minimum requirements:

1. At least 10 days before beginning demolition of any structure, rid the structure and adjacent areas within the limits of the demolition of rodents or their carcasses and prevent their migration to adjacent areas. Continue pest control throughout demolition and utility work and for one month after substantial completion. At the direction of the Resident Engineer, apply pest control to buildings in close proximity to the site.

2. Where there is no competing water supply, liquid anticoagulant baits may be used at the discretion of the certified pesticide applicator.

3. Place toxic bait in the form of one pound paraffinized block in each manhole or inlet of storm or combination drains located on the same street as the building to be demolished and within the same block, including the entire intersections of the nearest cross streets. Place bait in suitable locations within the drainage structures, as determined by the pest control operator. Fasten the bait block in its location with wire.
   a. Inspect all toxic bait in structures or drains and renew as necessary on the fourth or fifth day after initial baiting and every (5) business days thereafter.
   b. Pest control measures shall be humane, without causing undue pain and suffering. Product shall be environmentally friendly and safe for humans and domestic animals within the vicinity.

4. Remove and dispose of all visible carcasses of rodents in sealed plastic bags.

5. Submit a statement signed by the pest control operator, after the initial treatment and each follow-up inspection reporting the amount and type of bait placed in each location and stating the visible results obtained from the rodent control program. Ensure the pest control operator is aware of the antidote noted on the rodenticide label.

B. Shrub, Trees and Vegetation

1. Remove all trees, shrubs, and other vegetation within construction limits, and as specified in Section 31 11 00, Clearing and Grubbing.

2. Protect trees and shrubs outside of construction limits as specified in Section 01 56 39, Temporary Tree and Plant Protection.

3. Protect street trees within construction limits as specified in Section 01 56 39, Temporary Tree and Plant Protection.

4. Some existing trees, shrubs and other vegetation shown within the “Contractor Working Limits” may be removed by others prior to notice to proceed date. Verify the quantity of existing trees prior to starting work. Assume no salvage value for trees, shrubs and other vegetation removed by others.

3.04 DEMOLITION

A. Perform demolition in accordance with the approved Demolition, Disposal and Salvage Construction Work Plan and ANSI A10.6.
B. Perform lead and lead-containing material work in accordance with Section 02 83 33, Removal and Disposal of Material Containing Lead.

C. Perform PCB containing material-related work in accordance with Section 02 84 33, Removal and Disposal of Polychlorinated Biphenyls.

D. Perform asbestos-related work in accordance with Section 02 82 33, Removal and Disposal of Asbestos Containing Materials.

E. Perform mercury-related work in accordance with Section 02 88 33, Removal and Disposal of Mercury Containing Components.

F. Install instrumentation to monitor earth and structure movements in accordance with Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork.

G. Blasting will not be permitted.

H. Backfill depressions caused by excavations, demolition, and removal with materials placed and compacted in accordance with Section 31 20 00, Earth Moving. Backfill and level to grades as indicated on Contract Drawings.

I. Exercise pollution controls as specified in Section 01 35 29.20, Health, Safety, Security, and Emergency Response Procedures and Section 01 57 19, Temporary Environmental Controls.

J. Demolish and remove foundations, footings, and grade beams.

K. Remove basement walls to remain to a depth of 1 foot below finished ground elevation unless otherwise indicated.

L. Remove poles, signs and fences, including footings. Restore damaged concrete after demolition. Removed existing fencing materials may be reused for construction fencing, subject to approval by the Resident Engineer.

M. Underground Storage Tanks: In accordance with requirements Section 02 65 00, Underground Storage Tank Removal.

N. Break up and remove asphalt and concrete pavement, curbs, walks, steps, retaining walls, slabs and aprons.

O. Abandoned Pipes: Where pipes to be abandoned and are designated to be capped and plugged, do so by plugging with concrete for a distance of 2 pipe diameters. Use concrete conforming to the requirements for 3,000 psi concrete as specified in Section 03 05 15, Portland Cement Concrete to form the plug.

P. Abandon Catch Basins, Valve Chambers, Manholes and Inlets as specified in the COS Standard Specifications, Section 2-02.

3.05 CLEANUP

A. Refer to Section 01 74 00, Cleaning and Waste Management.

END OF SECTION
SECTION 02 61 13
EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies screening, excavation, dewatering, handling, stockpiling, temporarily storing, and disposing of contaminated material, including soils and groundwater, that are known or that may be encountered during the Work.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of the work:

1. Section 01 35 29.10, Hazardous and Contaminated Substance Health and Safety Program.
2. Section 01 35 43.15, Unknown Hazardous and Contaminated Substances.
3. Section 01 35 43.20, Hazardous and Contaminated Substance Air Monitoring
4. Section 01 57 19, Temporary Environmental Controls.
5. Section 01 57 24, Temporary Site Water Discharge.
6. Section 31 20 00, Earth Moving
7. Section 31 23 19, Dewatering.
8. Section 31 50 00, Excavation Support and Protection.

1.02 REFERENCES

A. This Section incorporates by reference the latest revision of the following documents:

1. American Society for Testing and Materials (ASTM)
   a. ASTM D 5434 Guide for Field Logging of Subsurface Explorations of Soil and Rock

2. Code of Federal Regulations (CFR)
   a. 29 CFR 1910 Occupational Safety and Health Standards
   b. 40 CFR 262 Standards Applicable to Generators of Hazardous Waste
   c. 40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment
   d. 40 CFR 268 Land Disposal Restrictions
   e. 40 CFR 280 Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST)
3. Revised Code of Washington (RCW)
   a. RCW Chapter 70.105D Model Toxics Control Act (MTCA)

4. Washington Administrative Code (WAC)
   a. WAC 173-303 Dangerous Waste Regulations
   b. WAC 173-340 Model Toxics Control Act – Cleanup
   c. WAC 296-843 Hazardous Waste Operations

1.03 DEFINITIONS

A. Refer to Section 01 35 29.10, Hazardous and Contaminated Substance Health and Safety Program. For definitions of the following terms:
   1. Certified Industrial Hygienist (CIH)
   2. Site Safety Health Officer (SSHO)
   3. Contaminated Groundwater
   4. Contaminated Material
   5. Contaminated Soil
   6. Dangerous Waste
   7. Exclusion Zone
   8. Suspected Contaminated Material

B. Dewatering: Refer to Section 31 23 19, Dewatering.

C. Flame Ionization Detector (FID): A field screening device to detect contaminated materials, utilizing a small flame to burn samples which then pass through an ion detector to determine constituents.

D. Organic Vapor Analyzer (OVA): A field screening device to detect contaminated materials by analyzing volatile organic compounds emitted from a sample, using a photoionization detector and an ultraviolet light or lamp.

E. Photoionization Detector (PID): A field screening device to detect contaminated materials, utilizing an ultraviolet light to detect ions from volatile organic compounds emitted from a sample.

F. Surface Water: Refer to Section 01 57 24, Temporary Site Water Discharge.

1.04 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Contaminated Material Handling (CMH) Plan: 21 Days after Notice to Proceed.

C. Contaminated Material Screening Plan: 21 Days after Notice to Proceed.

D. Qualifications.
E. Certifications.

F. Surveys, including cross-sections of areas of excavation.

G. Analytical testing results within 24 hours of receipt, including field screening results.

H. Closeout Documents at the completion of the task, including:
   2. Analytical laboratory test results.
   3. Surveys.
   4. Logs.
   5. Waste manifests.

1.05 QUALITY ASSURANCE

A. Qualifications

1. CIH and SSHO: In accordance with Section 01 35 30, Contaminated Material Health and Safety Program.

2. Site supervisor:
   a. Trained and experienced in hazardous and contaminated material handling.
   b. Completed OSHA training requirements for working with hazardous substances including the eight-hour supervisory course.
   c. Minimum of three years of experience in managing hazardous materials projects.

3. Site personnel working with contaminated material:
   a. Received site specific training.
   b. Minimum three years experience with similar work.

4. For above Level D protection:
   b. Minimum of 40 hours health and safety training
   c. Minimum 24 hours of “on the job” training.
   d. Eight hours annual refresher training.
   e. Annual medical monitoring by an occupational physician.

B. Certification

1. For certification requirements for CIH and SSHO: See Section 01 35 30, Contaminated Material Health and Safety Program.
2. That workers entering the Exclusion Zone have appropriate training for anticipated conditions, and are medically cleared to work on contaminated material sites.

3. That personnel have received medical examinations and are certified for respirator use (if necessary), within the last 12 months.

4. That disposal sites are in accordance with all regulations for proper disposal or treatment.

5. That a state-licensed transporter of contaminated materials is being used.

C. Perform contamination excavation and disposal work in compliance with applicable statutes and regulations, including the Washington State Model Toxics Control Act (MTCA), RCW Chapter 70.105D.

D. Independent Testing Agency: Use a testing agency in accordance with requirements of Section 01 35 29.10, Hazardous and Contaminated Substances Health and Safety Program.

E. Calibrate the PID/FID and OVA screening devices as specified in instrument user manuals.

1.06 SITE CONDITIONS

A. Contaminated materials in soils and groundwater are anticipated to be encountered during the Work. These conditions will require the screening, excavation, handling, stockpiling, temporary storing, and disposal of contaminated materials.

B. Potential contaminants that may be encountered include but are not limited to Total Petroleum Hydrocarbons (TPH), gasoline-, diesel-, and oil-range; benzene, toluene, ethylbenzene, xylenes (BTEX); metals; carcinogenic polynuclear aromatic hydrocarbons (cPAHs); and volatile organic compounds such as perchloroethene (PCE), trichloroethene (TCE), and polychlorinated biphenyls (PCB), and vinyl chloride.

1.07 CONTAMINATED MATERIAL HANDLING (CMH) PLAN

A. The CIH shall prepare the CMH Plan. At a minimum, include the following in the CMH Plan:

1. Schedule of activities.

2. Methods and procedures of excavation and equipment to be used.

3. Shoring or side-wall slopes proposed, in accordance with Section 31 50 00, Excavation Support and Protection.

4. Staging and storage methods, procedures, and locations for liquid and solid contaminated material.

5. Borrow sources and haul routes, in accordance with Section 31 20 00, Earth Moving.

6. Methods and procedures for the transportation, disposal, and off-site treatment of contaminated materials, in compliance with applicable federal, state, and local laws and regulations, including the identification of disposal and treatment facilities, and the use of certified, licensed transporters.
7. Decontamination procedures.
8. Sampling and analysis plans and responsibilities, including the characterization of tank contents, and releases of hazardous and contaminated substances.
9. Spill Prevention, Control, Contingency, and Countermeasures (SPCCC) plan.
10. Water Management Plan
11. Procedures for documenting and reporting encounters with and/or releases of hazardous or contaminated substances.

B. Coordinate with requirements of Section 01 35 29.10, Hazardous and Contaminated Substance Health and Safety Program.

C. Coordinate with requirements of the Stormwater Pollution Prevention Plan (SWPPP), as specified in Section 01 57 19, Temporary Environmental Controls, and Section 01 57 24, Temporary Site Water Discharge.

D. Coordinate with requirements of Section 31 23 19, Dewatering.

E. Obtain all required permits and notifications for removal, excavation, dewatering, storage, transportation, and disposal of contaminated material. In furtherance of this requirement, the Resident Engineer will provide sampling results and other information developed by Sound Transit, if any. Obtain permits at no additional cost to Sound Transit.

1.08 CONTAMINATED MATERIAL SCREENING PLAN

A. Implement a Contaminated Material Screening Plan, prepared by the CIH, to ensure that soils and other materials potentially contaminated are properly handled, transported, and disposed of in accordance with applicable environmental regulations.

B. Plan may be submitted as part of the site Hazardous and Contaminated Substance Health and Safety Plan (HCSHSP) as described in Section 01 35 29.10, Hazardous and Contaminated Substance Health and Safety Program.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Backfill Material: See Section 31 20 00, Earth Moving.

B. Spill Response Materials:
   1. As required and described in the CMH Plan.
   2. Containers, adsorbents, shovels, and personnel protective equipment.
   3. Available at all times in which contaminated materials are being handled or transported.
   4. Compatible with the type of materials and contaminants being handled.

C. Staging Material:
   1. Plastic liner or material cover:
a. Chemical resistant.
b. Minimum thickness of 6 mils.

2.02 EQUIPMENT

A. Utilize a PID or FID and OVA to perform screening for contaminated materials. Use a PID/FID that is able to perform headspace analysis and is able to detect the contaminants of concern.

B. Colorimetric field screening kit. A field testing kit (such as a "Hanby kit" or RemediAid kit) may be used in addition to the PID/FID and OVA to screen for aromatic compounds, including BTEX, gasoline, and diesel. This screening method includes the extraction of aromatic compounds from the sample and provides a colorimetric indication of the concentration and type of contaminants present.

C. Immunoassay test kit. An immunoassay test kit may be used in addition to the PID/FID and OVA to screen petroleum compounds, polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbons (PAHs). This screening method depends on the ability of antibodies (analytes) to specifically bind to an antigen (compound); test results are measured visually or by a special instrument.

PART 3 - EXECUTION

3.01 CONTRACTOR'S ASSISTANCE

A. Assist the Resident Engineer in the performance of duties during general excavation and site remediation activities. Such assistance includes providing access for the Resident Engineer to document site activities and to collect soil and water samples. Such assistance may also include collecting soil samples with a backhoe at the direction of the Resident Engineer.

B. Anticipate a delay of up to five days between the collection of confirmation samples and the completion of chemical laboratory analyses and secure and maintain excavation areas during that time.

C. Notify the Resident Engineer immediately if contaminated substances are discovered which had not been previously identified, or if other discrepancies between data provided and actual field conditions are discovered.

3.02 CONTAMINATED MATERIAL REMOVAL

A. Give notification at least seven days prior to the start of excavation of known contaminated material.

B. Strip and stockpile soil separately from contaminated material, for areas that are considered to be below action levels based on field screening as specified herein. Be responsible for protecting this material from becoming contaminated. This may include covering the soil with plastic sheeting. Dispose of such soil that becomes contaminated as a result of work activities at own expense.

C. Excavate areas of contamination, as shown on the Contract Drawings, in compliance with the Contaminated Material Handling Plan. Limit the potential for contaminated material to be mixed with uncontaminated material during excavation.
D. Maintain a log of the materials and visible signs of contamination encountered during excavation for each area of excavation. Prepare excavation logs in accordance with ASTM D 5434.

E. Install sheeting, bracing, or shoring in the absence of adequate side slopes if there is a need for workers to enter the excavated area, in accordance with Section 31 50 00, Excavation Support and Protection.

F. Divert surface water to prevent entry into the excavation. Limit dewatering to that necessary to ensure adequate access, a safe excavation, and to ensure that compaction requirements can be met.

G. Contain water generated during dewatering until collection and analysis of samples.

H. Perform field surveys immediately prior to and after excavations of contaminated material to determine the volume of contaminated material removed. Provide cross-sections on 10 foot intervals and at obvious break points for excavated areas. Survey confirmation sample locations. Perform surveys using tape and compass methods.

I. Contain contaminated water and store on Site in accordance with applicable federal, state, and local disposal regulations until analytical results are obtained.

J. Provide approved containers, vehicles, equipment, labor, signs, labels, placards and manifests, and associated disposal notices and notifications, necessary for accomplishment of the Work.

3.03 CONTAMINATED MATERIAL STAGING

A. For suspected contaminated material, place material in a staging unit immediately after excavation while awaiting test results. Use staging units that are in good condition and constructed of materials that are compatible with the material or liquid to be staged. If multiple staging units are required, clearly label each unit with an identification number and keep a written log to track the source of contaminated material in each staging unit.

B. Isolate known and/or suspected contaminated soil from the environment.

C. For known or suspected contaminated groundwater, temporarily store water collected from excavations and stockpiles in 55 gallon, water-tight barrels or water-tight, portable tanks.

D. Water-tight roll-off units lined with 6 mils thick plastic sheeting may be used to stage the contaminated material. Place an impermeable cover over the units to prevent precipitation from contacting the stored material. Remove and store liquid that collects inside the units.

3.04 SPILLS

A. In the event of a spill or release of contaminated materials:

1. Notify the Resident Engineer immediately.

2. Take immediate containment actions to minimize the effect of spills or leaks.

3. Perform cleanup in accordance with applicable federal, state, and local regulations.

4. Perform additional sampling and testing to verify spills have been cleaned up.
5. The cleanup and testing of spills resulting from the negligent actions of the Contractor shall be performed at no additional cost to Sound Transit.

3.05 BACKFILL

A. Backfill excavations only after contaminated material removal is complete.

B. Consider contaminated soil removal to be complete after the bottom of the excavation is determined to have soil contamination levels below applicable State cleanup standards and/or the direction of the Resident Engineer.

C. Use stockpiled material that was sampled for testing as backfill if it is found to conform to the requirements of clean fill in accordance with Section 31 20 00, Earth Moving.

D. Place and compact backfill in accordance with Section 31 20 00, Earth Moving.

3.06 OFF-SITE DISPOSAL

A. Load contaminated material for offsite disposal.

B. Provide transportation in accordance with Department of Transportation (DOT) Hazardous Material Regulations and federal, state, and local requirements, including obtaining necessary permits, licenses, and approvals.

1. Cover each load with tarpaulin prior to leaving the Site.

C. Treatment, Disposal, and Recycling

1. Perform the treatment, disposal, and recycling of contaminated materials in accordance with all applicable laws and regulations, and conditions specified herein. Include all necessary personnel, labor, transportation, packaging, equipment, and reports for this work.

2. Contaminated soil can be treated or landfilled, with preference given to treatment as described in the MTCA WAC 173-340 hierarchy.

3. If landfilled, dispose of contaminated soils in a landfill licensed and permitted to accept the contaminated materials in accordance with applicable requirements.

4. If treated, dispose of contaminated soils at a treatment facility permitted to accept and treat the contaminated materials in accordance with applicable regulations and requirements.

5. If landfilling is the chosen disposal option, dispose of contaminated soil classified as Dangerous Waste, as outlined in WAC 173-303, in an approved Subtitle C Landfill, subject to approval of the Resident Engineer.

a. Records: Maintain records of all waste determinations, including appropriate results of analyses performed, substances and sample location, the time of collection, and other pertinent data as required by 40 CFR 280, Section 74 and 40 CFR 262 Subpart D, and other applicable regulations. Record transportation, treatment, disposal methods and dates, the quantities of waste, the names and addresses of each transporter and the disposal or reclamation facility and make available for inspection, as well as copies of the following documents:
1) Manifests.

2) Waste analyses or waste profile sheets.

3) Certifications of final treatment/disposal signed by the responsible disposal facility official.

4) Land disposal notification records required under 40 CFR 268 for hazardous wastes.

5) Provide records in accordance with applicable federal, state, and local regulations. Following Contract close out, the records shall become the property of Sound Transit.

b. Manifesting of dangerous waste: conform to EPA, DOT, and all other applicable federal, state, and local regulation. For disposal of all dangerous waste [with the exception of those wastes resulting from the release of contaminated materials negligently disturbed, removed, or handled by Contractor, its employees, agents, officers, or Subcontractors, or any other persons for whom the Contractor may be contractually or legally responsible], ensure that the Generator's Certification portion of the Uniform Hazardous Waste Manifest is signed only by Sound Transit's Hazardous Materials Coordinator or by an individual delegated with such authority by Sound Transit.

6. Documentation of Treatment or Disposal:

a. Transfer the materials to a treatment, storage, disposal facility which has EPA or appropriate state permits and/or hazardous or special waste identification numbers and complies with the provisions of all relevant solid waste disposal regulations.

b. Furnish the original return copy of the hazardous waste manifest, signed by the owner or operator of a facility legally permitted to treat or dispose of those materials furnished to the Resident Engineer not later than five days following the delivery of those materials to the facility.

c. Furnish a statement of agreement from the proposed treatment, storage or disposal facility and certified transporters to accept hazardous or special wastes in the CMH Plan.

d. Provide copies of all trucking tickets from the transport of contaminated materials to the Resident Engineer on a weekly basis.

e. If a different facility from that identified in the CMH Plan is proposed, provide documentation for approval to certify that the facility is authorized and meets the standards specified in 40 CFR 264 and applicable state and local regulations.

3.07 FIELD QUALITY CONTROL

A. Sampling, Screening, and Analysis

1. Have the independent testing agency employed by the Contractor perform required sampling and chemical analyses relating to generation, use, release, and disposal of contaminated substances in the course of operations, in accordance with the CMH Plan and the Contaminated Material Screening Plan.
2. Have the independent testing agency employed by the Contractor perform required sampling and chemical analyses relating to existing potentially contaminated substances unless otherwise provided herein or in the Contract Documents. Include characterization sampling and the sampling necessary to determine disposal methods in this sampling. Do not dispose of material until directed to do so by the Resident Engineer.

3. Submit results of all screening testing to the Resident Engineer. For screening of material adjacent to the public right-of-way or private property, submit an extra copy of test results for submittal to the City of [Seattle].

4. The Resident Engineer will inspect the removal of existing contaminated material from each site. Notify the Resident Engineer at least 48 hours prior to when confirmation sampling and analysis will be required. After suspected contaminated material is removed, confirmation samples from the excavation will be collected and analyzed by the Resident Engineer. Based on test results, proceed with additional excavation that may be required to remove material that is contaminated above action levels, as directed by the Resident Engineer. Mark locations of samples in the field and document on the surveys and the as-built drawings.

5. Sample and analyze stockpiled material in accordance with Washington State Department of Ecology or other applicable guidelines. Be aware and anticipate that up to five days may be required between the collection of samples and the completion of chemical laboratory analyses.

6. Screening procedures for Contaminated Materials:
   a. Screen samples collected from the material excavated in the areas of possible contamination, as identified above, with a PID/FID and OVA for the presence of volatile organic compounds. Screening may be conducted by collecting measurements in the vicinity of the suspect soil in place, or by headspace analysis. Conduct headspace analysis by placing suspect material into an inert sealable container, such as a glass jar or "Ziploc" bag, allowing the material to come to room temperature, and collecting measurements of the air within the container.
   b. Visually inspect samples for staining, debris, slag, or sheen. Note unusual odors to evaluate the presence of contamination.
   c. Field screening tests may be used to screen for potential for contamination.

7. Action levels:
   a. Establish site-specific action levels for this project, dependent on the specific suite of contaminants expected at the project location, set as the Washington State Department of Ecology cleanup levels. Action levels are also required to be established in Section 01 35 40, Hazardous and Contaminated Air Monitoring, for worker safety.
   b. If headspace measurements are greater than the screening Action Level, significant staining is present, or other evidence of contamination is observed, conduct excavation, removal and disposal work as specified herein.
c. If headspace measurements are greater than the screening Action Level, significant staining is present, or other evidence of contamination is observed in areas where contamination was not anticipated, cease all work in the area. Do not continue work in the area, as indicated in Section 01 35 43.15, Unknown Hazardous and Contaminated Substances, until potential risks are evaluated and as directed by the Resident Engineer.

d. If field-screening data indicate concentrations are less than the screening Action Level, consider the material as non-contaminated and manage as non-contaminated material in accordance with Section 31 20 00, Earth Moving.

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 03 05 15
PORTLAND CEMENT CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work in this section is intended to provide the Contractor and concrete mix designer with the information necessary to develop, produce, and use portland cement concrete for a wide range of applications. Both performance and prescriptive specifications for concrete are included in this work. Performance specifications are provided to encourage innovation in concrete mix design based on project specific performance criteria where warranted. Prescriptive specifications are provided to allow the Contractor to use existing concrete mixes produced under prescriptive requirements, such as City of Seattle Department of Planning and Development Continuously Approved Mixes.

1.02 SUMMARY

A. This Section includes specifications for materials used in and for proportioning and prequalifying portland cement concrete mix designs.

B. The work in this Section shall result in concrete mix designs that are approved for use in Sections 03 30 00 Cast-in-Place Concrete, 03 37 13 Shotcrete, and 03 41 00 Precast Structural Concrete. This section includes only the requirements for portland cement concrete mixes and prequalification. See the appropriate Related Sections below for the requirements of cast-in-place concrete, precast concrete, shotcrete, and other concrete related products.

C. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 03 11 00, Concrete Forming
2. Section 03 15 00, Concrete Accessories
3. Section 03 15 13, Waterstops
4. Section 03 20 00, Concrete Reinforcing
5. Section 03 30 00, Cast-In-Place Concrete
6. Section 03 34 00, Cellular Concrete Fill
7. Section 03 37 13, Shotcrete
8. Section 03 41 00, Precast Structural Concrete
9. Section 03 62 00, Non-shrink Grouting
10. Section 03 xx xx, Pigmented Concrete
1.03 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Concrete Institute (ACI)
   a. ACI 116R Cement and Concrete Terminology
   b. ACI 121R Quality Management System for Concrete Construction
   c. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
   d. ACI 301 Standard Specifications for Structural Concrete
   e. ACI 304R Guide for Measuring, Mixing, Transporting and Placing Concrete
   f. ACI 304.2R Placing Concrete by Pumping Methods
   g. ACI 305R Hot Weather Concreting
   h. ACI 306.1 Standard Specification for Cold Weather Concreting
   i. ACI 501 Guide to Shotcrete

   a. ASTM C33 Standard Specification for Concrete Aggregates
   b. ASTM C40 Standard Test Method for Organic Impurities in Fine Aggregates for Concrete
   c. ASTM C88 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
   d. ASTM C94 Standard Specification for Ready-Mixed Concrete
   e. ASTM C127 Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate
   f. ASTM C128 Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Fine Aggregate
   g. ASTM C131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
   h. ASTM C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
   i. ASTM C138 Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete (wjc – for normal weight concrete)
   j. ASTM C150 Standard Specification for Portland Cement
1. ASTM C 173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method

m. ASTM C227 Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)

n. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete

o. ASTM C289 Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)

p. ASTM C494 Standard Specification for Chemical Admixtures for Concrete

q. ASTM C535 Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

r. ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

s. ASTM C666 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

t. ASTM C979 Standard Specification for Pigments for Integrally Colored Concrete

u. ASTM C989 Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars

v. ASTM C1017 Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete

w. ASTM C1077 Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

x. ASTM C1116 Standard Specification for Fiber-Reinforced Concrete and Shotcrete

y. ASTM C1202 Standard Test Method for Electrical Indication of Concrete’s Ability to Resist Chloride Ion Penetration

z. ASTM C1240 Standard Specification for Silica Fume Used in Cementitious Mixtures

aa. ASTM C1602 Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

bb. ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection and/or Testing

3. City of Seattle (COS)

a. Standard Specifications for Road, Bridge and Municipal Construction
b. Department of Planning and Development (DPD) Director's Rule 12-2006: Continuously Approved Concrete Design Mixes

c. Department of Planning and Development (DPD) Director's Rule 13-2006: Shotcrete for Structural Applications

4. Washington State Department of Transportation (WSDOT)
   a. Standard Specifications for Road, Bridge and Municipal Construction

B. Qualification Certification

1. Concrete Supplier: Certificate of Conformance for Concrete Production Facilities from the National Ready Mix Concrete Association.


1.04 DEFINITIONS

A. Concrete Mix Designation: Concrete mixes are defined in Table 03 05 15-A through Table 03 05 15-D. Each mix is designated to have one or more uses. Each designated mix requires a separate concrete mix design that shall be proportioned to achieve the performance limitations shown in tables.

B. Controlled Density Fill (CDF): Conform to Section 9-01.5 of the City of Seattle Standard Specification.

C. Supplementary Cementitious Materials: Cementitious materials other than Portland cement.

D. Except for the above definitions, the words and terms used in this Section conform to ACI 116R.

1.05 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures

B. Test program plan and schedule to prequalify concrete mixes as required in Part 3 of this Section.

C. Prequalification test results for Initial Testing and Final Testing as required in Part 3 of this Section.

D. Mix supplier requirements as identified in Part 3 of this Section.

E. Concrete Mix Designs: For each Concrete Mix Designation identified in Table 03 05 15-A through Table 03 05 15-D, submit a concrete mix design, which shall include the following as a minimum:

1. Supplier, mix design number, and supply plant location.

2. Mix use and location in the work.

3. Mix constituents, including:

   a. Cement: Type, class, manufacturer and plant location
b. Supplementary Cementitious Materials/Pozzolans: Type, class, manufacturer and plant location

c. Coarse Aggregates: Type, pit or quarry location, manufacturer, grading and specific gravity

d. Fine Aggregates: Type, pit or quarry location, manufacturer, grading and specific gravity

e. Admixtures: Type, brand name and manufacturer

f. Water: Source of supply

4. Mix constituent proportions per cubic yard including weight or dose and absolute volume.

5. Test data for each mix performance criterion identified for each mix in Table 03 05 15-A through Table 03 05 15-D. Only the mix performance criteria identified for a Mix Designation must be submitted for that mix.

6. Each mix submittal, in addition to the items identified above, shall include the following:

a. Strength gain with age (3-day, 7-day, 28-day, 56-day as a minimum)

b. Mix constituent ratios including (water)/(total cementitious material) ratio and (supplemental cementitious material)/(total cementitious material ratio).

c. Unit weight (Density)

d. Slump

7. Documentation of Average Compressive Strength

a. Average compressive strength shall be determined in accordance with ACI 318, Chapter 5 for mix proportioning and field acceptance.

b. If field test data are used, all data must be supported by an Independent Testing Laboratory compressive strength test reports. Furnish these reports for all mix designs.

c. If trial batch data are used, furnish compressive strength test reports and curve showing the relationship between water/total cementitious materials ratio and compressive strength.

d. Department of Planning and Development (DPD) continuously approved mix data, if applicable, as specified in DPD Director’s Rule 12-2006.

F. Material Data

1. Material Samples for Testing

a. Submit samples of cementitious materials, coarse aggregate and fine aggregate to the Independent Testing Laboratory for testing and analysis.
b. Submit samples to the Independent Testing Laboratory at least 30 days prior to use in prequalification testing.

c. Submit the sample test reports to the Resident Engineer at least 21 days prior to use on the project.

2. Certification of Conformance: In lieu of material samples for testing, submit manufacturer’s certification that the materials conform to the requirements of this Section.

G. Admixtures: For each admixture, submit the following:

1. Manufacturer’s Product Data.
2. Manufacturer’s written instructions for storage, handling, and use.
3. Manufacturer’s certification that admixture is compatible with all other admixtures used in the mix design.

H. Qualifications: Submit qualifications for the following:

1. Concrete supplier as indicated in Section 1.03.B.
2. Independent Testing Laboratory as indicated in Section 1.03.B.

I. Quality Program Plan: Section 01 45 00, Quality Control

1.06 QUALITY ASSURANCE

A. Concrete Supplier: Select a concrete supplier holding a current Certificate of Conformance as indicated in Section 1.03.B.

B. Independent Inspection and Testing Laboratory: Select an Independent Testing Laboratory in conformance Section 1.03.B.

C. Quality Program Plan: Develop a Quality Program Plan as defined in Section 01 45 00, Quality Control, in conformance with the recommendations of ACI 121R.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: For each material:

1. Use only one source in each mix design.
2. If source changes, submit a new mix design using the cementitious material from the new source.
3. Do not change source for an approved mix design without written approval by Sound Transit.

B. Cementitious Materials

1. Portland Cement: ASTM C150 with the Type as indicated in Table 03 05 15-A through Table 03 05 15-D.
2. Supplementary Cementitious Materials
   c. Silica Fume: ASTM C1240

C. Coarse Aggregate
   1. Hard, strong, durable gravel or crushed stone conforming to ASTM C33.
   2. Unless otherwise specified, conform to City of Seattle Standard Specification Section 9-03.1(3) D, Grading No. 6.
   3. Meet the following requirements when tested in conformance with the specified test methods:
      a. Resistance to Abrasion (ASTM C131): For the loss for aggregate size range 3/4-inch to 3/16-inch after 100 revolutions and 500 revolutions do not exceed 10 percent and 35 percent, respectively. Include within the test sample seven parts of Grading B and three parts of Grading C.
      b. Resistance to Abrasion (ASTM C535): For the loss for aggregate size range 1-1/2 inches to 3/4 inch (Grading 3) after 200 revolutions and 1,000 revolutions do not exceed 10 percent and 35 percent, respectively.
      c. Soundness (ASTM C88): Weighted average loss after 5 cycles not to exceed 10 percent when tested with sodium sulfate.
      d. Bulk Specific Gravity (ASTM C127): On the basis of saturated surface-dry aggregate not less than 2.60.
      e. Absorption (ASTM C127): Not to exceed 3 percent.
      f. Potential Reactivity (ASTM C289): Only use aggregates that are not harmful for Cement-Aggregate Alkali reactivity.
      g. Potential Reactivity (ASTM C227): Only use aggregates that are not harmful for Cement-Aggregate Alkali reactivity.

D. Fine Aggregate
   1. Hard, strong, durable stone or rock fragments conforming to ASTM C33, except as modified herein.
   2. Unless otherwise specified, conform to City of Seattle Standard Specification Section 9-03.1(2) C, Grading Class 2.
   3. Meet the following requirements when tested in conformance with the specified test methods:
      a. Soundness (ASTM C88): Weighted average loss after 5 cycles not to exceed 10 percent when tested with sodium sulfate.
      b. Bulk Specific Gravity (ASTM C128): On the basis of saturated surface-dry aggregate not less than 2.60.
c. Organic Impurities (ASTM C40): Supernatant liquid lighter in color than the reference standard color solution

d. Fineness Modulus (ASTM C33): In the range of 2.80 to 3.50; for the fine aggregate not to vary more than plus or minus 0.20 from the fineness modulus of the fine aggregates used in the concrete mix design.

e. Absorption (ASTM C128): Not to exceed three percent.

f. Potential Reactivity (ASTM C289): Only use aggregates that are not harmful for Cement-Aggregate Alkali reactivity.

g. Potential Reactivity (ASTM C227): Only use aggregates that are not harmful for Cement-Aggregate Alkali reactivity.

E. Admixtures

1. Admixtures may be included in the concrete mix designs to improve the workability of the concrete, provided the specified strengths and other characteristics of the concrete are achieved and maintained.


2. Do not use admixtures containing chlorides, sulfides, or nitrides.

3. Where more than one admixture is used in the mix, supply manufacturer’s certification to the Resident Engineer that the admixtures to be used are compatible in combination with the cement and aggregates.

F. Water: Clean and potable, free of impurities detrimental to concrete.

G. Polypropylene Fibers: Engineered and designed for use in concrete pavement, conforming to ASTM C1116, Type III.

2.02 SOURCE QUALITY CONTROL

A. Sample Tests and Analyses: Test cement, coarse aggregate and fine aggregate to demonstrate conformance with the following requirements:

1. Portland cement: In accordance with Section 2.01.B.

2. Aggregates:

a. Grading and quality:

1) In accordance with Section 2.01.C and Section 2.01.D

2) City of Seattle Specification, Section 9-03.1

b. Sieve analysis: ASTM C136
PART 3 - EXECUTION

3.01 MIX DESIGN DEVELOPMENT

A. Candidate mix designs shall include existing concrete mix designs that exhibit all characteristics specified in this Section, as well as project specific performance based concrete mix designs developed to exhibit all characteristics specified in this Section.

At the option of the Contractor, and in lieu of developing a new performance based concrete mix design, existing concrete mix designs that are prequalified in accordance with these Specifications may be proposed for acceptance after fulfilling all testing requirements specified herein.

3.02 PERFORMANCE BASED MIX DESIGN

A. Prequalification Meeting: Prior to development of the performance based mix design, the Contractor shall conduct a concrete mix prequalification meeting. As a minimum, meeting attendees shall include personnel from the Contractor, the ready mix supplier, the certified concrete testing laboratory, Sound Transit, and the Engineer-of-Record. The meeting is intended to develop a joint strategy for achieving the desired performance criteria for concrete placed and cured in accordance with anticipated construction means and methods. In addition to the design properties for the hardened concrete, attendees will also discuss the properties required to assure that dense and durable concrete of adequate strength as placed in the Work.

B. Inspection Laboratory: Obtain concrete mix designs from a qualified independent Inspection Laboratory or concrete supplier properly equipped to design concrete mixes.

C. Prequalified Mix Designs: All concrete mixes that are used in the Work but are not continuously approved by the City of Seattle Department of Planning and Development, the Seattle Department of Transportation, or the Washington Department of Transportation, or that otherwise do not meet the performance criteria outlined in Table 03 05 15-A through Table 03 05 15-D, shall be prequalified as outlined in Section 3.03.

D. Mix Designs: The concrete mixes shall be design in accordance with the following:

1. Select mix proportions in conformance with ACI 211.1.

2. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
   a. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

3. Provide performance concrete mixes that satisfy the limitations, quantities, and ratios outlined in Table 03 05 15-A through Table 03 05 15-D.

4. Design concrete mixes intended for pumping in conformance with the recommendations of ACI 304R and ACI 304.2R.

5. In the absence of sufficient test data to proportion a mix using field test records, all proportioning shall be based on trial mixtures. Proportioning shall be in accordance with ACI 211.1 “Standard Practice for selecting Proportions for Normal, Heavyweight, and Mass Concrete”.

NORTH LINK FINAL DESIGN BROOKLYN STATION FINISHES PORTLAND CEMENT CONCRETE LINK CONTRACT N140 RTA/LR 0177-09 PAGE 9
6. If trial batch data are used, sample and test concrete in conformance with Section 03 30 00 Cast-In-Place Concrete.

7. Maximum aggregate size shall be as indicated in Table 03 05 15-A through Table 03 05 15-D. It is acceptable for the contractor and mix designer to adjust the aggregate size, provided the maximum aggregate size does not exceed the following:
   a. Three-fourths of the minimum clear spacing between reinforcing bars
   b. One-fifth of the narrowest dimension between the sides of the forms
   c. One-third of the thickness of the slabs or toppings

8. Shotcrete concrete design mixes shall conform to the Seattle Department of Planning and Development (DPD) Director’s Rule 13-2006.

9. Where linear shrinkage limits are indicated in Table 03 05 15-A through Table 03 05 15-D, cement in excess of what is required to achieve the required compressive strength and satisfy requirements for minimum cementitious materials shall not be added to the mix.

3.03 CONCRETE MIX PREQUALIFICATION TESTING

A. Responsibility for Mix Design Prequalification: The Contractor shall be responsible for completing prequalification testing for performance based concrete mix designs.

B. Prequalification Scope of Work: The scope of work for prequalification includes Initial Testing of laboratory batched concrete and Final Testing of field batched/placed (in-situ) concrete as identified in the following subsections. Evaluate both laboratory trial mixes and concrete batched and placed using jobsite means and methods constraints. Initial Testing by the Contractor and final acceptance by the Resident Engineer of laboratory produced concrete shall be made prior to construction.

C. Prequalification Test Program Plan and Schedule: The Contractor shall prepare a testing program plan as outlined below to prequalify each Mix Designation:

1. Submit a testing program plan and schedule.

2. The testing program shall address all concrete properties provided for each mix identified in Table 03 05 15-A through Table 03 05 015-D.

3. The testing program shall consist of Initial Testing completed in a qualified laboratory and Final Testing completed at the start of construction as outlined below.

4. All materials, sample sizes, test methods and standards shall conform to these specifications.

5. The specified testing requirements and test sample quantities for both Initial Testing and Final Testing for prequalification will vary depending on the specified performance criteria. These criteria are defined in the tables at the end of this Specification.

6. The testing program and the schedule will be reviewed by Sound Transit and approval of the plans will serve as a notice to proceed with Initial Testing.
D. Prequalification Testing Requirements: Each Mix Designation Shall be prequalified as outlined below:

1. Initial Testing—Laboratory Testing
   a. The purpose of Initial Testing completed in the laboratory is to verify that each mix design meets the performance requirements outlined in this Section.
   b. Initial Testing shall be completed in accordance with test specimen quantities listed in Table 03 05 15-E.
   c. Complete laboratory tests for each mix performance parameter identified in Table 03 05 15-A through Table 03 05 15-D for each Mix Designation.
   d. All laboratory tests shall be completed in accordance with the standards defined in Section 1.03.

2. Final Testing—Preconstruction Field Mockups. This testing is in addition to specimen testing identified in Section 03 30 00.
   a. The purpose of Final Testing is to verify that the concrete mix will perform as indicated in the Initial Testing once it has been transported, conveyed, or otherwise subjected to construction means and methods.
   b. Testing requirements for final in-situ prequalification testing shall be in accordance with Table 03 05 15-F.
   c. Sampling and testing of concrete placed in the field can be completed on either a mock-up of the actual construction, or on the first field placement of the candidate mix in the Work. If the first pour in the Work is used for final acceptance sampling and testing, all core holes, damage, or modifications to the work shall be repaired to match the contract documents.
   d. If a mock-up is used for Final Testing, the mock-up shall be a full scale portion of the actual work in every detail. Build a mockup prior to the start of construction for each mix that will be prequalified.
      1) Each mockup shall be at least 5'-0" x 5'-0".
      2) Each mockup shall have reinforcing that represents the heaviest reinforcing density that will be encountered during construction for the Mix Designation.
   e. Test cores shall be from the mockups as indicated in Table 03 05 15-F. The test cores shall be tested in accordance with the standards defined in Section 1.03.

3. Mix supplier requirements: Proof that the mix has met these requirements shall be submitted to Sound Transit and the Resident Engineer at least 30 days before concrete placement.
   a. Batch plant inspection is required.
   b. Qualified field testing technicians shall perform tests on fresh concrete at the job site, prepare specimens required for curing under field conditions, prepare specimens required for testing in the laboratory, and record
temperature of fresh concrete when preparing specimens for strength tests. Qualified laboratory technicians shall perform all required laboratory tests. These tests are in addition to field test specimens required by Section 03 30 00.

c. The frequency of conducting strength tests of concrete and the minimum number of tests shall be as specified in ACI 318, Section 5.6.2 and Table 03 05 15-E and 03 05 15-F of this specification.

d. Specimens prepared for acceptable testing of concrete shall comply with ACI 318, Section 5.6.3 and the Quality Control section of this specification.

e. Field cured specimens shall be prepared, cured, tested, and the test results shall be evaluated for acceptance in accordance with ACI 318, Section 5.6.4 and Quality Control section of this specification.

f. Tests shall be performed for each performance mix criteria identified in Table 03 05 15-A on each Mix Designation for prequalification testing:

4. Acceptance Criteria: The following list outlines the standards that will deem a concrete mix design acceptable:

a. Final acceptance of the specified concrete shall be based on the following:

1) Sound Transit acceptance of concrete tested after being placed by field means and methods (tremmie, pumping, shotcreting, and other methods proposed by the Contractor).

2) The Contractor shall complete Initial and Final Testing of the test samples in accordance with the approved testing plan and submit the results in the final test report. The testing report, as a minimum, shall include the following:

   a) Test results shall be reported in writing to Resident Engineer, concrete manufacturer, and Contractor within 48 hours of testing.

   b) Reports shall contain

      i) Project identification name and number

      ii) Date of concrete placement

      iii) Name of concrete testing and inspecting agency

      iv) Location of concrete batch in Work

      v) Design compressive strength

      vi) Compressive breaking strength and type of break

      vii) Concrete mixture proportions and materials
viii) Test results for all prequalification criteria identified in Table 03 05 15-A through Table 03
05 15-D

ix) Indication that the testing quantities identified in Table 03 05 15-E and Table 03 05 15-F have
been satisfied.

3) Approval by Sound Transit of the test report shall constitute final acceptance of the specified concrete for use in the Work.

4) Where linear shrinkage limits are included in Table 03 05 15-A through Table 03 05 15-D, additional cement shall not be added to achieve the shrinkage limit if the additional cement will significantly increase the compressive strength in excess of what is specified in Table 03 05 15-A through Table 03 05 15-D.

b. If concrete performance testing indicates that a mix does not meet the performance criteria of Table 03 05 15-A through Table 03 05 15-D, the concrete mix shall be redesigned and retested until it conforms to the performance criteria of Table 03 05 15-A through Table 03 05 15-D.

E. Preapproved Prequalified Mix Designs: Contractor/mix designer have the option of using a City of Seattle DPD Continuously Approved Concrete Design Mixes as outlined in DPD Director’s Rule 12-2006 if the mix conforms to the limitations of Table 03 05 15-A through Table 03 05 15-D. Batch plant inspection is required for all concrete mixes, including DPD Continuously Approved Mixes, with compressive strength greater than 6,000 psi.

3.04 MATERIALS STORAGE AND HANDLING

A. Cementitious Materials: Store in dry, weather tight buildings, bins, or silos that exclude contaminants.

B. Coarse and Fine Aggregates: Store and handle to avoid segregation and prevent contamination with other materials or other sizes or types of aggregate. Store to drain freely. Do not use aggregates containing frozen lumps.

C. Admixtures: Store and handle admixtures in conformance with manufacturer's written directions.

D. Water: Protect mixing water from contamination.

PART 4 - QUALITY CONTROL

A. All concrete is subject to special inspection and testing.

B. Tests and inspections shall be in conformance with Division 1.

C. Independent Testing Agency shall check batch tickets for compliance with required mix designs.

D. Concrete Sampling for Final Testing Prequalification: Testing of composite samples of fresh concrete obtained according to ASTM standards in Section 1.03 shall be performed according to the following requirements and Table 03 05 15-E and Table 03 05 15-F:
1. Testing frequency shall comply with Table 03 05 15-E and Table 03 05 15-F.

2. Test for each prequalification criterion identified in Table 03 05 15-A through Table 03 05 15-D, in accordance with the standards identified in Section 1.03.

3. In addition to the prequalification criterion identified in Table 03 05 15-A through Table 03 05 15-D, the following shall be measured:
   a. Slump: One test at point of placement for each composite sample. Perform additional tests when concrete consistency appears to change.
   b. Concrete temperature: One test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

4. Compression Test Specimens:
   a. Cast and laboratory cure standard cylinder specimens as outlined in Table 03 05 15-E and Table 03 05 15-F.
   b. At the Contractor's expense and direction, cast and field-cure standard cylinder specimens as may be required for construction. Number of specimens and testing age shall be determined by the Contractor based on construction sequence requirements.

5. Compressive-Strength Tests: Test laboratory cured specimens as required in Table 03 05 15-E and Table 03 05 15-F.
   a. Test field-cured specimens at the Contractor's direction.
   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

6. Concrete Test Cores: Test field test cores as required in Table 03 05 15-E and Table 03 05 15-F.

7. Low Break Compressive Strength: When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete, the mix shall be rejected, and the mix shall be redesigned as required by the Concrete Mix Prequalification Section of this specification.

8. Satisfactory Compressive Strength: Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

9. Additional Tests: Testing and inspection agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by the Resident Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders, complying with ASTM C 42/C 42M or by other methods as directed by the Resident Engineer.
Mix Designation Table Notes:

1. See structural drawings for additional information on where the different mixes will be used in the structure.
2. Concrete mix designs shall be proportions to meet ACI 318 Chapter 4 unless more stringent performance criteria are defined in the tables.
3. Mix designs may include either fly ash or GGBF, but are not required to.
4. Mix designs may include either fly ash or GGBF, but not both.
5. If a mix design includes either fly ash or GGBF, the percent total cementitious material must be within the range noted.
6. For the invert slab, fly ash, GGBF slag, and silica fume may be used in combination provided the total weight of supplemental cementitious materials constitutes no more than 50% of the total weight of the cementitious materials, and the fly ash and silica fume constitute no more than 25% and 10%, respectively, of the total weight of the cementitious materials.
7. Mix supplier and contractor may propose compressive strength limits at a period of time other than that specified in the table above. Provide basis and justification for alternate compressive strength gain period.
8. Shrinkage control mixes shall be proportioned such that the drying shrinkage does not exceed percentage indicated at 28-days under laboratory conditions.
9. Mix designer may submit alternate mix performance criteria for review and approval. The alternate mix performance criteria shall provide a concrete mix that meets the performance requirements and the qualification procedures of this specification.
10. Aggregate sizes may be adjusted, but the contractor shall verify that the concrete using the adjusted aggregate will not exceed the criteria defined in Section 3.04.1.
11. Where concrete floors will be finished with architectural materials, the contractor shall verify that the moisture emission of the concrete is compatible with required floor finishes prior to placing floor finishes.
12. Shotcrete mixes shall conform to DPD Director’s Rule 13-2006 and ACI 506.2.
<table>
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<th>Concrete Mix Designation</th>
<th>Use</th>
<th>Exposure Class</th>
<th>Required Compressive Strength fc (psi)</th>
<th>Acceptance Age of Required Compressive Strength (days)</th>
<th>Maximum Aggregate Size (in)</th>
<th>Maximum Water/Total Cementitious Materials Ratio (W/C)</th>
<th>Maximum Fly-Ash (% total cementitious materials)</th>
<th>Maximum GGBF Slag (% total cementitious materials)</th>
<th>Cement Type</th>
<th>Air Content</th>
<th>Shrinkage Control Limit (% of drying shrinkage)</th>
<th>Maximum Chloride Ion Content</th>
<th>Permeability</th>
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<td>Required Compressive Strength f'c (psi)</td>
<td>Acceptance Age of Required Compressive Strength (days)</td>
<td>Maximum Aggregate Size (in)</td>
<td>Maximum Water/Total Cementitious Materials Ratio (W/C)</td>
<td>Maximum Fly-Ash (% total cementitious materials)</td>
<td>Maximum GGBF Slag (% total cementitious materials)</td>
<td>Cement Type</td>
<td>Air Content</td>
<td>Shrinkage Control Limit (% of drying shrinkage)</td>
<td>Maximum Chloride Ion Content</td>
<td>Permeability</td>
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<td>F0, S0, P0, C0</td>
<td>6,000</td>
<td>28</td>
<td>3/4&quot;</td>
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<td>40%</td>
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<td>4.5% ±1 1/2%</td>
<td>N/A</td>
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<td>6.B.2</td>
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<th>Exposure Class</th>
<th>Required Compressive Strength f'c (psi)</th>
<th>Acceptance Age of Required Compressive Strength (days)</th>
<th>Maximum Aggregate Size (in)</th>
<th>Maximum Water/Total Cementitious Materials Ratio (W/C)</th>
<th>Maximum Fly-Ash (% total cementitious materials)</th>
<th>Maximum GGBF Slag (% total cementitious materials)</th>
<th>Cement Type</th>
<th>Air Content</th>
<th>Shrinkage Control Limit (% of drying shrinkage)</th>
<th>Maximum Chloride Ion Content</th>
<th>Permeability</th>
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<td>Precast bridge elements</td>
<td>F1, S0, P0, C2</td>
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<td>28</td>
<td>1&quot;</td>
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<td>Type II</td>
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<td>8.C.2</td>
<td>Hollow core slabs</td>
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<td>28</td>
<td>1&quot;</td>
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<td>40%</td>
<td>40%</td>
<td>Type II</td>
<td>4.5% ±1 1/2%</td>
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<td>Concrete Mix Designation</td>
<td>Use</td>
<td>Exposure Class</td>
<td>Required Compressive Strength f’c (psi)</td>
<td>Acceptance Age of Required Compressive Strength (days)</td>
<td>Maximum Aggregate Size (in)</td>
<td>Maximum Water/Total Cementitious Materials Ratio (W/C)</td>
<td>Maximum Fly-Ash (% total cementitious materials)</td>
<td>Maximum GGBF Slag (% total cementitious materials)</td>
<td>Cement Type</td>
<td>Air Content</td>
<td>Shrinkage Control Limit (% of drying shrinkage)</td>
<td>Maximum Chloride Ion Content</td>
<td>Permeability</td>
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<tr>
<td>CDF A</td>
<td>Pipe bedding</td>
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<td>28</td>
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<td>40%</td>
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<tr>
<td>CDF B</td>
<td>Trench backfill</td>
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<td>28</td>
<td>1&quot;</td>
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<td>40%</td>
<td>40%</td>
<td>Type II</td>
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<tr>
<td>3.D.1</td>
<td>Surface Level Waterproofing Protection Slab with Polypropylene Fibers</td>
<td>F0, S0, P0, C1</td>
<td>3,000</td>
<td>28</td>
<td>1&quot;</td>
<td>N/A</td>
<td>40%</td>
<td>40%</td>
<td>Type II</td>
<td>N/A</td>
<td>N/A</td>
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<td></td>
</tr>
<tr>
<td>3.D.2</td>
<td>Concrete fill over composite metal deck; concrete curbs and mechanical/electrical equipment housekeeping pads</td>
<td>F0, S0, P0, C0</td>
<td>3,000</td>
<td>28</td>
<td>1&quot;</td>
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<td>40%</td>
<td>40%</td>
<td>Type II</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>4.D.1</td>
<td>Shotcrete</td>
<td>F0, S0, P1, C1</td>
<td>4,000</td>
<td>28</td>
<td>1&quot;</td>
<td>0.45</td>
<td>40%</td>
<td>40%</td>
<td>Type II</td>
<td>N/A</td>
<td>N/A</td>
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</tbody>
</table>
### TABLE 03 05 15-E – INITIAL TESTING SPECIMEN QUANTITIES

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### TABLE 03 05 15-F – FINAL TESTING SPECIMEN QUANTITIES

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</table>

**END OF SECTION**
CONTRACT SPECIFICATIONS

SECTION 03 11 00
CONCRETE FORMING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for the design, construction, and treatment of formwork for concrete construction.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 03 15 13, Waterstops.

2. Section 03 30 00, Cast-in-Place Concrete.

3. Section 03 35 00, Concrete Finishing: Description of governing requirements for concrete finishes required as end result of concrete forming work described in this Section.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Concrete Institute (ACI):
   a. ACI 301 Specifications for Structural Concrete
   b. ACI 347R Formwork for Concrete

2. American Plywood Association (APA):
   a. PS 1 U.S. Product Standard for Construction and Industrial Plywood

   a. ASTM D4397 Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications

4. Federal Specifications (FED):
   a. FED TT-S-1543B Sealing Compound: Silicone Rubber Base (For Caulking, Sealing, and Glazing in Buildings and Other Structures)

1.03 SYSTEM DESCRIPTION

A. Formwork Design Requirements

1. Design Standards: Unless otherwise indicated, design, construct, erect, maintain, and remove forms and related structures for concrete work in conformance with ACI 301 and ACI 347R.
2. Formwork Surface Materials: Use material and workmanship to produce finished surfaces within the allowable tolerances specified. Refer to section 03 35 00 for workmanship and tolerances allowed.

3. Special Sections: Provide openings, offsets, sinkages, keyways, recesses, moldings, rustication strips, chamfers, blocking, screeds, bulkheads, anchorages, embedded items, and other features. Select materials and provide workmanship to achieve indicated finishes.

4. Removal Features: Design formwork to be readily removable without impact, shock, and damage to concrete surfaces and adjacent materials.

5. Formwork Tolerances:
   a. Variation from plumb:
      1) In the lines and surfaces of columns, piers, walls:
         a) In any 10-foot length: 1/4 inch
         b) Maximum for entire length: 1 inch
      2) For exposed corner columns, control-joint grooves, and other conspicuous lines:
         a) In any 20-foot length: 1/4 inch
         b) Maximum for entire length: 1/2 inch
   b. Variation from the level or the grades indicated:
      1) In slab soffits, ceilings, beam soffits, measured before removal of supporting shores:
         a) In any 10-foot length: 1/4 inch
         b) In any bay or in any 20-foot length: 3/8 inch
         c) Maximum for entire length: 3/4 inch
      2) In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:
         a) In any bay or in any 20-foot length: 1/4 inch
         b) Maximum for entire length: 1/2 inch
   c. Variation of the linear building lines from established positions in plan and related position of columns, walls, and partitions:
      1) In any bay: 1/4 inch
      2) In any 20-foot length: 1/2 inch
      3) Maximum for entire length: 1 inch
   d. Variation in the sizes and location of sleeves, floor openings, and wall openings: plus or minus 1/4 inch
e. Variation in cross sectional dimensions of columns and beams and in the thickness of slabs and walls: negative 1/4 inch; positive 1/2-inch

f. Footings:
   1) Variation in dimensions in plan: negative 1/2 inch; positive 2 inches
   2) Misplacement or eccentricity: Two percent of the footing width in the direction of misplacement but not more than 2 inches
   3) Thickness: Decrease in specified thickness 3 percent
   4) Increase in specified thickness: No limit

g. Variation in steps:
   1) In a flight of stairs:
      a) Rise: plus or minus 1/8 inch
      b) Tread: plus or minus 1/4 inch
   2) In consecutive steps:
      a) Rise: plus or minus 1/16 inch
      b) Tread: plus or minus 1/8 inch

1.04 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Submit manufacturers' product data for manufactured products specified and indicated.

C. Shop Drawings: Submit drawings that indicate the following:
   1. Forming system and method of erection with associated details.
   2. Falsework and shoring accompanied by design calculations. Include reshoring procedures.
   3. Calculations for elevated forming systems addressing stresses and deflections.
   4. Locations of construction joints in plan and elevation views indicating the sequence of the concrete placement.
   5. Locations and sizes of conduits, openings, recesses, pipes, ducts, and other attached products.
   6. Beam intersections and other conditions where concrete casting by vertical drop may be restricted.
   7. Locations of all embeds.

D. Method Statements:
   1. Method and schedule for removing forms and shoring.
2. Methods and details of securing the formwork during concrete placement and curing.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Storage:
   1. Store form panels to prevent warpage. Protect panels from damage and contamination that could affect concrete.
   2. Store forms and form liners as recommended by the manufacturer. Do not stack higher than recommended by the manufacturer. Support each set separately; prevent permanent distortion of bottom form liners. Protect form liners from sun and weather with non-plastic materials; do not allow plastic sheeting to contact form liners.

B. Handling: Protects panels from damage and distortion when lifting.

1.06 PROJECT CONDITIONS

A. Allow sufficient time between erection of forms and placing of concrete for the various trades to properly install concrete reinforcement, embedded items, sleeves, and blockouts.

B. Do not apply lateral or vertical superimposed loads to structure until concrete has developed specified 28-day compressive strength.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lumber:
   1. Boards: Use dressed side of lumber for surface in contact with the concrete, and use dressed or tongue-and-groove edges.
   2. Framing Lumber: Structural grade, dressed or rough.

B. Plywood:
   4. Thickness: As required to maintain surface smoothness without deflection, but not thinner than 5/8 inch.
C. Steel Forms: Proprietary, patented, or fabricated steel forms, using standard or commercial quality, uncoated steel sheet or plate, 3/16-inch minimum thickness, for panel facings. Include panel framing, reinforcement, and erection accessories.

D. Round Column Forms: Pressed or molded fiber-reinforced plastic, manufactured round column forms, seamless or one-piece (one vertical seam), smooth surface, of sizes indicated.

E. Formliners for Exposed Concrete: Thermally formed, pressed or molded fiber-reinforced plastic (FRP), Acrylonitrile Butadiene Styrene (ABS) alloy plastic, Polyvinyl Chloride (PVC) alloy plastic, or similar material, manufactured to produce finished concrete of design, configuration, and surface texture indicated. Provide formliners with natural form-release surface. Formliners may be manufactured for single-use or multi-use service as appropriate.

F. Leakage Control Materials: Capable of producing flush, watertight and nonabsorbent surfaces and joints, and compatible with forming material and concrete ingredients. Seal form edges with gasketing material or sealant placed in the joint in such a way that neither a fin nor groove is made in the face of the cast concrete.

1. Calking Compound: Silicone or polyurethane construction sealant conforming to Federal Specification TT-S-1543B, as applicable.

2. Tapes: Form film tape of polypropylene plastic treated with waterproof adhesive, for joint conditions not exposed to public view.

G. Form Release Agent: Commercial formulation, silicone-free form-release agent, designed for use on all types of forms, which will not bond with, stain, nor adversely affect concrete surfaces, and which will not impair subsequent treatment of concrete surfaces requiring bond or adhesion nor impede wetting of surfaces which will be cured with water, steam, or curing compounds. Change form oil if the concrete surfaces are unduly blemished when stripping the forms.

H. Plugged Cone Form Ties: Rod type, with ends or end fasteners which can be removed without spalling the concrete. Use form ties of a design in which the hole left by the removed end or end fastener is easily filled to match the surface of the hardened concrete. Provide removable cones 1-1/4 inches in diameter by 1-1/2 inches deep. Provide preformed mortar plugs to match the color of the concrete, recessed 1/4 inch, adhered with an approved epoxy adhesive.

I. Inserts: Cast stainless steel or welded stainless steel, Type 316 or better, complete with anchors to concrete and fittings such as bolts, wedges, and straps. Provide hanger inserts spaced to match grid of suspended ceiling.

J. Dovetail Anchor Slots: 22-gage galvanized steel dovetail anchor slots, for anchoring of masonry veneer with dovetail anchors provided under Division 4, Masonry.

K. Chamfer Strips: 1/2-inch by 1/2-inch triangular fillets milled from clear, straight-grain pine, surfaced each side, or extruded vinyl type with or without nailing flange.

L. Miscellaneous Joint Strips: Preformed strips for reveals, rustications, and similar joints fabricated of wood, metal or plastic.

M. Waterstops: Refer to Section 03 15 13, Waterstops.

N. Polyethylene Sheeting Blockout Wrapping: Use single ply 6-mil polyethylene sheeting conforming to ASTM D4397. Provide a fully compatible tape that has equal or better water vapor control characteristics than sheeting material.
2.02 FABRICATION

A. Formwork, General: Fabricate forms in accordance with reviewed and accepted shop drawings. Maintain forms clean, smooth, and free from imperfections and distortion.

B. Joints:
   1. Arrange form panels in symmetrical patterns conforming to general lines of the structure.
   2. Unless otherwise indicated, orient panels on vertical surfaces with long dimension horizontal, and make horizontal joints level and continuous.
   3. Align form panels on each side of the panel joint with fasteners common to both panels, to provide a continuous, unbroken concrete plane surface.
   4. Use largest stock size practicable.

C. Steel Forms: Use material that is clean, smooth, and free from warps, bends, kinks, rust, cracks, and matter which could stain concrete. Fabricate panels in accordance with accepted shop drawings. Reinforce panel surfaces to prevent bow and deflection during concrete placement. Do not allow deflection between form supports to exceed 1/240 of the span length.

PART 3 - EXECUTION

3.01 PREPARATION

A. Layout of formwork:
   1. Locate and stake out all forms and establish all lines, levels, and elevations.

3.02 CONSTRUCTION

A. Formwork:
   1. Construct formwork in accordance with the accepted shop drawings, to produce finished concrete surfaces conforming to indicate design and within specified tolerances.
   2. Make joints and seams mortar-tight. Install leakage control materials in accordance with the manufacturer's installation instructions, to maintain a smooth continuity of plane between abutting form panels to resist displacement by concreting operations.
   3. Kerf wood inserts for forming keyways, reglets, and recesses to prevent swelling and allow easy removal.
   4. Maintain forms clean and free from indentations and warpage.
   5. Brace temporary closures to prevent warpage or displacement and set tightly against forms to prevent loss of concrete mortar.
   6. Support joints with extra studs or girts, to produce true, square intersections.
   7. Assemble forms to facilitate their removal without damage to the concrete.
8. Construct molding shapes, recesses, and projections with smooth finish materials and install in forms with sealed joints.

9. Provide camber in formwork as required compensating for deflections caused by weight and pressures of fresh concrete and construction loads.

10. Provide construction openings in forms where required for concrete pour pockets, vibrator access holes, and inspection openings to aid in proper placement and consolidation of concrete, and close up openings during placement of concrete as applicable.

11. Provide inspection and cleanout openings in forms at bottom of walls and columns and elsewhere as required. Do not close cleanouts until inspected and accepted just before placing concrete.

12. Drill air escape holes in bottom members of blockouts.

B. Edge Forms and Screeds for Slabs: Set edge forms or bulkheads and intermediate screeds for slabs to obtain required elevations and contours in the finished slab surface. Support screeds substantially without penetrating waterproof membranes and vapor barriers.

C. Corner Treatment: Form chamfers with 3/4 inch on each leg, unless otherwise indicated, and accurately shape and surface to produce uniformly straight lines and edge joints which prevent mortar runs. Extend terminal edges to limits, and miter chamfer strips at changes in direction.

D. Construction Joints:

1. Locate joints as indicated and as approved by the Resident Engineer. Support forms for joints in concrete so as to rigidly maintain their positions during placement, vibration, and curing of concrete.

2. Locate and install construction joints, for which locations are not indicated, so as not to impair strength and appearance of the structure.

3. Position joints perpendicular to longitudinal axis of pier, beam, or slab as the case may be.

4. Locate joints in walls, vertically as indicated; at underside of the deepest beam or girder framing into wall; or as required to conform to indicated details.

5. Provide keyways in construction joints in walls and slabs, unless otherwise indicated. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.

E. Load Supports: Carry loads for construction of elevated levels down to the base slab. Do not use intermediate spanning slabs to carry these loads at any time. Do not use interior walls to carry formwork loads.

F. Form Release Agent:

1. Coat form contact surfaces with approved form release material before reinforcement is placed. Do not allow excess form release agent material to accumulate in the forms or to come into contact with surfaces that are required to be bonded to fresh concrete such as concrete reinforcement and embedded items. Apply form release agent in compliance with manufacturer's application instructions.
2. Coat steel forms with non-staining, rust-preventive form release agent or otherwise protect against rusting. Do not use rust-stained steel surfaces for forms in contact with concrete.

3. Apply release agent to bolts and rods that are to be removed or that are to be free to move.

3.03 INSTALLATION

A. Embedded Items

1. Install conduit, pipe sleeves, appliance boxes, frames for items recessed in walls, door frames, drains, metal ties, inserts, nailing strips, blocking, grounds, and other fastening devices required for anchorage or attachment of other work.

a. Secure products in position, located accurately and oriented as indicated before beginning concrete placement.

b. Do not secure embedded items with nails in the forms or tie-wire to the bottom, sides or top of the forms.

B. Opening in Concrete

1. Provide openings in concrete for passage of ducts, and provide clearances as indicated on accepted shop drawings.

C. Polyethylene sheeting blockout wrapping

1. Use sheeting as a form release material or bond breaker between blockouts and invert concrete. Securely wrap concrete blockouts with 6-mil polyethylene sheeting as indicated on Contract Drawings forming a smooth, tight-fitting surface. Where seams are required, overlap sheeting material a minimum of 6 inches, and tape both sides of sheeting.

3.04 FIELD QUALITY CONTROL

A. Before placing concrete:

1. Check lines and levels of erected formwork and positioning of embedded inserts, block outs, and joints for correctness.

2. Verify that embedded piping and conduit are free from obstructions. Make corrections or adjustments to produce proper size and location of concrete members and stability of forming systems.

3. Verify that reinforcing steel or embedded items are not secured with tie wire attached to the bottom or side of the forms.

4. Verify that no nails are embedded in the concrete

5. Verify that all loose tie-wire and other debris have been removed from the forms.

B. While placing concrete, provide quality control to verify formwork and related supports are not displaced, that cement paste is not lost through joints, and that work is completed within specified tolerances.
C. Detection of Movement: Check movement during concrete placement using methods, such as plumb lines, telltales and survey equipment, as approved by the Resident Engineer.

D. During form removal, verify that architectural features meet the form and texture requirements of the samples.

E. In general, use tolerances that do not affect overall appearance, design intent or intended facility function. Do not use tolerances that negatively influence adjoining or adjacent work.

3.05 REMOVAL, CLEANING, AND RE-USE OF FORMS

A. Remove forms by methods that do not injure, mar, gouge or chip concrete surfaces; overstress concrete members; or distort formwork. Use air pressure or other approved methods. Do not pry against concrete. Leave surfaces clean and unblemished.

B. Maintain formwork in place for the following structural conditions until the concrete has attained the minimum percentage of specified design compressive strength or for the period of time specified in the following table, whichever is greater.

<table>
<thead>
<tr>
<th>Structural Member or Condition</th>
<th>Minimum Time Period Before Form Removal (Days)</th>
<th>Minimum Compressive Strength for Form Removal (Percent of Design Strength)</th>
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<tbody>
<tr>
<td>Over 20 feet between supports</td>
<td>21</td>
<td>90</td>
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<tr>
<td>Floor slabs</td>
<td>14</td>
<td>70</td>
</tr>
<tr>
<td>Free standing walls</td>
<td>14</td>
<td>70</td>
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<tr>
<td>Sides of beams, footing, slabs</td>
<td>2</td>
<td>30</td>
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<td>on grade.</td>
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C. For construction requiring falsework, do not release or remove falsework sooner than 21 days after last concrete has been placed or member has attained 90 percent of design compressive strength.

D. Plan reshoring operations so areas of new construction do not support their own weight. Construct reshoring in place before removing shoring. During reshoring, do not permit live loads on new construction. Do not locate reshoring in a manner or location that overstresses members or induces tensile stresses where reinforcing bars have not been provided. Remove shoring and reshoring supports in accordance with ACI 347R, except as modified herein.

E. Re-Use of Forms

1. Clean and repair surfaces of forms to be reused in the work. Do not reuse forms with split, frayed, delaminated, or otherwise damaged facing material. Remove such material from the site. Renew form release coating as specified for new formwork.

2. Align and secure joints in a manner that preclude offsets. Patch holes and defects in forms with materials and methods that will not be reflected in the concrete.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for furnishing and installing joint fillers and sealing compounds for joints in concrete.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 03 11 00, Concrete Forming.
   2. Section 07 10 00, Waterproofing and Seepage Management.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.
   1. American Concrete Institute (ACI):
      a. ACI 504R Guide to Sealing Joints in Concrete Structures
      a. ASTM D994 Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
      b. ASTM D1190 Concrete Joint Sealer, Hot Poured Type
      c. ASTM D1751 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
      d. ASTM D2628 Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
      e. ASTM D3405 Joint Sealants, Hot Applied, for Concrete, and Asphalt Pavements
      f. ASTM D6690 Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Shop Drawings: Include single-line diagram showing locations of all joints to be filled and sealed.
C. Manufacturers’ product data for products used.

D. Samples: 12-inch long sample of joint filler and 1 pint or quart can of sealing compound for review when requested by the Resident Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Joint Filler: Premolded, of sizes and thicknesses indicated, conforming to ASTM D994 or ASTM D1751. For structural joints and joints subject to movement, provide joint filler conforming to ASTM D1751.

B. Joint Sealant: ASTM D2628, for sealing of joints in slabs and at junctions of slabs and vertical surfaces. Use color selected by the Resident Engineer from the manufacturer’s standards.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that concrete conditions comply with the requirements of the manufacturer’s written directions before installation.

B. Verify that weather conditions comply with the requirements of the manufacturer’s written directions before installation.

3.02 PREPARATION

A. Prior to sealing joints, clean the surfaces of the seams and joints so they are dry, and free of all loose aggregate, paint, corrosion, form oil and concrete curing compound.

B. Remove all loose concrete, dirt and foreign matter by sandblasting or by the use of wire brush. Remove projections of concrete into the seams. Blow the joints and surfaces adjacent to the seams free from all loose dust by means of oil-free compressed air immediately prior to priming.

C. Clean alkaline seepage and form oil by etching of the concrete surface with hydrochloric acid, thorough rinsing, neutralizing, and drying.

D. Prime joint surfaces, where required, as recommended by the manufacturer of the joint sealing compound.

E. Mix multi-component sealing compound as recommended by the manufacturer.

3.03 INSTALLATION

A. General: Install and protect joint sealant in conformance with manufacturer’s written instructions.

B. Expansion and Isolation Joints:

1. Provide premolded joint filler to full depth of slabs, less 1/2 inch. Install joint filler with top edge 1/2 inch below the surface. Use steel pins to hold material in place during placing and floating of concrete. Tool adjacent concrete edges to a 3/8-inch radius.
2. Fill expansion joints with joint sealant to 1/8 inch below surface of slabs.

C. Contraction Joints: Fill with joint sealant in areas and locations indicated. Fill joints flush to within 1/16 inch of the slab surface.

END OF SECTION
SECTION 03 15 13
WATERSTOPS

PART 1 - GENERAL

1.01 SUMMARY
A. This Section includes specifications for furnishing and installing waterstops in concrete.
B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 03 11 00, Concrete Forming
   2. Section 03 30 00, Cast-in-place Concrete
   3. Section 07 10 00, Waterproofing and Seepage Management

1.02 DEFINITIONS
A. Type A. Waterstop:
PVC waterstop conforming to CRD-C572. To be cast into adjacent lifts of concrete. Where shown on drawings to be placed at rigid concrete joints and at above grade joints.
B. Type B. Waterstop:
Injectable grout tube. Where shown on drawings around tunnel penetrations and as show on the waterproofing drawings.
C. Type C Waterstop:
Expansive waterstop comprised of hydrophilic, modified rubber. Where shown on drawings at joints between the station box walls and slabs and walers.

1.03 SUBMITTALS
A. Procedures: Section 01 33 00, Submittal Procedures.
B. Shop Drawings: Submit single-line diagram showing locations of all joints to receive waterstops.
C. Product Data: Submit manufacturers' product data.
D. Samples: Submit 12-inch long sample of typical waterstop and sample of field splice.

1.04 DELIVERY, STORAGE, AND HANDLING
A. Deliver, store, and handle waterstops in conformance with manufacturers' published instructions.
PART 2 - PRODUCTS

2.01 MATERIALS

A. Type A: Tricosal PVC-P A50, manufactured by Tricosal GmbH & Co.KG
B. Type B: Fuko Injection Hose, manufactured by Greenstreak.
C. Type C: Hydrotite CJ-Type 1020-2k with adhesive Greenstreak Products.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide waterstops as indicated on Contract Drawings.
B. Install waterstops accurately in place and secure rigidly against movement by methods adequate to assure proper support and embedment during the placement of concrete.
C. Install waterstops in the longest practicable length, with joints spliced to form a continuous watertight seal for the full length of the joint.
D. Carefully place and consolidate concrete to ensure a complete filling and bond between the concrete and waterstop. Cement-sand grout slurry may be used where necessary to assure contact and bond of waterstop and concrete without voids.
E. Repair or replace damaged, defective or misaligned waterstop material in accordance with the manufacturer's instructions at no additional cost to Sound Transit.
F. Splice waterstops in accordance with the manufacturer's published instructions.
G. Use factory premolded and fabricated waterstop directional changes. Field splices in the waterstop are not allowed at directional changes.
H. Retain manufacturer's representative to observe verify adequate field installation of injection hoses.

3.02 FIELD QUALITY CONTROL

A. Joints constructed with waterstops will be subject to inspection for misalignment, bubbles, inadequate bond, porosity, cracks, offsets, and other defects that could reduce the effectiveness of joints against water penetration.
B. Replace defective waterstops and unacceptable waterstop installations at no cost to Sound Transit.

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 03 15 25
ANCHORAGE TO CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for anchoring structural steel and metal fabrications to concrete and concrete masonry.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 03 11 00, Concrete Forming
2. Section 03 20 00, Concrete Reinforcing
3. Section 03 30 00, Cast-in-place Concrete
4. Section 05 05 13, Shop-Applied Coatings for Metal

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Iron and Steel Institute (AISI)
   a. AISI 304/316

   a. ASTM A108 Standard Specification for Steel Bars, Carbon and Alloy, Cold Finished
   b. ASTM A496 Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement
   c. ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts
   d. ASTM A706 Standard Specification for Low Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
   e. ASTM F436 Standard Specification Hardened Steel Washers
   f. ASTM F1554 Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

   a. ANSI/AWS D1.1 Structural Welding Code – Steel
   b. ANSI/AWS D1.4 Structural Welding Code – Reinforcing Steel
c. ANDI/AWS D1.6 Structural Welding Code – Stainless Steel

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures
B. Cast-In Concrete Anchors
   1. Mill certificates demonstrating conformance.
C. Post-Installed Concrete Anchors:
   1. Manufacturer’s Product Data demonstrating conformance.
   2. Manufacturer’s written instructions for storage, handling, and installation.
D. Welder Certification
E. Weld Procedure Specification
F. Source Quality Control inspection and test reports
G. Field Quality Control inspection and test reports

1.04 QUALITY ASSURANCE

A. Welder Certification: Current Washington Association of Building Officials certification for each process, method, position, and size of weld executed.
C. Post-installed anchors
   1. An on-site Quality Control Program shall be provided for all post-installed adhesive anchors in accordance with ICC-ES AC308 Articles 14.3 and 14.4
   2. Post-installed anchors shall be installed by an installer with a minimum of five years experience performing similar installations.
   3. Installer Training: Conduct thorough training with the manufacturer or the manufacturer’s representative for the installer on the Project. Training shall consist of a review of the complete installation process for drilled-in anchors including, but not limited to, the following:
      a. hole drilling procedure
      b. hole preparation and cleaning technique
      c. adhesive injection technique and dispenser training/maintenance
      d. anchor element type, material, diameter, and length
      e. proof loading/torquing

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast-in concrete anchor materials to the fabricator tied and identified with plastic tags indicating the mill, melt or heat number, and the grade and size of bar.
B. Store and handle concrete anchors in conformance with manufacturer's written instructions.

PART 2 - PRODUCTS

2.01 CAST-IN CONCRETE ANCHORS

A. Reinforcing Bars: Noted A706; ASTM A706

B. Anchor Rods

1. Unless noted otherwise: ASTM F1554 Grade 36 with ASTM A563A hex nuts
2. Noted Gr 105: ASTM F1554 Grade 105 with ASTM A563DH heavy hex nuts
3. Washers: ASTM F436
4. Finish: Section 05 05 13, Shop-Applied Coatings for Metal

C. Welded Headed Studs: ASTM A108, grades 1015 through 1020, headed stud type, cold finished carbon steel, AWS D1.1, Type B; with fluxed end conforming to ANSI/AWS D1.1.

2.02 POST-INSTALLED CONCRETE ANCHORS

A. Expansion Anchors

1. Hilti Kwik Bolt TZ Anchors or approved equal. Provide galvanized carbon steel anchors unless noted otherwise.

B. Adhesive Anchors

1. Adhesive: Hilti HIT–RE 500-SD or approved equal.
2. Threaded rod: Stainless steel: AISI 304/316

C. Undercut Anchors

1. Hilti HDA Design Anchors. Provide galvanized carbon steel anchors unless noted otherwise.

D. Substitute Products: Substitute post-installed concrete anchor products, if submitted, shall have current International Code Council approval for use in cracked concrete.

2.03 WELDING ELECTRODE

A. Match filler metal requirements in conformance with ANSI/AWS D1.4

2.04 FABRICATION

A. Reinforcing Bars Noted A706

1. Fabrication: Section 03 20 00, Concrete Reinforcing
2. Welding: ANSI/AWS D1.4

B. Welded Headed Studs: Weld to structural steel and metal fabrications in conformance with ANSI/AWS D1.1 and manufacturer's written instructions.
2.05 SOURCE QUALITY CONTROL
A. Visually inspect all shop welds.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Cast-In Concrete Anchors
   1. Anchor Rods: Install anchors as indicated on Contract Drawings. Secure to formwork or reinforcement to prevent movement during concrete placement. Protect threads until structural steel or metal fabrication is installed.
   2. Other Cast-In Concrete Anchors: Install anchors with fabricated assembly in conformance with Section 03 11 00, Concrete Forming.

B. Post-Installed Concrete Anchors
   1. Post-installed anchors may only be installed in sound concrete. Surfaces showing obvious distress by way of porosity, disintegration, carbonation, and cracks over 0.02-inch in width and 12-inches or longer and within the distance of the embedment length shall be reported to the Engineer for evaluation.
   2. Preparation for drilling
      a. Existing reinforcement shall be exposed as indicated on the Contract Drawings to establish the reinforcement pattern before drilling.
      b. No cutting of reinforcement will be permitted without prior written approval from the Engineer. Multi-cutting of the same bar is considered as one cut.
      c. Reinforcement will be considered to be cut if:
         1) For No. 4 through No. 7: Cuts, nicks, or drill into bar body are greater than 1/16-inch
         2) For No. 8 and Larger: Cuts, nicks, or drill into bar body are greater than 1/8-inch
      d. When installing anchors through cut reinforcement, the anchoring mechanism shall be located at least two anchor diameters beyond the cut reinforcement.
   3. Post-installed anchors shall be installed in accordance with the ICC-ES reports and manufacturer's installation instructions. Where installation criteria differ, the order of precedence from highest to lowest is: 1) this Specification; 2) the ICC-ES reports; 3) the manufacturer's installation instructions.
   4. Holes for post-installed anchors shall be drilled with carbide-tipped bits using rotary hammer drills meeting the requirements of ANSI B212.15 unless ICC-ES AC193 or ICC-ES AC308 testing demonstrates that using percussive drilling or another type(s) of bit, including core drills, is acceptable. Drilled holes shall be cleaned of chips, dust, loose material, and water prior to anchor installation. The hole diameters and depths shall be as recommended in the manufacturer's instructions. The hole diameter shall be checked every ten holes for conformance
5. Anchors shall be installed perpendicular to the concrete surface within a plus or minus 5-degree tolerance. Post-installation verification of this criterion may be satisfied by visual inspection to verify proper seating of the nut and washer.

6. In areas where concrete has been removed, the minimum anchor embedment shall be measured from the surface of sound concrete.

7. Unless otherwise noted on the Contract Drawings, the spacing requirements indicated in the applicable ICC ES report shall be used.

8. Bending and welding of post-installed anchors is not permitted.

9. The nut thread engagement for the anchors (studs) shall be such that the bolt threads project past the outside face of the nut when completely installed.

10. The length identification code on the head of the anchor shall not be damaged during installation. Anchor projection may be cut-off subject to the approval of the Engineer and documentation of the location, embedment, and length code.

11. Unused anchors shall be driven in and cut-off flush. Cut-off anchors shall be considered an abandoned ungrouted hole for future anchor spacing requirements.

12. Care shall be exercised to avoid bending anchors to match base plate holes, or loosening of anchors by prying sideways after tightening. Care shall also be exercised to ensure that the cone nut of an undercut anchors does not become loose from the stud during the setting or tensioning operation.

13. Non-grouted base plates may have a maximum 1/8-inch gap as evidenced under exterior edges around the plate provided that 1) the plate exhibits bearing contact within its interior against the concrete surface; and 2) the uneven bearing does not prevent application of the prescribed torque. If an unacceptable bearing contact condition exists, one of the following procedures shall apply:

   a. The concrete surface shall be reworked to obtain a proper fit.

   b. For gaps of up to 1-inch, the base plate may be grouted instead using the following technique:

      1) Insert post-installed anchors and set the base plate.

      2) Insert nuts to finger-tight condition.

      3) Install shims positioned no more than 1/2-inch away from the anchors to reduce gaps between base plate shims to 1/8-inch or less at anchor locations.

      4) Apply tightening torque. The bolt tightening shall not be performed when interior shims under the base plates have been placed away from anchors so that downward bending of the base plate would result upon tightening. Shims shall be moved.
as close as possible to the anchors before applying the installation torque.

5) Fill the gap with non-shrink grout leaving the shims in place. For base plates on walls where grouting is not feasible, the gap may be filled with shim plates. The shims may be stacked but no more than four shims shall be stacked.

14. Relocating Holes Within Base Plates: The base plate with bolts may be relocated no more than 1-inch in any direction with respect to the attachment principal axis unless otherwise noted on the Contract Drawings.

15. Do not use adhesive anchors for conditions that place constant tensile loads on the anchor.

3.02 FIELD QUALITY CONTROL

A. Post-Installed Concrete Anchors

1. Full-time special inspection is required for all adhesive anchor systems together with proof load testing. Proof load testing alone is not recognized as meeting special inspection requirements.

2. Testing Method: Post-installed anchors shall be tested by the direct tension method as follows:
   a. Direct Tension Method: A tensile load as defined herein below is applied. If the tension load is applied by jacking against the concrete, the jacking pressure is to be distributed outside of an area having its center at the post-installed anchor and its diameter, or least dimension, equal to the required anchor spacing as given in the ICC ES report. Post-installed anchors tested by this method shall be retightened by applying the installation torques.
   b. Testing shall be in accordance with {ICC-ES AC308 Figure 5-1} or {ACI 355.2 and ASTM E488}.

3. Test (Proof) Load: Tension test (proof) load shall be as indicated on the approved shop drawings.

4. For post-installed adhesive anchors, the test shall be equal to the lesser of:
   a. A tensile load equal to 80-percent of the specified nominal yield strength of the anchor bolt material times the tensile area of the bolt; or
   b. A tensile load equal to twice the design load and at least 50 percent of the expected ultimate load based on the adhesive bond strength shown in the ICC-ES report, whichever is greater.

5. For post-installed mechanical anchors, the test load shall be a tensile load equal to 80-percent of the specified nominal yield strength of the anchor bolt material times the tensile area of the bolt.

6. Test Frequency: Unless otherwise specified, the following test frequencies shall apply:
   a. Post-Installed Mechanical Anchors: All anchors shall be tension-tested.
b. Post-Installed Adhesive Anchors: All anchors shall be tension-tested.

7. Acceptance Criteria: A post-installed anchor is acceptable if the test load specified herein is attained without:

a. Slippage of more than:
   1) 1/16-inch for adhesive anchors
   2) 2.5-percent of the embedded length, rounded to the nearest 1/16 inch for mechanical anchors

b. Bolt failure

c. A sign of damage in the surrounding concrete

8. Installation Inspection Record

a. Test Inspection Record: The test inspection record shall include, but not be limited to, the following information:
   1) Product description, including product name
   2) Adhesive expiration date
   3) Anchor or rebar diameter and steel grade
   4) General location of anchor and group represented
   5) Method of test or verification
   6) Test results, accepted or rejected
   7) Inspector's name
   8) Date of test
   9) Identification number of testing tool

b. Failed Anchor Documentation: Documentation for anchors is required for an anchor that does not pass the test acceptance criteria specified herein. Failed anchor documentation shall be submitted to the Engineer. The documentation shall include, but not be limited to, the following:
   1) Exact location of failed anchor
   2) Reason for failure
   3) Repair steps taken
   4) Inspector's name
   5) Date of test
3.03 REPAIR AND RESTORATION OF DEFECTIVE WORK

A. Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout. Anchors that fail to meet proof load or installation torque requirements shall be regarded as malfunctioning.

B. Abandoned holes shall be grouted with non-shrink grout. When post-installed anchors fail to meet the acceptance criteria under inspection and testing, the following repairs may be undertaken:

1. When failure is due to excessive anchorage pullout, contact the Engineer to evaluate the damage and approve a repair method. If approved, the anchor may be reset once prior to redrilling the hole and installing an anchor of equal size. Use the minimum spacing embedment depth, and installation torque required for the original anchor.

2. When failure is due to breaking of the anchor, slippage or loosening, bending, improper installation or poor attachment, remove the defective anchor, redrill the hole, and install the same diameter anchor if the integrity of surrounding concrete has not been disturbed.

3. For cases where excessive slippage upon torquing is experienced, or usage of the same hole is not possible, fill the existing hole with non-shrink grout and relocate the anchor location.

4. When failure is due to breakout of concrete around the anchor, the Engineer will develop an appropriate repair. Contact the Engineer to evaluate the damage and repair method. Local spalling of the concrete around the anchor, up to a maximum depth of 1/4-inch, is not considered a concrete breakout failure.

5. Mislocated anchors may be cut flush with concrete surface, and need not be removed if they do not interfere with subsequent installations.

6. Mislocated anchors or anchors installed for temporary applications may be left in place. Those anchors that must be removed to accommodate other attachments, aesthetics, or safety of personnel may be removed completely or abandoned in place by cutting off beneath the surface after chipping the concrete 1-inch minimum and patching with epoxy grout. Mislocated anchors that will be covered by a base plate or an attachment may be cutoff flush with the concrete. In the event that an anchor must be removed from the hole and a new anchor installed, the removal and installation of the new anchor shall be in accordance with the manufacturer’s specifications. The abandoned hole or removed concrete shall be filled with non-shrink grout.

7. Removal of installed anchors for inspection or replacement may be performed by using a bolt extractor as manufactured by Drillco Devices, Ltd., or approved equal.

8. Retest all replaced anchors as specified herein.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for fabrication, welding, and placement of steel reinforcing for concrete, and concrete reinforcing accessories, with the following exceptions:

1. Welding for reinforcing steel is covered in Section 03 15 25, Anchorage to Concrete.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 01 45 00, Quality Assurance/Quality Control.
2. Section 03 15 25, Anchorage to Concrete.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents

1. American Concrete Institute (ACI):
   a. ACI 116R Cement and Concrete Terminology
   b. ACI 301 Specifications for Structural Concrete for Buildings
   c. ACI 315 Details and Detailing of Concrete Reinforcement
   d. ACI 318 Building Code Requirements for Reinforced Structural Concrete

   a. ASTM A82 Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
   b. ASTM A185 Standard Specification for Steel Welded Wire Reinforcement, Plain for Concrete
   c. ASTM A497 Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete
   d. ASTM A615 Standard Specification for Deformed and Plain CarbonSteel Bars for Concrete Reinforcement
   e. ASTM A706 Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
1.03 DEFINITIONS
A. The words and terms used in this Section conform to the definitions given in ACI 116R

1.04 SUBMITTALS
A. Procedures: Section 01 33 00, Submittal Procedures.

B. Placing Drawings:
   1. Bar lists, bending diagrams and schedules, and placement plans and details for all reinforcing steel. Include weights on bar lists.
   2. Indicate descriptions, details, dimensions, arrangements and assemblies, and locations of reinforcing steel. Include number of pieces, sizes, and markings of reinforcing steel, laps and splices, supporting devices and accessories, and other information required for fabrication and placement. Indicate adjustments required as specified.
   3. Detail reinforcing steel in conformance with ACI 315. Indicate individual weight of each bar, total weight of each bar size, and total weight of all bars on the list.

C. Manufactured Products: For each manufactured product submit:
   1. Manufacturer’s Product Data.
   2. Manufacturer’s written instructions for storage, handling, and installation.

D. Mill Certificates:
   1. For each lot or load of reinforcing steel delivered to the jobsite, submit mill certificates demonstrating the grades and physical and chemical properties of the reinforcing steel.

E. Welder Certification
   1. Submit current Washington Association of Building Officials reinforcing steel welding certifications for each welder, valid for each process, method, position and bar size used.

F. Weld Procedure Specification
   1. Submit welding procedure specifications for all reinforcing steel welds in conformance with ANSI/AWS D1.4.

G. Test Reports
1. Submit reports for weld procedure specification qualification.
2. Submit test reports demonstrating acceptance of weld procedure specifications.
3. Submit shop and field weld inspection reports.

1.05 QUALITY ASSURANCE

A. Qualifications for Independent Testing Laboratory: In conformance with ASTM E329, and Section 01 45 00, Quality Assurance/Quality Control.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver reinforcing steel to the fabricator in bundles, limited to one size and length of bar, securely tied and identified with plastic tags in an exposed position indicating the mill, the melt or heat number, and the grade and size of bars.

B. Deliver reinforcing steel to the jobsite properly tagged and identified:
   1. Store, and block up in a manner that will ensure that no damage occurs
   2. Protect from moisture, dirt, grease, oil, or other cause that might impair bond with concrete.
   3. Maintain identification of reinforcing steel after bundles are broken.

C. Store and handle manufactured items in compliance with manufacturer’s written instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing Steel Bars: ASTM A615, Grade 60, unless otherwise indicated.

B. Weldable Reinforcing Steel Bars (including Cathodic Protection and Grounding reinforcement): ASTM A706.

C. Welded Steel Wire Fabric - Plain Wire: ASTM A185, wire sizes and spacings as indicated.

D. Welded Steel Wire Fabric - Deformed Wire: ASTM A497, wire sizes and spacings as indicated.

E. Wire and Plain Bars: ASTM A82, wire used as reinforcement and plain bars used as spiral reinforcement as indicated.

F. Accessories: Provide reinforcement accessories, including bar supports, spacers, hangers, chairs, and similar items as required for spacing, assembling, and supporting reinforcement in place. Conform to CRSI referenced standards. Provide metal chairs with Class 1 or Class 2 protection. Provide concrete blocks with equal or greater compressive strength to the concrete being used for the finished structure.

G. Tie Wire: ASTM A82, No. 16 gauge or heavier, black or galvanized, soft or commercial grade steel tie wire.

H. Smooth Dowel Bars: ASTM A615 Grade 60.
I. Mechanical Splices:
   1. Capable of being installed in clear space indicated.
   2. Capable of developing 125 percent of the yield strength of spliced reinforcing bars.
   3. Position Couplers: Capable of splicing two bars without rotation of coupler. Provide Lenton Position Couplers Type P9, or approved equal.

J. Mechanical Anchorages:
   1. Capable of being installed in clear space indicated.
   2. Capable of developing 125 percent of the yield strength of anchored reinforcing bar.

K. Welding Electrode:
   1. Match filler metal requirements in conformance with ANSI/AWS D1.4.

2.02 FABRICATION:

A. Dimensions:
   1. Conform to placing drawings.

B. Cutting and Bending:
   1. Perform cutting and bending at a central location, equipped and suitable for the purpose.
   2. Accurately cut and cold bend bars as indicated on the approved placing drawings. Do not heat bars for bending or straightening. Do not bend or straighten bars in a manner that will injure the material.
   3. Label all bars in conformance with bending diagrams and schedules, and secure like pieces in bundles when appropriate.

2.03 SOURCE QUALITY CONTROL

A. Tolerances:

B. Identification:
   1. Bundle and tag reinforcing steel with grades and sizes, heat numbers, and suitable identification marks for checking, sorting, and placing.
   2. Mark tags with sizes and numbers corresponding to approved placing drawings and schedules.
   3. Use waterproof tags and markings that cannot be removed until steel reinforcement is placed in position.

C. Shop Welding Inspection:
   1. Visually inspect all shop welds in conformance with ANSI/AWS D1.4.
PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that surfaces over or against which reinforcing is to be placed are clean and in proper condition for placing reinforcement.

B. Verify that items to be embedded in concrete are secured in place as required.

3.02 PLACEMENT

A. General: Place concrete reinforcing in compliance with approved placing drawings. Install reinforcement accurately and secure against movement due to placement of concrete.

B. Reinforcing Supports: Support bars on metal chairs, concrete blocks, spacers, and hangers, accurately placed and securely fastened to steel reinforcement in place. Support legs of accessories in forms without embedding in the form surface.

C. Placing and Tying: Install reinforcing steel in place securely to prevent displacement. Point ends of wire ties away from forms. Do not secure bars to the sides or bottom of the forms using tie wire.

D. Spacing: Place bars in compliance with the approved placing drawings.

E. Longitudinal Location of Bends and Ends of Bar: A maximum of plus or minus three inches from the indicated location will be permitted, provided that specified protective concrete cover at ends of members is not reduced by more than 1/2 inch.

F. Lap Splices: Stagger splices of alternate bars a minimum clear offset of 4 feet between splices, or as indicated on the approved placing drawings.

G. Mechanical Splices:
   1. Install in conformance with the manufacturer’s written instructions.
   2. Where mechanical splices are connected to reinforcement on only one end and embedded in concrete, provide a metal cap on the open end to protect the interior of the splice and prevent intrusion of concrete.

H. Mechanical Anchorages: Install in conformance with the manufacturer’s written instructions.

I. Dowels: Provide dowels where indicated to connect construction and maintaining structural and reinforcement continuity. Provide additional bars for proper support and anchorage where required. Do not bend dowels after embedment.

J. Welded Wire Fabric:
   1. Install wire fabric in lengths as long as practicable, wire-tie at all laps and splices. Offset end laps in adjacent widths. Lap welded wire fabric not less than 1-1/2 times the spacing of wires in the direction of lap, nor less than 6 inches.
   2. Secure welded wire fabric in position with suitable supports, accessories, and tie wire as indicated and required to protect against movement from workers and placement of concrete. Where indicated or required, lift fabric as concrete is placed to proper embedment depth at positions as indicated.
K. Protective Concrete Cover: Provide a minimum concrete cover for steel reinforcement as shown on Contract Drawings.

L. Protection of Waterproofing Membrane: Where reinforcement is to be installed over or against a waterproofing membrane, protect the membrane during installation of the reinforcement to avoid punctures, tears, and abrasion. Notify the Resident Engineer immediately if the membrane is damaged.

M. Tolerances


2. Adjustment: Bars may be moved as necessary to avoid interference with other reinforcing steel or embedded items. Do not increase the maximum spacing or reduce the total number of bars. Properly replace and secure all bars moved to permit access for cleanup operations before the start of concrete placement.

3.03 CLEANING

A. Clean reinforcement, so it is free of corrosion and coatings which may impair bond with concrete, such as concrete from previous pours, form oil, mill scale, or loose deposits of rust and other corrosion.

3.04 FIELD QUALITY CONTROL

A. Perform the following tests by the Independent Testing Laboratory with approval of the Resident Engineer during installation:

1. Mechanical Splices
   a. Provide continuous inspection of 100 percent of installed splices.
   b. Remove and replace incorrectly installed splices

2. Field Welding
   a. Visually inspect all field welds in conformance with ANSI/AWS D1.4.

B. Perform the following inspections by the Independent Testing Laboratory with approval of the Resident Engineer present prior to placing concrete:

1. Placement: Visually inspect reinforcing placement for conformance with the placing drawings. Verify the following:
   a. Bar grade
   b. Bar size, length, and bends
   c. Bar location, quantity, spacing, and cover
   d. Lap splice types, lengths, and locations
   e. Sufficient ties, supports, and side form spacers
   f. Bars are free from oil, paint, dried mortar, or loose rust

2. Waterproofing Membrane: Verify integrity of waterproofing membrane.
SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for conveying, placing, repairing, curing, protecting, and testing cast-in-place concrete.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 03 05 15, Portland Cement Concrete
2. Section 03 11 00, Concrete Forming
3. Section 03 15 00, Concrete Accessories
4. Section 03 15 13, Waterstops
5. Section 03 20 00, Concrete Reinforcing
6. Section 03 35 00, Concrete Finishing: Finishing, curing and sealing formed and unformed concrete surfaces
7. Section 03 62 00, Non-Shrink Grouting
8. Section 07 10 00, Waterproofing and Seepage Management

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Concrete Institute (ACI)
   a. ACI 116R Cement And Concrete Terminology
   b. ACI 301 Specifications For Structural Concrete
   c. ACI 304R Guide For Measuring, Mixing, Transporting, And Placing Concrete
   d. ACI 304.2R Placing Concrete by Pumping Methods
   e. ACI 305R Hot Weather Concreting
   f. ACI 306.1 Standard Specifications For Cold Weather Concreting
   g. ACI 309R Guide For Consolidation Of Concrete
   h. ACI 503.4 Standard Specification For Repairing Concrete With Epoxy Mortars
   a. ASTM C31 Standard Practice For Making And Curing Concrete Test Specimens In The Field
   b. ASTM C33 Standard Specification For Concrete Aggregates
   c. ASTM C39 Standard Test Method For Compressive Strength Of Cylindrical Concrete Specimens
   d. ASTM C42 Standard Test Method For Obtaining And Testing Drilled Cores And Sawed Beams Of Concrete
   e. ASTM C94 Standard Specification For Ready-Mixed Concrete
   f. ASTM C143 Standard Test Method For Slump Of Hydraulic Cement Concrete
   g. ASTM C150 Standard Specification For Portland Cement
   h. ASTM C171 Standard Specification For Sheet Materials For Curing Concrete
   i. ASTM C172 Standard Practice For Sampling Freshly Mixed Concrete
   k. ASTM C231 Standard Test Method For Air Content Of Freshly Mixed Concrete By The Pressure Method
   l. ASTM C309 Standard Specification For Liquid Membrane Forming Compounds For Curing Concrete
   m. ASTM C881 Standard Specification For Epoxy Resin Base Bonding Systems For Concrete
   n. ASTM C928 Standard Specification For Packaged, Dry, Rapid-Hardening Cementitious Materials For Concrete Repairs
   o. ASTM C1059 Standard Specification For Latex Agents For Bonding Fresh To Hardened Concrete
   q. ASTM E329 Standard Specification for Agencies Engaged In Construction Inspection, Testing, or Special Inspection

3. American Association of State Highway and Traffic Officials (AASHTO)
   a. AASHTO M182 Specification For Burlap Cloth Made From Jute or Kenaf

4. Washington State Department of Transportation (WSDOT)
   a. Standard Specifications for Road, Bridge, and Municipal Construction

5. Other Standards
1.03 DEFINITIONS

A. Mass Concrete: Any volume of concrete with dimensions large enough to require that measures be taken to cope with generation of heat from hydration of the cement and attendant volume change, to minimize cracking.

B. The words and terms used in this Section conform to the definitions given in ACI 116R.

1.04 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. For each manufactured product submit:
   1. Manufacturer's Product Data.
   2. Manufacturer's written instructions for storage, handling, and installation.

C. Qualifications: Independent Testing Laboratory.

D. Construction Work Plan

E. Quality Program Plan

F. Placement Records: Report the location in the finished work of each concrete class, and the start and completion times of each batch of concrete placed.

G. Field Quality Control inspection and test reports and documents
   1. Concrete slump, air content, and temperature results.
   2. Concrete compressive strength test results.
   3. Concrete truck batch tickets in conformance with ASTM C94. Include any modifications to water or admixture volumes from the original mix design.

1.05 QUALITY ASSURANCE

A. Qualifications for Independent Testing Laboratory: ASTM E329 and Section 01 45 00, Quality Assurance/Quality Control.

B. Construction Work Plan: Section 01 45 00, Quality Assurance/Quality Control. Include descriptions of methods, materials, labor, and equipment used in:
   1. Conveying, placing, repairing, curing, protecting, and testing cast-in-place concrete.
   2. Hot weather concreting, cold weather concreting, and wet weather concreting.

C. Quality Program Plan: Section 01 45 00, Quality Assurance/Quality Control.
D. Mock-ups: Provide the mock-ups for evaluation of cast-in-place concrete installation methods and workmanship:

1. Provide mock-ups of each performance concrete mix as required in Section 03 05 15.

2. Provide mock-ups and meet all requirements for same described in Section 03 35 00, Concrete Finishing.

3. Provide mock-ups of sample concrete patches and repairs as described in Paragraph 3.04C and 3.04D.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Ready Mix Concrete: Section 03 05 15, Portland Cement Concrete.

B. Store and handle manufactured products in conformance with manufacturer’s written instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Portland Cement For Site-Mixed Repair Materials

1. ASTM C150, type and brand to match cement used in concrete to be repaired.

2. Provide white portland cement where required to match surrounding concrete.

B. Fine Aggregate for Site-Mixed Repair Materials

1. For Bonding Grout: ASTM C33 washed clean sand passing a Number 30 sieve.

2. For Patching Mortar: ASTM C33 washed clean, graded fine aggregate of suitable size for areas to be repaired. Aggregate up to Size Number 8 may be used for repair of larger defects.

2.02 MANUFACTURED PRODUCTS

A. Patching Mortar: ACI 503.4 for Epoxy Mortar.

B. Epoxy Adhesive: ASTM C881

1. Type II for non-load-bearing concrete, Type V for load-bearing concrete.

2. Select grade and class by project conditions and requirements.

C. Damp Curing Materials

1. Waterproof Sheet Materials: ASTM C171 waterproof paper with white paper face, polyethylene film pigmented white or white burlap-polyethylene sheeting.

2. Burlap: AASHTO M182, class or weight suitable for the use and location.

1. Type 1 for concrete not exposed to sunlight, Type 1-D with white fugitive dye for concrete exposed to sunlight.

2. Class A or B as appropriate for use and location.

E. Patching Materials Other Than Portland Cement

1. Portland cement mortar modified with a latex bonding agent conforming to ASTM C1059 Type II.

2. Epoxy mortars and epoxy compounds that are moisture-insensitive during application and after curing, that embody an epoxy binder conforming to ASTM C881, Type III. Select type, grade, and class appropriate for the application.

3. Non-shrink grout: Section 03 62 00, Non-Shrink Grouting.


2.03 MIX DESIGNS

A. Mix Designs: Section 03 05 15, Portland Cement Concrete.

PART 3 - EXECUTION

3.01 PREPARATION

A. Notification: Prior to each concrete placement:

1. Notify the Resident Engineer at least 24 hours prior to actual placement, and not later than 3 pm on the day prior to placement.

2. Notify the Resident Engineer at least 48 hours prior to actual placement when schedules require concrete placement at times other than normal working hours or for Mass Concrete pours.

3. Notify the Resident Engineer of the location of the placement and the concrete mix to be placed.

B. Prior to placement, verify the following:

1. Formwork installation conforms to Section 03 11 00, Concrete Forming.

2. Reinforcing placement conforms to Section 03 20 00, Concrete Reinforcing.

3. Embedded items are located correctly and secured to resist movement.

4. For slabs on grade, also verify the subgrade is well drained; free of debris, free of frost and ice; and moist with no muddy spots, soft spots, or ruts.

C. Construction Joints

1. Make construction joints straight and as inconspicuous as possible, and in vertical and horizontal alignment with the structure.

2. Locate construction joints as indicated on the Contract Documents, and according to 03 11 00, Concrete Forming.
3. Install waterstops in conformance with Section 03 15 13, Waterstops.

4. Apply epoxy adhesive to hardened concrete in conformance with manufacturer’s written instructions.

D. Obtain acceptance of preparation from the Resident Engineer prior to placement.

E. Waterproofing Membrane: Where concrete is to be placed over a waterproofing membrane, obtain acceptance of the membrane integrity from the Resident Engineer prior to concrete placement. Refer to Section 07 10 00, Waterproofing and Seepage Management.

F. Weather Considerations
   1. Wet Weather: Provide protection for concrete during placement, finishing, and curing while rain, sleet, or snow is falling.
   2. Hot Weather: Conform to the recommendations of ACI 305R.
   3. Cold Weather: Conform to the requirements of ACI 306.1.

3.02 PLACEMENT

A. Conveying
   1. General
      a. Convey concrete rapidly from mixer to the place of final deposit using methods that prevent segregation and loss of ingredients, and will ensure the required quality of concrete.
      b. Do not use aluminum pipes or chutes.
      c. Conform to the recommendations of ACI 304R
   2. Pumping
      a. Conform to the recommendations of ACI 304.2R.
      b. Use pumping equipment that permits placement rates that avoid cold joints and prevent segregation in discharge of pumped concrete.
      c. Support pump hoses so that reinforcement is not moved from its original position.

B. Depositing
   1. Place concrete continuously in one horizontal layer or in several horizontal layers with fresh concrete deposited over previous placements that are still plastic.
   2. Do not place concrete that has surface-dried, partially hardened, or contains foreign material.
   3. Do not drop concrete freely through reinforcing which may cause segregation.
   4. Do not drop concrete freely more than 5 feet. When placing vertical sections of greater heights, use openings in the form, elephant trunks, tremies, or other approved devices to reduce the free drop.
5. Placement Using Tremie Methods: Place concrete in or under water in conformance to the recommendations of ACI 304R.

6. If truck is being sampled, place no more than 1/2 cubic yard until tests demonstrate concrete conforms to temperature, air content, and slump requirements.

C. Consolidating

1. Consolidate concrete by mechanical vibration in conformance with the recommendations of ACI 309R.

2. Thoroughly work concrete around reinforcement and embedded items and into corners of forms to eliminate air and rock pockets. Insert and withdraw the vibrator vertically at uniform spacing over the entire area of the placement. Space the distance between insertions such that the influence zones of each insertion overlap. Do not drag vibrators to move concrete horizontally.

3. Use internal vibrators of the largest size and power that can properly be used in the Work. Maintain vibrators and provide sufficient back-up units on site.

4. Conduct vibration using competent, skilled, and experienced workers,

3.03 CURING AND PROTECTION:

A. Damp Curing Materials:

1. Waterproof Sheet Materials: ASTM C171, waterproof paper with white paper face, polyethylene film pigmented white, or white burlap-polyethylene sheeting.

2. Burlap: AASHTO M182, of class or weight suitable for the use and location. Do not use burlap where concrete is exposed to direct sunlight.

B. Curing Compound: ASTM C309, liquid membrane-forming curing compound, Type 1 for concrete not exposed to sunlight, and Type 1-D with white fugitive dye for concrete exposed to sunlight, Class A or B as appropriate for the use or location.

C. Curing Unformed Concrete Surfaces

1. After placing and finishing, cure concrete by application of mats or fabric kept continuously wet for not less than 14 days.

2. Do not cure with earth, sand, sawdust, straw, or hay.

3. Do not use burlap where exposed to direct sunlight.

D. Curing Formed Concrete Surfaces

1. Keep absorbent wood forms wet until they are removed.

2. After formwork is removed, apply a curing compound.

E. Protection

1. Immediately after placing, protect concrete from premature drying, excessively hot or cold temperatures, mechanical injury, and staining.
2. Protect concrete during the curing period from mechanical and physical stresses that may be caused by heavy equipment movement, subjecting the concrete to load stress, load shock, or excessive vibration.

3. Where concrete surfaces will receive architectural finishes, such as clear or penetrating pigmented sealer/densifier, resilient floor coverings or paint, ensure membrane-forming curing compound does not leave a coating or residue that will impair application or bond of sealers, adhesives, paints, and coatings with concrete.

3.04 REPAIR OF SURFACE DEFECTS

A. General

1. Repair tie holes and surface defects immediately after removing formwork and before curing.

2. Where the surface is to be textured, repair tie holes and surface defects before texturing.

3. Manufactured repair materials may be used in lieu of site-mixed repair materials. Apply manufactured repair materials in conformance with manufacturer’s printed directions.

4. Repair concrete damage caused by construction activities, such as accidental equipment impact, temporary anchor bolts and construction equipment connections.

B. Site-Mixed Repair Materials

1. Bonding grout: Mix one part cement to one part fine sand to the consistency of thick cream.

2. Patching mortar
   a. Use same materials as the concrete to be patched with no coarse aggregate. Do not use more than one part cement to 2-1/2 parts sand.
   b. For repairs in exposed concrete, substitute white portland cement for a portion of the gray portland cement to produce a mix matching the surrounding concrete color when dry. Determine the proportion of white portland cement by trial mixes and test areas, prior to repair of actual defective areas.

C. Repair of Tie Holes

1. Plug all tie holes with the exception of tie holes at CONC-1 and CONC-4 described in Section 03 35 00.

2. If portland cement patching mortar is used for plugging, clean and dampen tie holes before application.

D. Repair of Surface Defects Other Than Tie Holes

1. Outline defect with 1/2 inch to 3/4 inch deep saw cut. Remove all concrete within the sawcut to sound concrete. If chipping is required, leave chipped edges perpendicular to the surface or slightly undercut. Do not feather edges.
2. Dampen area to be patched plus a 6-inch band around the perimeter. Brush bonding grout thoroughly into the surface.

3. When bond coat begins to lose water sheen, apply patching mortar and thoroughly consolidate into place. Strike off mortar, leaving slightly higher than surrounding surface to permit shrinkage.

4. Finish the patch after 1 hour. Keep patch damp for seven days.

E. Removal of surface stains and deposits
   1. Remove stains, rust, efflorescence, and surface deposits considered objectionable by the Resident Engineer.

3.05 MASS CONCRETE
   A. Use measures to mitigate heat of hydration in mass concrete placement by adjusting the concrete mix design, precooling concrete constituents or the concrete mix, postcooling or insulating the in-place concrete mass, or modifying construction methods.
   B. Limit concrete temperatures to the following during curing
      1. Maximum internal concrete temperature: 145 degrees F.
      2. Maximum differential temperature between internal concrete and surface: 35 degrees F.
   C. Demonstrate that concrete temperatures do not exceed the specified limits.
      1. Test concrete temperatures in conformance with ASTM C186.
      2. Record internal and surface temperatures
         a. Hourly until internal concrete temperature has dropped to less than 90 percent of the maximum recorded.
         b. As necessary to confirm specified limits are not exceeded and internal concrete temperature remains within 35 degrees F of the surface concrete temp.
         c. As necessary until trend indicates internal and surface concrete temperatures are converging.

3.06 FIELD QUALITY CONTROL
   A. Independent Testing Laboratory: To perform the following:
      1. Observe concrete batching and mixing operations.
      2. Record all concrete batched.
      3. Record all concrete delivered to the project.
      4. Collect and check concrete truck batch tickets.
      5. Visually inspect concrete placement.
      6. Sample and test concrete.
7. Obtain drilled cores of concrete, if required by the Resident Engineer.

8. Install and read temperature measurement devices in mass concrete placements.

9. Prepare reports on all inspection and test results.

B. Provide additional labor, materials, or equipment required to assist the Independent Testing Laboratory in obtaining and handling samples at the site.

C. Provide and maintain for the sole use of the Independent Testing Laboratory adequate facilities for safe storage and proper curing of concrete test specimens on site for initial curing.

D. Concrete Sampling

1. Obtain composite samples in compliance with ATSM C172. Select the trucks or batches of concrete to be tested on a random basis. Samples may be obtained at the truck.

2. Obtain at least one composite sample for the first batch of concrete, and then for each 100 cubic yards, or fraction thereof, of each concrete mixture placed in any one day. When the total quantity of a given concrete mixture is less than 50 cubic yards, test the first batch of concrete, and at least one other batch.

3. Conduct compressive strength tests of each sample in compliance with the following:
   a. Mold and cure three cylinders in compliance with ASTM C31. Record any deviations from the ASTM requirements in the test report.
   b. Test cylinders in compliance with ASTM C39. Test one specimen at seven days for information and two specimens at 28 days for acceptance, unless otherwise specified.

4. Determine slump of each sample in compliance with ASTM C143.

5. Determine air content of each sample in compliance with ASTM C231.

6. Determine temperature of each sample in compliance with ASTM C1064.

7. Place no more than ½ cubic yard before slump, temperature, and air content tests demonstrate concrete is within acceptable limits.

E. Evaluation and Acceptance of Tests

1. Acceptance of Concrete
   a. The compressive strength tests results for acceptance of each sample shall be the average of the compressive strengths from the two specimens tested at 28 days.
   b. If one specimen in a sample shows evidence of improper sampling, molding, or testing, discard the specimen and consider the strength of the remaining cylinder to be the test result.
   c. If both specimens in a sample show any defects, both specimens shall be discarded.
d. Compressive strength tests will be considered acceptable if the average compressive strength of all 28-day specimens of three consecutive sample tests are equal to or exceed the specified 28-day compressive strength, and if no individual specimen compressive strength is more than 300 pounds per square inch below the specified 28-day compressive strength.

2. Test Cores: If concrete strength is not considered acceptable, or if there is a likelihood of low strength concrete, a significant reduction in load-carrying capacity or an absence of desired durability in the concrete, the Resident Engineer may require tests of cores drilled for determination of in-place strength.
   a. Obtain and test specimens in conformance with ASTM C42. Take three cores from each area as directed by the Resident Engineer.
   b. Test cores will be considered acceptable if the average of the three cores is equal to at least 85 percent of the specified 28-day compressive strength and no single core is less than 75 percent of the 28-day compressive strength. Locations represented by erratic core strengths may be retested at the direction of the Resident Engineer.
   c. Fill core holes in conformance with the requirements of this Section for repair of surface defects.
   d. If, as a result of these tests, it is determined that the specified concrete properties are not being obtained, the Contractor may order such changes in proportions or materials, or both, as may be necessary to secure the specified properties.

3. Repair or replace low-strength concrete as directed by the Resident Engineer. Concrete is defined as low-strength if concrete compressive strength tests and test cores do not meet the requirements for acceptable tests as described herein.

3.07 MEASURING, BATCHING AND MIXING
   A. Measure, batch and mix Portland Cement concrete in conformance with ASTM C94.
      1. Use central-mixed concrete transported to the jobsite in truck mixers.
      2. Use truck mixers equipped with:
         a. Automatic device for recording number of revolutions of drum prior to completion of mixing operation.
         b. Either accurately calibrated water tanks or water meters.

3.08 DELIVERY
   A. Transport and deliver concrete in conformance with ASTM C94 and furnish batch ticket information.
      1. Batch tickets shall include the amount of water in the batch from the plant and the remaining water that may be added at the site, if any.
   B. Mix concrete continuously in truck mixer until discharged.
   C. Mix ready-mixed concrete for a period of not less than 10 minutes. Mix for at least 3 minutes immediately prior to discharging at the site.
D. Do not place concrete more than 90 minutes or 300 drum revolutions after the introduction of mixing water, whichever is less.

3.09 SLUMP ADJUSTMENT

A. If concrete arrives at the site with a slump less than is workable for the given mix design, the slump may be adjusted by adding water at the site with the following restrictions:

1. Water added at the site was withheld from the batch water at the plant.
2. The total water added at the plant and the site does not exceed the mix design water amount.
3. Water is added at the site in conformance with ASTM C94.

B. Do not add water to the concrete after water reducing admixtures are added at the site.

C. Retest slump, temperature and air content after slump adjustment in conformance with Section 03 30 00, Cast-In-Place Concrete.

3.10 WEATHER RELATED PLACEMENT

A. For batching, mixing and delivering concrete in hot weather, conform to the recommendations of ACI 305R.

B. For batching, mixing and delivering concrete in cold weather, conform to ACI 306.1.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for the finishing, curing and sealing of formed and unformed concrete surfaces, including the repair of surface defects.

B. Governance: Requirements of this Section as applicable to concrete surfaces exposed to view shall govern over concrete forming and finishing requirements as may be found in other Sections of these documents.

C. Finish treatments of floors, walls, ceilings and other miscellaneous concrete surfaces including the following as scheduled and as indicated on Contract Drawings:

1. CIP-1: Standard CIP concrete
2. CIP-2: Exposed CIP concrete in public areas with custom finish
3. CIP-3: Fluted acoustic concrete between ribs in station box. Not Applicable for N140
4. CIP-4: 2 x 2 scored pattern with light sandblast.
5. CIP-5: Same as CIP-4 with color added to concrete.
6. CIP-S1: Clear concrete sealer/densifier for typical interior exposed slabs
7. CIP-S2: Clear curing sealer for typical exterior concrete flat work.
8. CIP-S3: Concrete film forming sealer for concrete stair treads and landings, and elsewhere indicated,

D. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 03 11 00, Concrete Forming.
2. Section 03 30 00, Cast-in-Place Concrete: Prepared concrete floors ready to receive finish; concrete sealant; control and formed expansion and contraction joints and joint devices.
3. Section 03 45 00, Precast Architectural Concrete: Precast treads and risers to be color-matched in work of this Section.
4. Section 03 54 00, Cast Underlayment: Hydraulic and Self-Leveling Underlayment as potentially required to meet flatness specifications.
5. Section 07 19 10, Water and Graffiti Repellents: Requirements water repellents and graffiti-resistant coatings.

6. Section 09 30 00, Tiling: Tiling work on concrete substrates.

7. Section 09 06 00, Schedule for Finishes.

8. Section 09 96 00, High-Performance Coatings: Coatings on finished concrete surfaces.

9. Section 12 10 00, Art Coordination and Installation.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Association of State Highway and Transportation Officials (AASHTO):
   a. AASHTO M182 Burlap Cloth Made from Jute or Kenaf

2. American Concrete Institute (ACI):
   a. ACI 117 Standard Tolerances for Concrete Construction and Materials
   b. ACI 301 Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.
   c. ACI 302 Recommended Practice for Concrete Floor and Slab Construction
   d. ACI 302.1R Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004.
   e. ACI 503.4 Standard Specification for Repairing Concrete with Epoxy Mortars

   a. ASTM C33 Specification for Concrete Aggregates
   b. ASTM C150 Specification for Portland Cement Type II, Low Alkali
   c. ASTM C171 Specifications for Sheet Materials for Curing Concrete
   d. ASTM C309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete
   e. ASTM C881 Specification for Epoxy-Resin-Base Bonding Systems for Concrete
   g. ASTM D2244 Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

4. WSDOT Standard Specification for Pigmented and Clear Sealer/Densifiers
1.03  SUBMITTALS

A.  Procedures: Section 01 33 00, Submittal Procedures.

B.  Product Data - MCM Sheets: Manufacturer’s data sheets on each product to be used, including thickness, physical characteristics, and finish, and:
   1.  Finish manufacturer’s data sheet showing physical and performance characteristics.
   2.  Storage and handling requirements and recommendations.
   3.  Installation/application instructions and recommendations.
   4.  Specimen warranty for finish, as specified herein.

C.  Shop Drawings or diagrams to scale, which indicate the location in plan and elevation of all concrete finishes.
   1.  Indicate substrates and adjacent work with which the finish applications must be coordinated.
   2.  At all CIP-2 work, submit Shop Drawings indicating elevation layout of all visible wall form tie locations with spacing between form ties noted.

D.  Installer’s Qualifications for concrete installers and finishers.

E.  Certificate that the work results of this section meet or exceed specified requirements.

F.  Samples: 1/2-pint sample container of aluminum oxide and silicon carbide abrasive grit for review and acceptance where non-slip finish is indicated on Contract Drawings or specified.

   1.  A one-quart wet sample, a draw down color sample and spectrophotometer or colorimeter readings, taken in accordance with ASTM D2244, for each batch. The calculated Delta E shall not exceed 1.0 deviation from the CIELAB analysis for each pigmented sealer color.
   2.  The one-quart wet sample shall be submitted in the manufacturer's labeled container with product number, batch number and size of batch. The companion draw down color sample shall be labeled with the product number, batch number and size of batch. Submit the specified samples and readings to the Resident Engineer at least 14 calendar days prior to the scheduled application of the sealer.
   3.  Do not begin applying pigmented or clear sealer/densifier until receiving the Resident Engineer’s written approval of the pigmented sealer color samples.
   4.  Submit four copies of the manufacturer’s written installation instructions.
1.04 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 302.1R.
   1. Maintain one copy of each reference on project site.

B. Installer Qualifications: Companies specializing in performing work of the type specified in this section with at least five years of documented experience.

C. Mock-Ups: Provide the following mock-ups for evaluation of fabrication, installation method and workmanship:
   1. Locate mock-ups for each CIP finish type indicated below as directed by Resident Engineer.
   2. Provide mock-ups in sizes indicated below.
   3. Mock-ups shall demonstrate installation methods to be employed.
   4. In place mock-ups that are approved by Resident Engineer may remain as part of the Work.
   5. Mock-ups that are not approved shall be completely removed from site by Contractor.

D. Provide Mock-ups for each of the following Concrete Finishes. Mock-ups shall include typical clear or colored concrete sealer/densifiers, abrasive aggregate slip-resistant treatment or other finish or applied treatment as typical or as specified for each one.
   1. Exterior Cast-in-Place Concrete upstands at CMU, Stone, or Metal Panels; minimum of 10 lineal feet.
   2. Exterior CIP flatwork: min. 50 sq ft area.
   3. Interior CIP floors in public area at surface level: min. 50 sq. ft. area.
   4. Typical exposed concrete free standing round columns at N140 and in-wall columns at N150 at platform level: one sacrificial column mock-up 8 ft high
   5. Interior back-of-house CIP walls exposed to view: min. 50 sq. ft. area.
   6. Interior back-of-house CIP floors not receiving finishes other than sealer: min. 50 sq. ft. area.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Concrete Floor Finishing and Sealing Product Manufacturers:
   1. Dayton Superior Corporation; CIP-S1 penetrating sealer densifier; and CIP-S3 film forming sealer, www.daytonsuperior.com.
   3. BASF Construction Chemicals, Inc; CIP-S1 penetrating sealer densifier; and CIP-S3 film forming sealer, www.chemrex.com.

2.02 BASIS-OF-DESIGN PRODUCTS

A. CIP-S1: Dayton Superior, Sure Hard Densifier J17.
C. CIP-S3: Dayton Superior, AggreGloss Satin J25S.

2.03 MATERIALS:

A. Chemical Compounds – Hardeners, Sealers and Slip-Resistant Treatments

<table>
<thead>
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<th>FINISH TREATMENT</th>
<th>FINISH TREATMENT DISCRIPTION</th>
<th>FINISH TREATMENT INFORMATION</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
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<td>CIP-S1</td>
<td>Clear sealer/densifier.</td>
<td>Water based penetrating hardener, dustproofer, and sealer.</td>
<td></td>
</tr>
<tr>
<td>CIP-S2</td>
<td>Clear curing sealer.</td>
<td>U-V resistant and non-yellowing curing compound conforming to ASTM C309 and C1315, Type 1-D, ClassA.</td>
<td></td>
</tr>
<tr>
<td>CIP-S3</td>
<td>Clear sealer.</td>
<td>Film forming, non-yellowing, low gloss, solvent based sealer.</td>
<td></td>
</tr>
<tr>
<td>Slip-Resistant Treatment</td>
<td>Abrasive Aggregate</td>
<td>95 percent minimum fused homogeneous aluminum oxide</td>
<td></td>
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</tbody>
</table>
B. Finishes and Sealers: Provide Concrete Finish Materials, Treatments and Product Types as described in table below:

<table>
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<tr>
<th>CONCRETE FINISH</th>
<th>BASIS-OF-DESIGN PRODUCT TO ACHIEVE REQUIRED FINISH</th>
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<tr>
<td>CIP-1</td>
<td>Plywood or MDO formwork allowed with specified limits on honeycomb or other allowable blemishes.</td>
<td>Formed finish to receive either water and graffiti coating per Section 07 19 10, or paint as indicated in Section 09 06 00, Schedules for Finishes.</td>
<td>Maximum allowable size of un-filled air holes, blemishes or pockets is 1/8-inch.</td>
</tr>
<tr>
<td>CIP-2</td>
<td>Prefabricated tempered concrete form-grade hardboard, steel, or glass fiber forms for smooth form finish.</td>
<td>Smooth finish. Clear sealed at interior surfaces and at exterior surfaces. Wall tie locations to be approved. Provide water and graffiti coating per Section 07 19 10.</td>
<td>Fiberglass or steel forms, basic CIP concrete with forms stripped and major “fins” knocked off flush to surface. Maximum allowable size of un-filled air holes, blemishes or pockets is 3/16-inch.</td>
</tr>
<tr>
<td>CIP-3</td>
<td>Fluted acoustic concrete.</td>
<td>Formed finish with 4 1/2” deep metal decking formliner.</td>
<td></td>
</tr>
<tr>
<td>CIP-4</td>
<td>Steel Troweled</td>
<td>Smooth finish with Light sandblast</td>
<td></td>
</tr>
<tr>
<td>CIP-5</td>
<td>Steel Troweled</td>
<td>Smooth finish with Light sandblast</td>
<td>TBD</td>
</tr>
<tr>
<td>PS-1</td>
<td>Steel-formed precast treads and risers.</td>
<td>Smooth finish with integral Davis Colors “Graphite” color add-mixture in concrete mix. Clear CIP-S3.</td>
<td>Provide fine aggregate and sandblasted texture - See requirements of Section 03 45 00, Precast Architectural Concrete. Conform to ACI 301 “nonslip finish” on tread surfaces.</td>
</tr>
</tbody>
</table>

C. Repair and Finishing Materials

1. Portland Cement: ASTM C150, Type II, of same brand as used in the work. Furnish white Portland Cement where required to produce color matching color of surrounding concrete.

2. For Bonding Grout: ASTM C33 washed clean sand passing a Number 30 sieve.
3. For Patching Mortar: ASTM C33 washed clean, graded fine aggregate of suitable size for areas to be repaired. Clean coarse aggregate up to Size Number 8 may be added for repair of larger pockets and voids.

4. Commercial Patching Mortar: Latex-modified Portland Cement mortar may be furnished if appropriate for the use.

5. Epoxy Patching Mortar: As specified in ACI 503.4 for Epoxy Mortar.

6. Epoxy Adhesive: ASTM C881, Type II or Type V, epoxy-based bonding agent.

7. Anti-Slip Abrasive Grit: Virgin grain Aluminum Oxide or Silicon Carbide particles.

D. Curing Materials

1. Damp Curing Materials:
   a. Waterproof Sheet Materials: ASTM C171, waterproof paper with white paper face, polyethylene film pigmented white, or white burlap-polyethylene sheeting.
   b. Burlap: AASHTO M182, of class or weight suitable for the use and location. Do not use burlap where concrete is exposed to direct sunlight.

2. Curing Compound: ASTM C309, liquid membrane-forming curing compound, Type 1 for concrete not exposed to sunlight, and Type 1-D with white fugitive dye for concrete exposed to sunlight, Class A or B as appropriate for the use or location.

3. Where concrete surfaces will receive architectural finishes, such as clear penetrating sealer/densifier, resilient floor coverings or paint, ensure membrane-forming curing compound does not leave a coating or residue that will impair application or bond of sealers, adhesives, paints, and coatings with concrete.

2.04 EQUIPMENT

A. Furnish all materials, tools, equipment, facilities, and services as required for performing the required concrete-finishing work.

PART 3 - EXECUTION

3.01 FINISHES

A. Exposed Concrete Surfaces General: Unless indicated or specified otherwise, provide the following finishes and treatments for concrete in the completed structure:

1. Smooth Form Finish: Conform to ACI 301 smooth form finish.
2. Smooth Rubbed Finish: Conform to ACI 301 smooth rubbed finish.
4. Unspecified Finish: When finish is not indicated or specified, provide smooth form finish as specified above.
5. Abrasive Aggregate Slip-Resistant Finish: Apply at locations indicated or where interior or exterior surface slope of concrete exceeds 5 percent. Comply with
manufacturer’s published instructions and recommendations for broadcasted application.

B. Unexposed Formed Concrete Surfaces:

1. For concrete not exposed to view in the completed structure provide any form finish as specified in ACI 301 for rough form finish. Any concrete not directly covered by a separate finish material (not including paint or high-performance coatings) shall be considered exposed to view.

C. Concrete Slab and Flatwork Finishing:

1. Placement and Finishing Standards: Comply with the applicable requirements of ACI 301.

2. Slab Finishes: Unless indicated or specified otherwise, provide the following finishes as indicated:

   a. Scratched Finish: Conform to ACI 301 scratched finish. Provide scratched finish for slab substrates to receive cementitious toppings or finishes, such as terrazzo or mortar underbed for ceramic tile.

   b. Floated Finish: Conform to ACI 301 floated finish. Provide floated finish for slabs and flatwork to receive membrane elastomeric bearing pads, roofing and waterproofing.

   c. Troweled Finish: Conform to ACI 301 troweled finish, and applicable requirements of ACI 302.1R. Provide troweled finish for interior slabs and flatwork to be exposed in the completed structure and for slabs to receive resilient floor coverings.

   d. Broom Finish: Conform to ACI 301 "broom or belt finish" on all slabs and on all slabs scheduled and/or detailed to receive tiling in accordance with Section 09 30 00, Tiling.

      1) Provide fine or medium-course Broom Finish at walkways and other surfaces indicated, as approved by Resident Engineer.

      2) Exact texture and coarseness of the broom finish shall match approved texture and coarseness samples submitted by the Contractor site mock-up required in accordance with Article 1.04D.9, herein above.

   e. Nonslip Finish: Conform to ACI 301 "nonslip finish." Provide aluminum oxide and silicone carbide grit particles. Provide "nonslip finish" for, stair treads and landings at public stairs and ramps and other floor areas where indicated. See for Precast Stair finishes.

   f. Unspecified Finish: When finish is not indicated or specified, provide finishes as specified in ACI 301.

3.02 CURING

A. Provide materials specified in Article 2.02D, herein above, and install in accordance with manufacturer’s recommendations, except use a curing period duration of at least 14 days.

B. Do not cure concrete with earth, sand, sawdust, straw, or hay.
3.03 APPLICATION OF CIP-S1 PENETRATING CLEAR CONCRETE SEALER/DENSIFIER

A. Apply penetrating concrete sealer/densifier at exposed surfaces of concrete structures outside of station area, typical unless noted or scheduled otherwise. Comply with manufacturer’s published instructions and recommendations.

B. Apply penetrating clear concrete sealer/densifier at exposed surfaces of concrete slabs and curbs within station area, typical unless noted otherwise.

C. All surfaces to receive penetrating clear sealer/densifier shall receive a Class 2 finish or better, and shall receive a light brush sandblasting in order that complete neutralization of the surface and subsequent penetration of the pigmented sealer is achieved. All curing agents and form release agents shall be removed. The surface shall be dry and clean and prepared in accordance with manufacturer’s written instructions.

D. The penetrating pigmented or clear sealer/densifier shall be spray-applied in accordance with the manufacturer’s written instructions for application, air temperature required for sealer application and curing, qualification of applicator, rate of application, and number of coats to apply. Sealer shall not be applied until the concrete has cured for at least 28 days.

E. Penetrating pigmented or clear sealer/densifier shall not be applied upon damp surfaces, nor shall it be applied when the air is misty, or otherwise unsatisfactory for the work, in the opinion of the manufacturer or the Resident Engineer. The final appearance shall have an even and uniform color acceptable to the Resident Engineer.

F. For concrete surfaces such as columns, retaining walls and abutments, the penetrating pigmented or clear sealer/densifier shall extend to 1 foot below the finish sidewalk or ground line, unless otherwise shown in the Contract Drawings.

3.04 SLIP-RESISTIVE TREATMENTS APPLICATION

A. Install in field in conformance with Manufacturer’s recommendations.

3.05 REPAIR/RESTORATION

A. Repair Standards: Conform to the applicable requirements of ACI 301. When using epoxy mortar, conform to applicable requirements of ACI 503.4.

B. Repair Work:

1. Remove honeycombed and other defective concrete down to sound concrete. Saw-cut the edges perpendicular to the surface or slightly undercut. Feathered edges will not be permitted. Dampen the area to be patched and an area at least 6 inches wide surrounding it to prevent absorption of water from the patching mortar.

2. Bond patching mortar to concrete with bonding grout or epoxy adhesive. For bonding grout, include 1 part portland cement to 1 part Number 30 mesh sand, mixed to the consistency of a thick cream. Brush well onto the concrete.
3. Make the patching mortar of the same materials and of approximately the same proportions as used for the concrete, except omit the coarse aggregate. Use not more than 1 part Portland Cement to 2-1/2 parts sand by damp loose volume, and substitute white Portland cement for a portion of the regular gray Portland Cement to produce patching mix matching the surrounding concrete in color when dry. Determine the proportion of white Portland Cement by trial mixes and test areas, prior to repair of actual defective areas.

3.06 FIELD QUALITY CONTROL

A. Tolerances

1. An Independent Testing Laboratory employed by Sound Transit, as specified in Section 01 45 00, Quality Assurance/Quality Control, will inspect finished slabs for flatness.

2. Measure flatness of slabs in accordance with ACI 302.1R and to achieve the following tolerances:
   a. Maximum Variation of Surface Flatness For Exposed Concrete Floors: 1/8 inch in 10 feet.
   b. Maximum Variation of Surface Flatness Under Resilient Flooring: 1/4 inch in 10 feet.

3. Finish concrete to achieve the following tolerances:

4. Correct the slab surface if tolerances are less than specified.

5. Correct defects by grinding or by removal and replacement of the defective work as directed by the Resident Engineer. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

B. Finishes: Conform to applicable requirements of ACI 301.

1. Remediation:
   a. Cast slabs that fail to meet specified flatness tolerances shall be remediated with use of cast concrete underlayment materials as specified in Section 03 54 00, Cast Underlayment. Slabs shall be prepared for work of that Section as specified therein.

2. Acid etching shall not be employed at any slabs.

3. Protect exposed concrete surfaces, including flatwork, as required to prevent damage form construction work in progress, impacts or stains.
### APPLICATIONS SCHEDULE

<table>
<thead>
<tr>
<th>CONCRETE FINISH</th>
<th>DESCRIPTION</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N140</td>
</tr>
<tr>
<td>CIP-1</td>
<td>Sealed or painted standard plywood or MDO formwork finish</td>
<td>X</td>
</tr>
<tr>
<td>CIP-2</td>
<td>Clear sealed smooth fiberglass or steel formwork finish</td>
<td>X</td>
</tr>
<tr>
<td>CIP-3</td>
<td>Fluted metal formliner finish.</td>
<td></td>
</tr>
<tr>
<td>CIP-4</td>
<td>Clear sealer</td>
<td>X</td>
</tr>
<tr>
<td>CIP-5</td>
<td>Clear sealer</td>
<td>X</td>
</tr>
</tbody>
</table>

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Delegated engineering design of precast architectural concrete work.
   2. Precast, removable infill slabs.
   3. Architectural precast concrete wall panels (PC-1). Not used for N140.
   4. Precast concrete stair treads and landings for Public Stairs # 5 thru #10 (PS-1) N150. #5 thru #6 N140
      a. Two-piece metal nosing with removal abrasive inserts in each tread and at top landing.
   5. Supports, anchors, attachments, and other items cast into precast concrete units.
   6. Grouting under and between units.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 03 20 00, Concrete Reinforcing.
   2. Section 03 45 00, Concrete Finishing
   4. Section 07 92 00, Joint Sealants.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

B. American Concrete Institute (ACI)
   1. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International
   2. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International.

C. American Society for Testing and Materials International (ASTM)


D. American Welding Society (AWS)
   1. AWS D1.1/D1.1M - Structural Welding Code - Steel.
   2. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel.

E. Precast/Prestressed Concrete Institute (PCI)
   1. PCI MNL-117 - Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.
   2. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete
   3. PCI MNL-122 - Architectural Precast Concrete.
   4. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete.
   5. PCI MNL-135 - Tolerance Manual for Precast and Prestressed Concrete Construction.

1.03 DESIGN REQUIREMENTS

A. Design units to withstand design loads and erection forces. Calculate structural properties of units in accordance with ACI 318.

B. Design units to withstand static loads and anticipated dynamic loading, including positive and negative wind loads and thermal movement loads.

C. Design and size components to withstand seismic loads and sway displacement as calculated in accordance with code.

D. Design units to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

1.04 SUBMITTALS

A. See Section 01 33 00, Submittal Procedures, for submittal procedures.
B. Product Data: Manufacturer's information on accessory products, including pigments, admixtures, inserts and plates.

C. Shop Drawings: Indicate layout, dimensions, and cross sections, unit locations, configuration, unit identification marks, reinforcement, connection details, support items, location of lifting devices, dimensions, openings, and relationship to adjacent materials. Provide erection drawings.

1. Include details of mix designs.
2. Include structural design calculations.
3. Include sequencing of erection, procedures, tolerances, and other items necessary for fabrication.
4. Show welded connections using AWS standard symbols.

D. Provide details of all connections, joints, accessories, cast inserts, and openings.

E. Provide complete design calculations, including loads imposed on structure, prepared by a qualified professional engineer.

F. Samples:

1. Submit two concrete cast samples, 12 by 24 inches in minimum size, illustrating surface finish and texture. Sample to be kept on site for reference and quality control standard.
2. Submit 6-inch long samples of each type and finish of abrasive metal nosing.

G. Fabricator qualifications.

H. Maintenance Data: Indicate surface cleaning instructions.

1.05 QUALITY ASSURANCE

A. Perform the work of this Section in accordance with PCI MNL-117, PCI MNL-120, PCI MNL-122, PCI MNL-123, PCI MNL-135, ACI 318, and CRSI Manual of Standard Practice. Perform welding in accordance with AWS D1.1.

1. Maintain one copy of each document on site.

B. Fabricator Qualifications:

1. Firm having at least two years of documented experience in production of precast concrete of the type required.
2. Plant certified under Precast/Prestressed Concrete Institute Plant Certification Program; product group and category A1 - Architectural Precast Concrete.


D. Welder: Certified within previous 12 months in accordance with AWS D1.1 and AWS D1.4.
1.06 MOCK-UP
A. Provide full size mock-up of each type of unit specified in this Section, with lifting device, and attachment points, and finish in accordance with approved sample.

B. Mock-up may remain as part of the Work, if approved.

1.07 PRE-INSTALLATION MEETING
A. Convene one week prior to commencing work of this Section.

1.08 PROJECT CONDITIONS
A. Field Measurements: Check actual locations of walls, slabs, framing, and other construction to which work of this Section must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication, delivery and installation schedule with construction progress to avoid delay of work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction with work of other trades to ensure that actual dimensions correspond to guaranteed dimensions. Allow for fitting and trimming.

1.09 DELIVERY, STORAGE, AND PROTECTION
A. Deliver precast units to project site in such quantities and at such times to ensure continuity of installation.

B. Handling: Lift and support precast units only from designated support points.

C. Blocking and Lateral Support During Transport and Storage: Use materials that are clean, non-staining, and non-harmful to exposed surfaces. Provide temporary lateral support to prevent bowing and warping, and cracking.

D. Protect units to prevent staining, chipping, or spalling of concrete.

E. Mark units with date of production in location that will be concealed after installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Architectural Precast Concrete:

1. Any manufacturer holding a PCI Group A Plant Certification for the types of products specified; see wwwpci.org.

B. Metal Nosings:

1. American Safety Tread Co., Inc.


3. Balco, Inc.
2.02 FORMWORK
A. Provide forms and, where required, form-facing materials of metal, plastic, wood, or other acceptable material that is nonreactive with concrete and will produce required finish surfaces.
B. Unless forms for plant-manufactured prestressed concrete units are stripped prior to detensioning, design forms so that stresses are not induced in precast units due to deformation of concrete under prestress or to movement during detensioning.

2.03 REINFORCEMENT
A. Comply with requirements of Section 03 20 00, Concrete Reinforcing.

2.04 PRESTRESSING TENDONS Not used for N140.
A. Uncoated, 7-wire stress-relieved strand complying with ASTM A 416. Use Grade 250 unless noted otherwise.

2.05 CONCRETE MATERIALS
A. Cement: ASTM C 150, Type II, Low-Alkali or Type III High Early Strength. Portland type.
C. Surface Finish Aggregate: Clean, washed natural gravel; size as approved, color as approved, from single source throughout conforming to ASTM C 33.
D. Water: Clean and not detrimental to concrete.
E. Admixtures: Air entrainment as specified in Section 03 30 00, Cast-in-Place Concrete.
F. Water reducing, retarding, or accelerating agents: ASTM C 494, type as selected by fabricator, not containing more than 0.1 percent chloride ions.
G. Grout:
   1. Non-shrink, non-metallic, non-corrosive, non-staining, minimum 10,000 psi, 28 day strength, when tested in accordance with CRD C-621, colored to match precast units

2.06 FORM LINERS Not used for N140.
A. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

2.07 SUPPORT DEVICES
A. Connecting and Support Devices: ASTM A 36/A 36M steel; hot-dip galvanized in accordance with ASTM A153/A 153M or Stainless Steel AISI Type A316
B. Bolts, Nuts, and Washers: ASTM A 325 (A 325M) heavy hex structural bolts, Type 1, plain, with matching ASTM A 563 (A 563M) nuts, and washers as follows:
2. Compressible Direct Tension Indicators: ASTM F 959, Type 325.

C. Primer: Zinc rich type.

2.08 ACCESSORIES

A. Bearing Pads: One of the following types, as recommended by precast fabricator for application:

1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, Type A durometer hardness of 50 to 70, ASTM D 2240, minimum tensile strength 2250 psi, ASTM D 412.

2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Type A durometer hardness of 70 to 90, ASTM D 2240; capable of supporting a compressive stress of 3000 psi with no cracking, splitting, or delaminating in the internal portions of pad. Test one specimen for every 200 pads used in Project.

3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer; Type A durometer hardness of 80 to 100, ASTM D 2240; complying with AASHTO's "AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications, Division II, Section 18.10.2, or with MIL-C-882E.

4. Frictionless Pads: Tetrafluoroethylene (Teflon), glass-fiber reinforced, bonded to stainless or mild-steel plate, of type required for in-service stress.


B. Shims for Tread/Riser Units: High density plastic concrete grey color.

C. Sealant: Type specified in Section 07 92 00, Joint Sealers.

2.09 MIX

A. Prepare design mixtures for each type of precast concrete required.

B. Design mixtures may be prepared by a qualified Independent Testing Laboratory or by qualified precast plant personnel at architectural precast concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.

D. Normal-Weight Concrete Mixtures: Proportion full-depth mixture by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 days): 5000 psi minimum.

2. Maximum Water-Cementitious Materials Ratio: 0.45.

E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.

F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.
G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.10 METAL NOSINGS
A. Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.
   1. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above aluminum extrusion.
   2. Nosings: Two-piece units, 3 inches wide, with subchannel for casting into concrete steps and replaceable abrasive filler.
   3. Aluminum finish: Mill.
   4. Abrasive color: Black.
B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
C. Apply clear lacquer to concealed surfaces of extruded units.

2.11 FABRICATION
A. Fabricate in conformance with PCI MNL-117 and PCI MNL-135.
B. Forms: Accurately construct forms mortar tight and of sufficient strength to withstand pressures due to concrete placing operations, temperature changes, and, when prestressed, pretensioning and detensioning operations. Maintain form work to provide completed precast concrete units of shapes, lines, and dimensions indicated, within specified fabrication tolerances.
C. Use rigid molds, constructed to maintain precast unit uniform in shape, size, and finish.
D. Use form liners in accordance with manufacturer's instructions.
E. Fabricate connecting devices, plates, angles, items fit to steel framing members, inserts, bolts, and accessories. Fabricate to permit initial placement and final attachment.
F. Embed reinforcing steel, anchors, inserts plates, angles, and other cast-in items required for securing units to supporting and adjacent members.
G. Embed receivers for nosings of stair tread units.
H. Locate hoisting devices to permit removal after erection.
I. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
J. Fabricate units straight, smooth, and true to size and shape, with exposed edges and corners precise and square unless otherwise indicated.
K. Cast-in items:
1. Provide reglets, slots, holes, and other accessories in units to receive windows, cramps, dowels, reglets, waterstops, flashings, and other similar work as indicated.

L. Minor patching in plant is acceptable, providing structural adequacy and appearance of units is not impaired.

2.12 FINISH - PRECAST UNITS

A. Panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved sample panels and as follows: Not used for N150 and N140.

1. As-Cast Surface Finish: Provide surfaces free of pockets, sand streaks, and honeycombs. Use light abrasive blast to remove surface sheen without exposing course aggregate. Not used for N150 and N140.

B. Precast Stair Units: Finish tread surface with trowel and medium broom finish. Finish exposed riser with smooth form finish or trowel finish.

C. Finish other exposed surfaces of architectural precast concrete units by smooth, steel-trowel finish.

D. Finish unexposed surfaces of architectural precast concrete units by float finish.

2.13 FABRICATION TOLERANCES

A. Conform to PCI MNL-117 and PCI MNL-135, except as specifically amended below.

1. 10 feet or less: plus or minus 1/8 inch.
2. 10 to 20 feet: plus 1/8 inch, minus 3/16 inch.
3. Angular deviation of plane of side mold: 1/32 inch per 3 inches depth, or 1/16 inch total.
4. Openings: plus or minus 1/8 inch.
5. Out of square: 1/8 inch per 6 feet.
6. Thickness: Minus 1/8 inch, Plus 1/4 inch.
7. Other dimensions: 1/16 inch
9. Maximum Variation from Square or Designated Skew: Plus or minus 1/8 inch in 10 feet.
10. Maximum Variation from Thickness: Plus or minus 1/8 in.
11. Maximum Misalignment of Anchors, Inserts, Openings: Plus or minus 1/8 inch.
12. Maximum Bowing of Members: Plus or minus length/360.
2.14 SOURCE QUALITY CONTROL AND TESTS

A. Concrete Sampling and Testing:

1. Sampling Method: Take representative samples in compliance with ATSM C172. Collect samples from different batches of concrete on a random basis. Place no more than 1/2 cubic yard before slump, temperature, and air content tests demonstrate concrete is within acceptable limits.

2. Sampling Frequency:
   a. Obtain at least one composite sample for each 100 cubic yards, or fraction thereof, of each concrete mixture placed in any one day.

3. Tests Per Sample: Perform the following tests on each sample:
   a. Slump: ASTM C143.
   b. Air content: ASTM C231.
   d. Compressive Strength:
      1) Make a minimum of three specimens from each sample. When additional sets of specimens are required beyond the normal seven and 28-day tests, include a minimum of two specimens in each set.
      2) Make and cure specimens in compliance with ASTM C31. Record all deviations from the ASTM requirements in the test report.
      3) Test specimens in compliance with ASTM C39. From each set of specimens cast, test one specimen at 7 days for information and two specimens at 28 days for acceptance, unless otherwise specified.

B. Evaluation and Acceptance of Tests:

1. Acceptance of Concrete:
   a. Compressive strength tests will be considered acceptable if the averages of all specimens of three consecutive strength test results are equal to or exceed the specified 28-day compressive strength, and no individual strength test result is more than 300 pounds per square inch below the specified 28-day compressive strength.
   b. If one specimen in a sample shows evidence of improper sampling, molding, or testing, discard the specimen and consider the strength of the remaining cylinder to be the test result.
   c. If both specimens in a sample show evidence of improper sampling, molding, or testing discard both specimens. Determine acceptance of concrete using test cores. The Resident Engineer may waive this requirement for large pours.
PART 3 - EXECUTION

3.01 EXAMINATION
   A. Verify that building structure, anchors, devices, and openings are ready to receive work of this Section.

3.02 PREPARATION
   A. Provide for erection procedures and induced loads during erection. Maintain temporary bracing in place until final support is provided.

3.03 ERECTION
   A. Deliver anchorage items to be embedded in other construction before start of such work. Provide setting diagrams
   B. Erect units without damage to shape or finish. Replace or repair damaged panels.
   C. Erect units level, plumb, and in alignment within allowable tolerances specified below. Provide temporary supports and bracing as required to maintain position, stability, and alignment as members are being permanently connected.
   D. Align and maintain uniform horizontal and vertical joints as erection progresses.
   E. When units require adjustment beyond design or tolerance criteria, discontinue affected work; advise Resident Engineer.
   F. Fasten units in place with mechanical connections, or weld, as indicated in shop drawings. At welded connections, chip of slag, and touch up with primer.
   G. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers. Pack grout to base of unit. Pack grout between units, tool with standard masonry
   I. Exposed Joint Dimension: 1/2 inch.
   J. Seal perimeter and intermediate joints in accordance with Section 07 92 00, Joint Sealants.

3.04 ERECTION TOLERANCES
   A. Erect members level and plumb within allowable tolerances. Conform to PCI MNL-135, except as specifically amended below.
      1. Bowing: not to exceed 1/360, with a maximum of 3/4 inch over 30 feet.
      2. Warpage: not to exceed 1/16 inch per foot. 1/8 inch maximum.
      3. Joint widths: plus or minus 3/16 inch total. 1/40 inch per foot taper.
5. Edge alignment: 1/8 inch.
6. Plumb: Plus or minus 1/4 inch in 40 feet.
7. Level: Plus or minus 1/4 inch in 40 feet.
10. Maximum Plumb Variation over Height of Structure or 100 ft (whichever is less): Plus or minus 1/2 inch.

3.05 ADJUSTING
A. Adjust units so that joint dimensions are within tolerances.

3.06 REPAIRS
A. Repair architectural precast concrete units if permitted by Resident Engineer. The Resident Engineer reserves the right to reject repaired units that do not comply with requirements.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

C. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

D. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.07 CLEANING
A. Clean surfaces of precast concrete units exposed to view.

B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator’s recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.

2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.
3.08 PROTECTION OF FINISHED WORK

A. Provide non-combustible shields during welding operations.

END OF SECTION
SECTION 03 54 00
CAST UNDERLAYMENT

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:

1. Hydraulic, liquid-applied, cementitious-based, self-leveling or trowelable floor underlayments; applied where indicated or scheduled.

2. Hydraulic, liquid-applied, cementitious-based, self-leveling or trowelable floor underlayments; to be provided as remedially-required to bring cast-in-place or post-tensioned concrete slab surfaces into specified levelness or flatness tolerances; or for patching other concrete surfaces as required.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 01 66 00, Product Storage and Handling Requirements.

2. Section 03 30 00, Cast-in-Place Concrete: Substrate for work of this Section.

3. Section 03 35 00, Concrete Finishing: Hydraulic and Self-Leveling Underlayment as potentially required to meet flatness specifications.

1.02 REFERENCES

A. This Section incorporates by reference the following documents.

1. American Society for Testing and Materials International (ASTM)


1.03 SUBMITTALS

A. Procedures: See Section 01 33 00, Submittal Procedures.

B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation.
C. Manufacturer’s Instructions: Indicate mix instructions.

D. Certificate: Certify that products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years of experience.

B. Mock-Ups

1. Provide mock-ups for evaluation of surface preparation techniques and application workmanship.
   a. Provide one mock-up of each type of underlayment to be installed, as indicated on the Contract Drawings, and/or as required for remediation.
   b. Prepare mock-ups in locations approved by Resident Engineer.
   c. Minimum Mock-up Area: 6 feet by 6 feet.
   d. Do not proceed with underlayment work until workmanship of each mock-up has been approved by Resident Engineer.

2. Construct mock-up of each underlayment material to be employed, illustrating product levelness and finished surface characteristics.

3. Mock-ups to include both self-leveling and trowelable products for all concrete substrate conditions.

4. Mock-ups may remain as part of the Work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer’s unopened packaging until ready for installation.

B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.06 PROJECT CONDITIONS

A. Environmental Requirements

1. Do not install underlayments until floor penetrations and peripheral work are complete.

2. Maintain minimum ambient temperatures of 50 degrees F, 24 hours before, during and 72 hours after installation of underlayment.

3. Refer to manufacturer’s printed instructions for installation requirements.

4. During the curing process, ventilate spaces to remove excess moisture.
PART 2 - PRODUCTS

2.01 MATERIALS

A. Pourable, Fast-Setting, Self-Leveling Cementitious-based Underlayment Systems for Concrete Floors:


3. Mapei Corporation; Product "UltraPlan 1" or "UltraPlan M20" (as appropriate for the conditions); www.mapei.com; 800-426-2747.


5. Substitutions: See Section 01 66 00, Product Storage and Handling Requirements.

B. Trowelable, Fast-Setting, Cementitious-based Underlayment System for Concrete Floors for Smoothing, Patching and Repairing Concrete:


2. Mapei Corporation; Product "Quickcem Top 102": www.mapei.com; 800-426-2734.


5. Substitutions: Section 01 25 00, Substitution Procedures.

C. Accessories: Furnish primers, patching compounds, and sand fillers as recommended by the underlayment manufacturer for the conditions of the project.

D. Cementitious Underlayment: Blended cement mix, which when mixed with water in accordance with manufacturer’s directions will produce self-leveling underlayment with the following properties:

1. Compressive Strength: Minimum 2000 pounds per square inch after 28 days, tested in accordance with ASTM C109/C109M.

2. Flexural Strength: Minimum 1000 pounds per square inch after 28 days, tested in accordance with ASTM C348.

3. Density: As standard with approved underlayment system.

4. Final Set Time: 1-1/2 to 2 hours, maximum.

5. Thickness: Feather edge to maximum 3-1/2 inch.

6. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.
E. Aggregate: Dry, well graded, washed silica aggregate, 1/8 inch sieve size and acceptable to underlayment manufacturer.

F. Reinforcement: Galvanized metal lath complying with recommendations of underlayment manufacturer for specific project circumstances.

G. Water: Potable and not detrimental to underlayment mix materials.

H. Primer: Manufacturer's recommended type.

I. Joint and Crack Filler: Latex or cement based filler, as recommended by manufacturer.

2.02 MIXES

A. Site mix materials in accordance with manufacturer's instructions.

B. Add aggregate for areas where thickness will exceed 1/2 inch. Mix underlayment and water for at least two minutes before adding aggregate, and continue mixing to assure that aggregate has been thoroughly coated.

C. Mix to self-leveling consistency without over-watering.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum by-products, or other compounds detrimental to underlayment material bond to substrate.

3.02 PREPARATION

A. Concrete: Mechanically prepare steel troweled concrete to create a textured surface necessary to achieve the best bond. Acceptable methods include bead blasting and scarifying. Do not use acid etching. See Section 03 35 00, Concrete Finishing.


C. Vacuum clean surfaces.

D. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

E. Close floor openings.

3.03 APPLICATION

A. Install underlayment in accordance with manufacturer's instructions.

B. Pump or pour material onto substrate. Do not re-temper or add water.
   1. Pump, move, and screed while the material is still highly flowable.
   2. Be careful not to create cold joints.
   3. Wear spiked shoes while working in the wet material to avoid leaving marks or irregularities.
C. Place to thickness indicated.

D. For final thickness over 1-1/2 inches, place underlayment in layers at least ½ inches thick. Allow initial layer to harden to the point where the material has lost its evaporative moisture. Immediately prime and begin application of the subsequent layer within 24 hours.

E. Place before metal-framed partition installation.

F. If a fine, feathered edge is required by detail or for remediation of levelness, steel trowel the edge after initial set, but before it is completely hard.

G. Application: Place underlayment at 1/2 inch minimum over plank or poured-in place-concrete or acoustical mat material (as indicated or specified). Spread and screed underlayment to a smooth surface. Except at authorized/designated joints, place underlayment as continuously as possible until application is complete so that no underlayment product slurry is placed against underlayment product that has obtained its initial set.

H. Drying: Contractor shall provide continuous ventilation and adequate heat to rapidly remove moisture from the material until the underlayment is dry. Contractor shall provide mechanical ventilation if necessary.

I. 5-7 days is usually adequate underlayment drying time. To test for dryness, tape a 24 inch by 24 inch section of plastic or high density rubber mat to the surface of the underlayment. After 48-72 hours, if no condensation occurs, the underlayment shall be considered dry. Perform dryness test 5-7 days after pour.

3.04 CONSTRUCTION

A. Curing
   1. Once underlayment starts to set, prohibit foot traffic until final set has been reached.
   2. Air cure in accordance with manufacturer's instructions.

B. Application Tolerance
   1. Top Surface: Level to 1/16 inch in 10 feet.

3.05 FIELD QUALITY CONTROL

A. Employ an independent testing laboratory to perform field inspection and testing, as specified in Section 01 45 00, Quality Assurance/Quality Control. Employ independent testing laboratory to inspect and test for conformance to Contract Specifications.

3.06 PROTECTION

A. Take any measures necessary to protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking. Cover with opaque visqueen sheet material or provide sun shading with opaque materials until cast underlayment is cured.

B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION
1.01 SUMMARY

A. This Section includes specifications for providing nonshrink grouts as follows:
   1. Furnishing, mixing, and placing nonshrink, nonmetallic, noncorrosive cementitious grout for structural columns, base plates, and equipment bases as indicated.
   2. Furnishing, mixing, and placing nonshrink, nonmetallic, noncorrosive epoxy grout for equipment bases subject to impact, vibration, or chemical attack.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 03 30 00, Cast-In-Place Concrete
   2. Section 03 35 00, Concrete Finishing

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.
   1. American Concrete Institute (ACI):
      a. ACI 503.2 Specification for Bonding Plastic Concrete to Hardened Concrete with a Multi-Component Epoxy Adhesive
      c. ASTM C579 Standard Test Method for Compressive Strength of Chemical Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
      d. ASTM C827 Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
      e. ASTM C881 Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
g. ASTM C1107 Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrinkable)

h. ASTM D149 Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies

i. ASTM D395 Standard Test Methods for Rubber Property—Compression Set


3. United States Army Corps of Engineers:
   a. CRD-C620 Standard Method of Sampling Fresh Grout
   b. CRD-C621 Corps of Engineers Specification for Nonshrink Grout

1.03 DEFINITIONS:

A. Nonshrink grout: A mortar or grout that does not shrink in the plastic state, is dimensionally stable in the hardened state, and bonds permanently to a clean baseplate and concrete substrate.

1.04 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Submit manufacturer’s product data and installation instructions.

C. Certification: Submit certificates of compliance or laboratory test reports that indicate the following:
   1. Materials used in the grout are free from metallic components and corrosion-producing elements.
   2. Materials meet specified shrinkage and compressive strength requirements.

1.05 PROJECT CONDITIONS:

A. Handle grout the same as concrete with regard to temperature and curing, as specified in Section 03 30 00, Cast-In-Place Concrete, Section 03 05 15, Portland Cement Concrete, and Section 03 35 00, Concrete Finishing.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cementitious Grout: Provide nonshrink, nonmetallic, noncorrosive cement-based grout conforming to the following requirements:
   2. Manufactured specifically for use in supporting heavy loads (loads in excess of 300 pounds per square foot (psf) concentrated load or 100 psf uniform load).
Grout: ASTM C1107, Grade A, B, or C, as appropriate for the condition or circumstance.

3. Expansion: 0.4 percent maximum at 3, 14, and 28 days. No displacement when tested in accordance with ASTM C157.

4. Shrinkage at 28 days: none (0.00 shrinkage when tested in accordance with ASTM C827).

5. Compressive strength, minimum:
   a. At one day: 1000 pounds per square inch (psi)
   b. At three days: 3000 psi
   c. At seven days: 5000 psi
   d. At 28 days: 8000 psi

6. Initial setting time, after addition of water: approximately one hour at 70 degrees F.

7. Provide nonsag trowelability or flowability as necessary for the particular application.

B. Water: Clean and potable, free of impurities detrimental to grout.

C. Epoxy Grout: Provide nonshrink, nonmetallic, noncorrosive epoxy grout conforming to the following requirements:

1. Manufactured specifically for use in supporting heavy loads.
2. Expansion: No displacement when tested in accordance with ASTM C827 and ASTM C157, modified procedures.
3. Shrinkage at 28 days: None (0.00 shrinkage when tested in accordance with ASTM C827 modified procedure using a specific gravity of indicator ball of approximately 1.0) with a minimum effective bearing area (EBA) of 95 percent.
4. Compressive strength, minimum: 10,000 psi at 7 days.
5. Initial setting time: Approximately one hour at 70 degrees F.
6. Provide flowable consistency as necessary for the particular application.
7. Epoxy grouts which are volatile and which give off noxious fumes are not acceptable.

D. Epoxy Adhesive: ASTM C881, Type V, epoxy-based bonding agent.

E. Elastomeric Grout:

1. Tensile Strength: ASTM D395
2. Dynamic Deflection: ASTM D5992
3. Dielectric Strength: ASTM D149
2.02 SOURCE QUALITY CONTROL

A. Inspections and Tests: Perform visual inspections, and shrinkage tests using an approved independent test laboratory, and strength tests as necessary to verify performance requirements of grout. Sample and test grout in conformance with applicable ASTM or CRD-620 requirements.

B. Perform expansion and shrinkage tests to meet requirements specified herein.

C. Strength Tests: Meet the compressive strength grout requirements specified herein.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prepare concrete surfaces to receive grout by chipping, sandblasting, water blasting, or other accepted methods to remove defective concrete, laitance, dirt, oil, grease, and other foreign matter to achieve sound, clean, and roughened concrete surfaces.

B. Cover concrete areas with protective waterproof covering until ready to place grout.

C. Remove foreign matter from steel surfaces to be in contact with grout. Clean contact steel surfaces as necessary by wire brushing and wiping dust clean.

D. Align and level components to be grouted, and maintain in final position until grout placement is complete and accepted.

E. Install forms for grout about the columns and other spaces to be grouted.

F. Remove protective waterproof covering and clean contaminated surfaces immediately before grouting.

G. Provide air-relief holes in large baseplates and in baseplates where underneath obstructions may cause air entrapment.

H. Saturate concrete surfaces with clean water, and remove excess water immediately before grouting.

I. Where necessary or appropriate for better bond, epoxy adhesive may be applied to clean, dry substrate surfaces in accordance with applicable requirements of ACI 503.2.

3.02 CONSTRUCTION

A. Mixing

1. Mix grout ingredients in accordance with the respective manufacturer's instructions and recommendations. Mix grout materials in proper mechanical mixers.

2. Mix grout as close to work area as possible.

B. Installation

1. Place grout in accordance with the manufacturer's published instructions. Pour grout from one side only until grout rises at least one inch above the plate on opposite side of said plate. Strapping and plunging or other recommended method may be used to force grout to flow under the entire area.
2. Neatly trowel edges of grout base, tapered at an angle of 60 degrees when measured from the horizontal, or as indicated.

3. Do not remove leveling shims for at least 48 hours after grout has been placed.

4. After shims have been removed, if used, fill voids with grout, packing the material with a suitable tool.

5. Do not use grout that has begun to set or if more than one hour has elapsed after initial mixing.

C. CURING

1. Cure cementitious grout the same as specified for concrete in Section 03 35 00, Concrete Finishing.

2. Cure epoxy grout as recommended by the grout manufacturer.

END OF SECTION
SECTION 03 64 23
EPOXY INJECTION GROUTING

PART 1 - GENERAL

1.01 SUMMARY
A. This Section includes specifications for repair of cracks in the existing secant pile diaphragm wall concrete by pressure injection of an epoxy resin adhesive. Identify cracks to be epoxy-injected in while the dewatering system is operational.

1.02 REFERENCES
A. This Section incorporates by reference the latest revisions of the following documents.
   1. American Society for Testing and Materials International (ASTM)
      e. Brookfield Engineering

1.03 SUBMITTALS
A. Procedures: Section 01 33 00, Submittal Procedures.
B. Product Data: Submit manufacturer's specifications and installation instructions for each item of proprietary material used to show compliance with these Specifications.
C. Data on proposed injection equipment.

1.04 QUALITY ASSURANCE
A. Applicator's Qualifications: Ensure epoxy injection is performed by a manufacturer certified applicator. Submit applicator's qualifications to the Resident Engineer at least 2 weeks before commencing of epoxy injection work.
B. Workers' Qualifications: Ensure workers engaged in the epoxy injection process have satisfactorily completed a program of instruction in the methods of restoring concrete structures utilizing the specific epoxy injection process indicated or submit evidence of sufficient work experience in utilizing the process. Submit qualifications of workers to the Resident Engineer for review two weeks before starting work.
1.05 DELIVERY STORAGE AND HANDLING

A. Store and handle manufactured materials in conformance with manufacturer’s published directions.

B. Provide and maintain one set of current Material Safety Data Sheets (MSDS) for each material being used on-site. Comply with MSDS requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Epoxy Adhesive: Two-component, low viscosity, moisture insensitive, structural epoxy adhesive capable of restoring the structural integrity of concrete by bonding the cracks. Provide hydrophilic resin formulations with variable viscosity to allow for full depth penetration in cracks having a width of 6 mils or greater.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Test Method</th>
<th>Min. Performance</th>
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</thead>
<tbody>
<tr>
<td>Minimum Tensile Strength</td>
<td>ASTM D638</td>
<td>6,000 pounds per square inch (psi)</td>
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<tr>
<td>Elongation at Break</td>
<td>ASTM D638</td>
<td>2.5 percent</td>
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<tr>
<td>Compressive Strength</td>
<td>ASTM D695</td>
<td>12,000 psi</td>
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<tr>
<td>Minimum Flexural Strength</td>
<td>ASTM D790</td>
<td>5,200 psi</td>
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<tr>
<td>Heat Deflection Temperature</td>
<td>ASTM D648</td>
<td>120 degrees F</td>
</tr>
<tr>
<td>Maximum Viscosity at 77 degrees F</td>
<td>Brookfield</td>
<td>700 cps</td>
</tr>
</tbody>
</table>

B. Surface Seal:

1. Material used to confine the epoxy adhesive in the cracks during injection and cure.

2. Has adequate strength to hold injection fittings firmly in place and to resist injection pressures adequately to prevent leakage during injection.

2.02 EQUIPMENT

A. Equipment used to meter and mix the two injection adhesive components, and inject the mixed adhesive into the cracks:

1. Portable positive displacement-type pumps with interlock to provide positive ratio control of exact proportions of the two components at the nozzle.

2. Electric or air-powered,

3. Provide in-line metering and mixing.

4. Discharge Pressure:

   a. Automatic pressure control

   b. Capable of discharging the mixed adhesive at any preset pressure up to 200 psi

   c. Equipped with a manual pressure control override.
5. Ratio Tolerance:
   a. Capability to maintain the volume ratio for the injection adhesive prescribed by the manufacturer of the adhesive within a tolerance of 2.5 percent by volume at all discharge pressures up to 200 pounds per square inch (psi).

6. Automatic Shut-Off Control: Be equipped with sensors on both Component A and Component B reservoirs that automatically stop the machine when only one component is being pumped to the mixing head.

PART 3 - EXECUTION

3.01 EXAMINATION
   A. The Resident Engineer will identify cracks to be injected.
   B. Inject all cracks identified by the Resident Engineer with epoxy resin.

3.02 PREPARATION
   A. Approval: Prior to preparation for injection work, mark cracks to be injected in color. Mark all cracks that exceed 6 mils in width that are not identified by the Resident Engineer with a different color.
   B. Surfaces: Clean surfaces adjacent to and within cracks to remove all dirt, dust, grease, oil, efflorescence, or other foreign matter and sealing materials detrimental to bond for the epoxy surface seal and epoxy adhesive injection materials, respectively. Do not use acids or corrosives for cleaning.
   C. Entry Ports: Provide entry ports along the crack at an interval not-to-exceed the minimum dimension of the member receiving epoxy injection. Set the entry ports in accordance with epoxy injection material manufacturer's recommendation. Drill the holes for the entry ports shall be drilled with a hollow bit with an attached vacuum chuck to prevent concrete dust from becoming embedded in the crack.
   D. Surface Seal: Apply surface seal material to the surface of the crack, and adjacent areas of application between the entry ports, as needed. Allow sufficient time for the surface seal material to gain adequate strength and attain a seal capable of withstanding the injection pressures.

3.03 INSTALLATION
   A. Injection:
      1. Space pressure grout ports depending on size and overall thickness of area containing cracks to be filled. Begin injecting of epoxy adhesive at lower entry port and continue until there is an appearance of epoxy adhesive at the next entry port adjacent to the entry port being pumped.
      2. When epoxy adhesive travel is indicated by appearance at the next adjacent port, discontinued injection on the entry port being pumped, seal the port, transfer epoxy injection to next adjacent port where epoxy adhesive has appeared.
3. Perform epoxy adhesive injection continuously until each crack is completely filled.

4. If port-to-port travel of epoxy adhesive is not indicated, immediately stop the work and notify the Resident Engineer.

5. If the ambient temperature or temperature of the epoxy approaches 85 degrees F, take precautions to prevent premature setting of epoxy while the injection is in progress.

6. On wide cracks where resin travels between ports rapidly, two or more ports may be pumped simultaneously. On exceptionally large cracks, use a formulation of epoxy resins and fine sands as approved by the Resident Engineer.

B. Finishing:

1. When the cracks are completely filled, allow the epoxy adhesive to cure in conformance with the manufacturer’s instructions and to allow the removal of the surface seal without draining or runback of the epoxy material from voids or cracks.

2. Grind the face of the crack flush with the adjacent concrete, and finish surface to show no indentations or protrusions caused by the placements of entry ports.

3.04 FIELD QUALITY CONTROL

A. Inspection

1. Pressure Test:

   a. Equipment:

      1) Consist of two independent valved nozzles capable of controlling flow rate and pressure by opening or closing the valve

      2) Contains a pressure gauge capable of sensing the pressure buildup behind each valve

   b. Procedure:

      1) Disconnect the mixing head of the injection equipment and attach the two-adhesive component delivery lines to the pressure check device

      2) Close the valves on the pressure check device

      3) Operated equipment until the gauge pressure on each line reads 160 pounds per square inch (psi).

      4) Stop the pumps and verify the gauge pressure does not drop below 150 psi within 2 minutes.

   c. Frequency of Pressure Test: For each injection unit Run test at the beginning and every 4 hours of use for every shift that the unit is used in the work of crack repair.

B. Ratio Test
1. Equipment:
   a. Consist of two independent valved nozzles capable of controlling back pressure by opening or closing the valve.
   b. Contains a pressure gauge capable of sensing the back pressure behind each valve.
   c. Supplied by the Contractor

2. Procedure:
   a. Disconnect the mixing head of the injection equipment pump the two-adhesive components simultaneously through the ratio check device
   b. Simultaneously discharged both adhesive components into separate calibrated containers.
   c. Adjust discharge pressure to 160 psi for both adhesive components
   d. Measure the amounts discharged into the calibrated containers simultaneously during the same period to determine that the volumes discharged conform to the manufacturer's recommended ratio for applicable material.

3. Frequency of Ratio Test: For each injection unit, run test at the beginning and every 4 hours of use for every shift that the unit is used in the work of crack repair.

C. Proof of Ratio and Pressure Test

1. At all times during the course of the work, keep complete and accurate records available to the Resident Engineer of the pressure and ratio tests specified above.

2. In addition, the Resident Engineer at any time without prior notification may request the Contractor to conduct the tests specified above in the presence of the Resident Engineer.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specification for:

1. Standard Smooth, and Colored Polished and Ground Face Concrete Unit Masonry
2. Liquid polymeric admixture added to Concrete Masonry Units at the time of manufacture
3. Mortar and Grout
4. Steel Reinforcement and Anchorage
5. Flashings
6. Accessories
7. Masonry Installation

B. Related Section: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 01 45 00, Quality Assurance/Quality Control
2. Section 03 20 00, Concrete Reinforcing
3. Section 05 50 00, Metal Fabrications: Loose steel lintels
4. Section 07 19 10 Water and Graffiti Repellents
5. Section 07 62 00, Sheet Metal Flashing and Trim including prefinished aluminum coping for masonry
6. Section 07 84 00 Firestopping
7. Section 07 92 00, Joint Sealants
8. Section 08 11 13, Hollow Metal Doors and Frames
9. Section 09 06 00 Schedule for Finishes: Tinted or polished masonry, grout and sealants
10. Section 09 23 13 Acoustical Gypsum Plastering

1.02 REFERENCES

A. This Section incorporates by reference the following documents.
1. American Concrete Institute (ACI):
   a. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International; 2005.
   b. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International; 2005.

   e. ASTM C90 Standard Specification for Load-bearing Concrete Masonry Units; 2006.
   g. ASTM C 140 Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units, 2005.
   m. ASTM C744 Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units. 2005.
3. Underwriters Laboratories Inc. (UL):
   a. UL (FRD) - Fire Resistance Directory (FRD); Underwriters Laboratories Inc.; current edition.

1.03 SUBMITTALS
A. Procedures: Section 01 33 00, Submittal Procedures.
B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
C. Shop Drawings: Indicate reinforcement fabrication, bending, and placement. Include bar schedules, stirrup spacing schedules, bending and arrangement diagrams for reinforcement. Indicate height of walls, including top and bottom of any raked walls. Indicate location and provisions required for attachment of work included in other sections.
D. Samples: Submit four samples of ground-face masonry units, glazed ceramic tile face units and standard units to illustrate color, texture, and extremes of color range.
E. Manufacturer’s Certificate: Certify that masonry units, grout and mortar mixes meet or exceed specified requirements. Include test results or ICBO reports for all specified items required to meet specific standards.

1.04 QUALITY ASSURANCE
A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.
   1. Maintain one copy of each document on project site.
B. CMU producer: qualified by manufacturer of integral CMU water-repellent admixture.
C. Fire-Rated Assemblies: Conform to Building Code for fire-resistive requirements for fire-rated masonry construction.
D. Coordinate sealant materials in control joints and other joints that are adjacent to any work of this section to match colors of work of this section and as specified in Section 09 90 10, Finish and Color Schedule.

1.05 MOCK-UP
A. Construct a masonry wall as a mock-up panel of reinforced ground-face masonry sized 8 feet long by 6 feet high, which includes mortar and accessories, structural backup, wall openings, flashings, and typical strike joints and patterns, including a typical control joint with proposed colored sealant.
B. Locate where directed by Resident Engineer.
C. Accepted mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
1.07 PROJECT CONDITIONS

A. Environmental Requirements

1. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

2. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. CONCRETE MASONRY UNITS (CMU)

1. Basis-of-Design Manufacturers:

2. Standard Smooth, and Colored Ground Face Concrete Block: Comply with descriptive requirements and referenced standards as follows:
   a. Description of CMU Types:
      1) CMU-1: Colored/Polished Faces: Sizes as shown on drawings. 
         Not Applicable to N140.
      2) CMU-2: Standard Natural/Smooth Faces: Sizes as shown on drawings.
      3) CMU-3: Colored/Ground Faces: Sizes as shown on drawings. 
         Color: Charcoal.
   b. Block with multiple ground faces: Where ground face units indicated or specified, provide ground surfaces on all faces exposed to view.
   c. Block Colors: Provide colors as scheduled in Section 09 06 00, Schedules for Finishes.
   d. Special Shapes: Provide non-standard blocks configured for corners, bond beams (if any), lintels, headers, control joint edges, and other detailed conditions.
   e. Load-Bearing Units (Typical): ASTM C90, normal or medium weight with a minimum compressive strength as noted on Contract Drawings.
   f. Standard, and Exterior Ground and Polished Face Concrete Masonry Units: ASTM C90, Type 1, hollow block.
      1) Colors and styles: Select color from manufacturer's complete line. Provide standard or ground or polished face at locations as indicated on Contract Drawings.
2) Manufacturer: As listed above.

3) Substitutions: Section 01 25 00, Substitution Procedures.

**g. Integral CMU Water-Repellent:**

1) Summary: Integral liquid polymeric admixture mixed with concrete during production of concrete masonry units. Acceptable products include:

   a) Addiment Incorporated; Block Plus W-10.
   b) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
   c) Master Builders, Inc.; Rheopel.

2) Water Permeance of Masonry: Capable of achieving a Class E Rating when evaluated using ASTM E514 with the test extended to 72 hours, using the rating criteria specified in ASTM E514-74

   a) Under the current version of the ASTM E514 the test period is only 4 hours; and the laboratory is instructed only to record their observations on the specimen. Under the 1974 version of the test method: the test period lasted for 72 hours; and the laboratory was instructed to rate the wall on an objective Rating Scale in one of five categories from "L" (indicating leakage), to "E" (for Excellent). Measure the required level of performance for this project in accordance with the 1974 version of ASTM E514.

3) Flexural Bond Strength of Masonry: An increase of minimum 10 percent in masonry flexural bond strength shall occur as a result of adding integral water-repellent CMU and mortar admixtures when compared to a control (containing no admixtures) CMU and mortar tested according to ASTM C1357.

4) Compressive Strength of Masonry Prisms: Maximum 5 percent decrease in compressive strength of prisms shall occur as a result of adding integral water-repellent CMU and mortar admixtures when compared to a control (containing no admixtures) CMU and mortar when tested according to ASTM C1314.

5) Drying Shrinkage of CMU: Maximum 5 percent increase in drying shrinkage of the CMU shall occur as a result of adding integral water-repellent CMU admixture when compared to a control (containing no admixtures) CMU when tested according to ASTM C426.

6) Grout Shear Bond Strength: Maximum 5 percent decrease in grout shear bond strength shall occur as a result of adding integral water-repellent admixture to the CMU compared to a control (containing no admixtures) CMU when tested according to California State Chapter 2405(c)3.C test for Grout Shear Bond Strength.
B. Mortar and Grout Materials

1. Masonry Cement: ASTM C91, Type N; or as indicated on Contract Drawings.
   a. Colored mortar: Premixed cement as required to match Resident Engineer's color sample.

2. Portland Cement: ASTM C150, Type I; color as required to produce approved color sample.
   a. Hydrated Lime: ASTM C207, Type S.

   a. Color(s): Section 09 06 00, Schedules for Finishes. Match Resident Engineer's samples when incorporated into specified mix designs.
   b. Manufacturers:
      3) Substitutions: Section 01 25 00, Substitution Procedures

4. Water: Clean and not detrimental to mortar mixture.

5. Integral Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.
   a. Description: Integral liquid polymeric admixture for mortar added during mixing.
   b. Water Permeance of Masonry: Capable of achieving a Class E Rating when evaluated using ASTM E514 with the test extended to 72 hours, using the rating criteria specified in ASTM E 514-74.
   c. Acceptable product: Use "Dry-Block Integral Water Repellent System" by WR Grace or "Crete Gard Mortar Mix" by Krete Industries, Inc.

C. Reinforcement and Anchorage

1. Manufacturers of Joint Reinforcement and Anchors:
   d. Substitutions: Section 01 25 00, Substitution Procedures

2. Reinforcing Steel: Section 03 20 00, Concrete Reinforcing; galvanized finish.

D. Masonry Flashings
1. Metal Flashing Materials including through-wall masonry flashings: Stainless Steel, as specified in Section 07 62 00, Sheet Metal Flashing and Trim.

E. Accessories

1. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   a. Manufacturers:
      4) Substitutions: Section 01 25 00, Substitution Procedures

2. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; 6 inches wide by the maximum lengths available.
   a. Manufacturers:
      4) Substitutions: Section 01 25 00, Substitution Procedures

3. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.


5. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.02 MIXES

A. Mortar and Grout Mixes

1. Mortar for Unit Masonry: ASTM C270, using the design strength shown on the construction documents.
   a. Exterior, loadbearing masonry: Type N.
   b. Exterior, non-loadbearing masonry: Type N.
   c. Interior, loadbearing masonry: Type N.
   d. Interior, non-loadbearing masonry: Type N.
2. Colored Mortar: Proportion selected pigments and other ingredients to match Resident Engineer’s sample without exceeding manufacturer’s recommended pigment-to-cement ratio.
   b. Match Resident Engineer’s sample.

3. Grout: ASTM C476. Using the design strength and proportions shown on the construction documents and with a consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

4. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 - EXECUTION

3.01 EXAMINATION
   A. Verify that field conditions are acceptable and are ready to receive masonry.
   B. Verify that related items provided under other sections are properly sized and located.
   C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
   D. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION
   A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
   B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 INSTALLATION
   A. Comply with referenced standards.
   B. Leave openings for equipment to be installed. Coordinate with other trades.

3.04 COURSING
   A. Establish lines, levels, and coursing indicated. Protect from displacement.
   B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
   C. Concrete Masonry Units:
      1. Bond: Running.
      2. Coursing: One unit and one mortar joint to equal 8 inches.
3.05 STRIKE JOINTS

A. Visible strike joint locations: Provide concave strike.
B. Locations where strike joints not visible: Provide flush strike.

3.06 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
B. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate location of openings, joints, returns, and offsets. Avoid the use of less than half size units at corners, jambs, and other locations.
C. Lay hollow masonry units with face shell bedding on head and bed joints.
D. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
E. Remove excess mortar and mortar smears as work progresses.
F. Interlock intersections and external corners, except for units laid in stack bond.
G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
I. During erection, cover tops of walls, projections, and sills with waterproof sheeting at the end of each day's work. Cover partially completed masonry when construction is not in progress. Extend cover a minimum of 24 inches down both sides and hold securely in place.
J. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that comes into contact with such masonry.
   1. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on wall surface and on the ground.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames as well as similar products from mortar drippings. See Section 08 11 13, Hollow Metal Doors and Frames.
K. Stopping and Resuming work: In each course, rack back as required, clean exposed surfaces of set masonry, wet clay masonry units if required, and remove loose units prior to laying fresh masonry.
L. Isolate masonry partitions from vertical structural framing members with a control joint.
M. Isolate top joint of masonry partitions from horizontal structural framing members and floor slabs or decks with compressible joint filler or firestopping as required.
3.07 WEEPS/CAVITY VENTS
A. Install weeps in veneer and cavity walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.

3.08 CAVITY MORTAR CONTROL
A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
B. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.09 REINFORCEMENT AND ANCHORAGE - GENERAL
A. See reinforcing schedule indicated on Contract Drawings for reinforcing. For walls not specified in the schedule, install 2-#4 horizontal and 1-#5 vertical rebar in grouted cells at 48 inches on-center each way.
B. Reinforce openings as shown on the contract drawings. Extend minimum 16 inches each side of openings.
C. Place continuous horizontal reinforcement in masonry bond course below top of walls.
D. Reinforce stack bonded unit joint corners and intersections.
E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Refer to reinforcement and anchorage requirements in Contract Drawings. In case of conflict, those requirements shall govern.

3.10 MASONRY FLASHINGS
A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
   2. Seal lapped ends and penetrations of flashing before covering with mortar.
B. Extend metal flashings to within 1/4 inch of exterior face of masonry.
C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

3.11 LINTELS
A. Provide reinforced concrete or reinforced concrete masonry lintels as detailed or scheduled on Contract Drawings, typical.
B. Install loose stainless steel lintels over openings where indicated or noted on Contract Drawings.
C. See Section 05 50 00, Metal Fabrications, for steel lintel Contract Specifications.
D. All lintels to maintain minimum 8-inch bearing on each side of opening.
3.12 GROUTED COMPONENTS
A. Lap splices minimum 24 bar diameters.
B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
C. Place and consolidate grout fill without displacing reinforcing.
D. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

3.13 CONTROL AND EXPANSION JOINTS
A. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.
B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer’s instructions.
C. Size control joint in accordance with Section 07 92 00, Joint Sealants, for sealant performance. Color sealant materials in control joints and other joints that are adjacent to any work of this section to match colors of work of this section.

3.14 BUILT-IN WORK
A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.
B. Install built-in items plumb, level, and true to line.
C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
D. Do not build into masonry construction organic materials that are subject to deterioration.

3.15 TOLERANCES
A. Maximum Variation from Unit to Adjacent Unit: 1/16 inch.
B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
D. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.
E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.
F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.16 CUTTING AND FITTING
A. Cut and fit for chases, pipes, conduit, and structure. Coordinate with other sections of work to provide correct size, shape and location.
B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

C. Cut wall caps 45 degrees at wall corners to create continuous ridge line.

3.17 FIELD QUALITY CONTROL

A. An Independent Testing Laboratory to perform field quality control tests, as specified in Section 01 45 00, Quality Assurance/Quality Control.

B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140, Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units for conformance to requirements of this Contract Specification.

3.18 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.19 PROTECTION OF FINISHED WORK

A. Without damaging completed work, provide protective boards at exposed external corners which are subject to damage by construction activities.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section Includes specifications for:
   1. Dimension stone panels set with individual anchors.
   2. Dimension stone panels mechanically anchored on steel strongback frames.
   3. Dimension stone panels mechanically anchored on steel stud frames.
   4. Dimension stone panels mechanically anchored (field installed) on a metal-grid system.
   5. Dimension stone trim units, including jambs and soffits.

B. Related Requirements:
   1. Section 033000 Cast-in-Place Concrete.
   2. Section 042000, Unit Masonry.
   3. Section 079200, Joint Sealants

1.02 DEFINITIONS

A. Definitions contained in ASTM C 119 apply to this Section.

B. Dimension Stone Cladding Assembly: An exterior wall covering system consisting of dimension stone panels and trim together with anchors, backup structure, secondary weather barrier, mortar adhesives, fasteners, and sealants used to secure the stone to the building structure and to produce a weather-resistant covering.


1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

A. Product Data: For stone, stone accessories, and manufactured product.

B. Shop Drawings: Show fabrication and installation details for dimension stone cladding assembly, including dimensions and profiles of stone units.
   1. Show locations and details of joints both within dimension stone cladding assembly and between dimension stone cladding assembly and other construction.
2. Include details of sealant joints.
3. Show locations and details of anchors.
4. Show direction of veining, grain, or other directional pattern.
5. Include large-scale shaded elevations and details of decorative surfaces and inscriptions.

C. Samples for Initial Selection: For joint materials involving color selection.

D. Stone Samples for Verification: Sets for each variety, color, and finish of stone required; not less than 12 inches square.
   1. Sets shall consist of at least four Samples, exhibiting extremes of the full range of color and other visual characteristics expected and will establish the standard by which stone will be judged.

E. Colored Pointing Mortar Samples for Verification: For each color required. Make Samples using same sand and mortar ingredients to be used on Project.

F. Sealant Samples for Verification: For each type and color of joint sealant required.

G. Delegated-Design Submittal: For dimension stone cladding assembly.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer fabricator professional engineer and testing agency.

B. Welding certificates.

C. Material Test Reports:
   1. Stone Test Reports: For stone proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous five years.

   2. For metal components, by a qualified testing agency, indicating chemical and physical properties of metal.

   3. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer complying with requirements in Section 079200 "Joint Sealants" and indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

D. Source quality-control reports.

E. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.06 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Dimension Stone Units: Furnish 2 finished stone panels for stone specified.
1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate dimension stone cladding assemblies similar to that required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: A firm or individual experienced in installing dimension stone cladding assemblies similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build stand alone mockups of typical exterior wall area as shown on Drawings not less than 72 inches long by 48 inches high. Include typical components, attachments to building structure, and methods of installation.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
   1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
   2. Store stone on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.

B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels so that they are right side up when units are installed.

C. Deliver sealants to Project site in original unopened containers labeled with manufacturer's name, product name and designation, color, expiration period, pot life, curing time, and mixing instructions for multicomponent materials.

D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

E. Store aggregates in locations where grading and other required characteristics can be maintained and where contamination can be avoided.

1.09 FIELD CONDITIONS

A. Protect dimension stone cladding during erection by doing the following:
1. Cover tops of dimension stone cladding installation with nonstaining, waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 inches down both sides and hold securely in place.

2. Prevent staining of stone from mortar, grout, sealants, and other sources. Immediately remove such materials without damaging stone.

3. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.

4. Protect sills, ledges, and projections from mortar and sealant droppings.

B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Remove and replace dimension stone cladding damaged by frost or freezing conditions. Comply with cold-weather construction and protection requirements for masonry contained in ACI 530.1/ASCE 6/TMS 602.


D. Environmental Limitations for Sealants: Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or below 40 deg F or when joint substrates are wet.

1.10 COORDINATION

A. Coordinate installation of inserts that are to be embedded in concrete or masonry, flashing reglets, and similar items to be used by dimension stone cladding Installer for anchoring, supporting, and flashing of dimension stone cladding assembly. Furnish setting drawings, templates, and directions for installing such items and deliver to Project site in time for installation.

B. Time delivery and installation of dimension stone cladding to avoid extended on-site storage and to coordinate with work adjacent to dimension stone cladding.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations for Stone: Obtain stone from single quarry with resources to provide materials of consistent quality in appearance and physical properties.

1. For stone types that include same list of varieties and sources, provide same variety from same source for each.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality for each cementitious component from single manufacturer and each aggregate from single source or producer.

C. Source Limitations for Other Materials: Obtain each type of stone accessory, sealant, and other material from single manufacturer for each product.

2.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design dimension stone cladding assembly.
B. General: Design stone anchors and anchoring systems according to ASTM C 1242.
   1. Stone anchors shall withstand not less than two times the weight of the stone cladding in both compression and tension.

C. Structural Performance: Dimension stone cladding assembly shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Wind Loads: As indicated.
   2. Equipment Loads: Allow for loads due to window cleaning and maintenance equipment.

D. Seismic Performance: Dimension stone cladding assembly shall withstand the effects of earthquake motions determined according to ASCE/SEI 7
   1. Component Importance Factor: 1.5

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg F ambient; 180 deg F material surfaces.

F. Horizontal Building Movement (Interstory Drift): Allow for maximum horizontal building movement equal to quotient resulting from dividing floor-to-floor height at any floor by 400.

G. Safety Factors for Stone: Design dimension stone cladding assembly to withstand loads indicated without exceeding stone's allowable working stress determined by dividing stone's average ultimate strength, as established by testing, by the following safety factors:
   1. Safety Factor for Basalt: 3

H. Design stone anchors and backup structure to withstand loads indicated without exceeding allowable working stresses established by the following:
   1. For Cast-in-Place and Postinstalled Fasteners in Concrete: One-fourth of tested capacity when installed in concrete with compressive strength indicated.
   2. For Postinstalled Fasteners in Masonry: One-sixth of tested capacity when installed in masonry units indicated.

I. Provisions for Fabrication and Erection Tolerances: Allow for fabrication and erection tolerances of building's structural system. Concrete fabrication and erection tolerances are specified in Section 033000 "Cast-in-Place Concrete."

J. Provision for Deflection of Building Structure:
   1. Deflection Due to Weight of Dimension Stone Cladding Assembly: Allow for 1/4-inch vertical deflection in 20-foot span of structural members supporting dimension stone cladding assembly.
   2. Live Load Deflection: Allow for 1/4-inch vertical deflection, in 20-foot span of structural members supporting dimension stone cladding assembly, due to live loads imposed on building's structural frame after stone installation.
K. Corrosion and Staining Control: Prevent galvanic and other forms of corrosion as well as staining by isolating metals and other materials from direct contact with incompatible materials. Materials shall not stain exposed surfaces of stone and joint materials.

2.03 BASALT STONE

A. Material Standards:
   1. Maximum Absorption per ASTM C 97/C 97M: 0.3-4.0 wt %
   3. Minimum Flexural Strength per ASTM C 880/C 880M: 11-16 MPa, dry

B. Cut stone from one block or contiguous, matched blocks in which natural markings occur

C. Finish:
   1. Exposed surface: Honed
   2. Concealed surfaces: Saw cut finish
   3. Edge Treatment: Square cut where concealed, eased as approved or as detailed at exposed arises; provide finish on panel edge to match face where exposed

D. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

E. Thickness: Not less than 2 inches unless otherwise indicated.

2.04 ANCHORS AND FASTENERS

A. Fabricate anchors, including shelf angles, from stainless steel, ASTM A 240/A 240M or ASTM A 666, Type 316; temper as required to support loads imposed without exceeding allowable design stresses. Fabricate dowels and pins for anchors from stainless steel, ASTM A 276, Type 316.

B. Cast-in-Place Concrete Inserts: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel, with capability to sustain, without failure, a load equal to 4 times the loads imposed as determined by testing per ASTM E 488, conducted by a qualified independent testing agency. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

C. Postinstalled Anchor Bolts for Concrete and Masonry: Chemical anchors, or torque-controlled expansion anchors made from stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304 or 316, for anchors, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

D. Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers.
   1. For stainless steel use annealed stainless-steel bolts, nuts, and washers; for bolts, ASTM F 593; and for nuts, ASTM F 594, Alloy Group 2
2. For galvanized-steel shelf angles, use carbon-steel bolts, nuts, and washers; for bolts, ASTM A 307, Grade A for nuts, ASTM A 563, Grade A; and for washers, ASTM F 436; all hot-dip or mechanically zinc coated.

E. Weld Plates for Installation in Concrete: Comply with Section 055000 "Metal Fabrications."

2.05 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type II, except Type III may be used for cold-weather construction, natural color or white as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207.


D. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Mix shall produce color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments shall not exceed 10 percent of portland cement by weight.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   b. Lafarge North America Inc.; Eaglebond.
   c. Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.

E. Aggregate: ASTM C 144; except for joints narrower than 1/4 inch and pointing mortar, 100 percent shall pass No. 16 sieve.

1. White Aggregates: Natural white sand or ground white stone.

2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other durable stone; of color necessary to produce required mortar color.

F. Water: Potable.

2.06 STONE ACCESSORIES

A. Setting Shims: Strips of resilient plastic nonstaining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.

B. Setting Buttons: Resilient plastic buttons, nonstaining to stone, sized to suit joint thicknesses and bed depths of stone units without intruding into required depths of pointing materials.

C. Concealed Sheet Metal Flashing: Fabricated from zinc-tin, alloy-coated stainless steel in thicknesses indicated, but not less than 0.0156 inch thick, and complying with Section 076200 "Sheet Metal Flashing and Trim."

D. Weep and Vent Tubes: Medium-density polyethylene tubing, 1/4-inch of length required to extend from exterior face of stone to cavity behind.
E. Cellular Plastic Weep Hole/Vents: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, of length required to extend from exterior face of stone to a cavity behind, in color selected from manufacturer's standard.

2.07 STONE FABRICATION

A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated.

B. Control depth of stone and back check to maintain minimum clearance of 1-1/2 inches between backs of stone units, and surfaces or projections of structural members, fireproofing (if any), backup walls, and other work behind stone.

C. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.

D. Cut and drill sinkages and holes in stone for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place.

E. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.

F. Cut stone to produce uniform joints 1/2 inch wide and in locations indicated.

G. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.

H. Fabricate molded work, including washes and drips, to produce stone shapes with a uniform profile throughout entire unit length, with precisely formed arris slightly eased to prevent snipping, and with matching profile at joints between units.

2.08 MORTAR MIXES

A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.

1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Do not use calcium chloride.

2. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer unless otherwise indicated. Discard mortar when it has reached initial set.


C. Pointing Mortar: Comply with ASTM C 270, Proportion Specification, Type S for types of mortar indicated. Provide pointing mortar mixed to match Architect's sample and complying with the following:


2. Colored-Aggregate Pointing Mortar: Produce color required by combining colored aggregates with portland cement of selected color.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive dimension stone cladding and conditions under which dimension stone cladding will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of dimension stone cladding.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of dimension stone cladding.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SETTING DIMENSION STONE CLADDING, GENERAL

A. Before setting stone, clean surfaces that are dirty or stained by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

B. Execute dimension stone cladding installation by skilled mechanics and employ skilled stone fitters at Project site to do necessary field cutting as stone is set.

1. Use power saws with diamond blades to cut stone. Produce lines cut straight and true, with edges eased slightly to prevent snipping.

C. Contiguous Work: Provide reveals, reglets, and openings as required to accommodate contiguous work.

D. Set stone to comply with requirements indicated. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure dimension stone cladding in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with uniform joints of widths indicated, and with edges and faces aligned according to established relationships and indicated tolerances.

E. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.

1. Keep expansion joints free of mortar and other rigid materials.

F. Install concealed flashing at continuous shelf angles, lintels, ledges, and similar obstructions to downward flow of water, to divert water to building exterior. Extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.

G. Keep cavities open where unfilled space is indicated between back of stone units and backup wall; do not fill cavities with mortar or grout.

1. Place weep holes in joints where moisture may accumulate, including at base of cavity walls and above shelf angles and flashing. Locate weep holes at intervals not exceeding 24 inches Use plastic weep hole/vents

2. Place vents in cavity walls at tops of cavities, below shelf angles and flashing, and at intervals not exceeding 20 feet vertically. Locate vents in joints at intervals not exceeding 60 inches horizontally. Use plastic weep hole/vents.
3.03 SETTING MECHANICALLY ANCHORED DIMENSION STONE CLADDING

A. Set dimension stone cladding with mechanical anchors without mortar unless otherwise indicated.

B. Attach anchors securely to stone and to backup surfaces. Comply with recommendations in ASTM C 1242.

C. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant indicated for filling kerfs.

D. Set stone supported on clips or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.

3.04 INSTALLATION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/4 inch in 10 feet or more. For external corners, corners and jambs within 20 feet of an entrance, expansion joints, and other conspicuous lines, do not exceed 1/8 inch in 10 feet or more.

B. Variation from Level: For lintels, sills, water tables, parapets, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 inch in 10 feet maximum.

C. Variation of Linear Building Line: For positions shown in plan and related portions of walls and partitions, do not exceed 1/4 inch in 20 feet or more.

D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus 1/4 inch

E. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/8 inch or a quarter of nominal joint width, whichever is less. For joints within 60 inches of each other, do not vary more than 1/8 inch or a quarter of nominal joint width, whichever is less from one to the other.

F. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/16-inch difference between planes of adjacent units.

3.05 ADJUSTING AND CLEANING

A. Remove and replace broken, chipped, stained, or otherwise damaged stone, defective joints, and dimension stone cladding that does not match approved samples and mockups. Damaged stone may be repaired if Architect approves methods and results.

B. Replace damaged or defective work in a manner that results in dimension stone cladding's matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean dimension stone cladding as work progresses. Remove mortar fins and smears before tooling joints. Remove excess sealant and smears as sealant is installed.

D. Final Cleaning: Clean dimension stone cladding no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.
END OF SECTION
SECTION 05 05 13
SHOP-APPLIED COATINGS FOR METAL

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:
   1. Galvanizing where indicated for steel items.
   2. Shop primer for steel items not receiving galvanized finish.

B. Related Sections:
   1. Section 05 12 00, Structural Steel Framing
   2. Section 05 50 00, Metal Fabrications
   3. Section 05 51 00, Metal Stairs
   4. Section 05 52 00, Metal Railings
   5. Section 05 53 31, Steel Gratings
   6. Section 08 33 23, Overhead Coiling Doors: Door and door guide parts to receive galvanized finish
   7. Section 09 90 00, Painting and Coating
   8. Section 09 96 00, High-Performance Coatings

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.
   1. American Hot-Dip Galvanizers Association, Inc. (AHDGA)
      a. AHDGA Inspection Manual for Hot-Dip Galvanized Products
   2. American Society for Testing and Material International (ASTM)
      a. ASTM A123/ A123M Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
      b. ASTM A143 Safeguarding against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
      c. ASTM A384 Safeguarding against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
      d. ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
e. ASTM B6 Standard Specification for Zinc

3. Society for Surface Protective Coatings (SSPC)
a. PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel,"
b. SP6 Commercial Blast Cleaning.
c. SP8 Pickling.

1.03 DEFINITIONS:
A. Hot-dip galvanizing: Dipping steel members and assemblies into molten zinc for lasting, or long-term corrosion protection. Resultant zinc coating fuses permanently with base steel material.

1.04 SUBMITTALS
A. Procedures: Section 01 33 00, Submittal Procedures.
B. Product Data: Submit data for shop primer and finish coats specified in Section 09 90 00, Painting and Coating, and 09 96 00, High-Performance Coatings.
   1. Submit metal coatings product data in conjunction with the painting and coating or high performance coating submittals that are to be used to paint or coat the metal. This is to confirm that the shop applied steel primer is compatible with the intermediate coat and final paint coat. This submittal will not be considered complete and acceptable if either product is not compatible with each other.
C. Certification: Furnish certification for the following, signed by the galvanizer:
   1. Membership in American Hot-Dip Galvanizers Association Inc.
   2. Materials used in galvanizing and repair.
   3. Methods used in galvanizing and repair.
D. Coordination Drawings: To safeguard against distortion, furnish to the galvanizer steel fabricator's shop drawings of non-standard fabrications, tubular fabrications, fabrications involving all dimension that exceed the size of the galvanizer's kettle and fabrications involving materials of different thicknesses.
E. Reports showing results of all inspections and tests.

1.05 QUALITY ASSURANCE
A. Engage a galvanizing firm with a current membership in the American Hot-Dip Galvanizers Association Inc. (AHDGA).
B. Inspect and test galvanized fabrications in compliance with ASTM 123 for the following:
   1. Visual examination of samples and finished products.
   2. Thickness of coating
   3. Adhesion
C. Mark all galvanized material with the galvanizer's stamp.

1.06 DELIVERY, STORAGE, AND HANDLING:
A. Deliver, store, and handle galvanized fabrications in a manner that prevents damage to the item and its galvanizing.

PART 2 - PRODUCTS

2.01 GALVANIZING MATERIALS
B. Galvanizing Repair Paint: A three-part system using an organic zinc-rich primer, an epoxy or urethane intermediate coat, and a urethane topcoat.

2.02 SHOP PAINTING MATERIALS
A. Primer Paint: Organic zinc-rich, urethane or epoxy:
   1. AISC-certified for Class B slip-critical connections.
   2. Minimum 8000 hours salt-spray resistance when tested in accordance with ASTM B 117.
   3. Acceptable products:
      a. Tnemec Series 394 "PerimePrime".
      b. Devoe Cathacoat 313 or 304V for slip critical connections. Abrade 100% of surface if critical re-coat window is exceeded.
      c. Or approved equal.

PART 3 - EXECUTION

3.01 PREPARATION FOR GALVANIZING
A. Complete fabrications to the greatest extent possible prior to galvanizing.
B. Mask areas that are to be field welded or that are to be shop welded to ungalvanized members to a distance of one inch from the weld line prior to galvanizing.
C. Clean all surfaces in compliance with SSPC SP6, Commercial Blast Cleaning.
D. Pickle all surfaces in compliance with SSPC SP8, Pickling.

3.02 APPLICATION OF GALVANIZING
A. Hot-dip galvanize in compliance with ASTM A123. Mix the galvanizing bath to contain 0.05 to 0.09 percent nickel by weight. Apply galvanizing in the weights and thicknesses specified.
B. Safeguard against steel embrittlement in compliance with ASTM A143
C. Safeguard against warpage or distortion in compliance with ASTM A384. Notify the Resident Engineer of potential warpage problems that require modification in design before proceeding with fabrications.

3.03 REPAIR OF GALVANIZING

A. Grind rough areas to produce a uniform surface.

B. Repair minor defects and coat masked areas in accordance with ASTM A780.

3.04 SHOP PAINTING

A. Surface Preparation For Non-Galvanized Fabrications: Remove loose rust, loose mill scale and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
   1. Solvent clean and blast clean steel surfaces using abrasive air blast method in accordance with SSPC-SP 6 "Commercial Blast Cleaning". The height of profile or anchor pattern shall be 1.5 to 2.5 mils, unless otherwise required by the primer manufacturer.

B. Primer Application: Immediately after surface preparation, apply primer to provide dry film thickness of not less than 3 mils.
   1. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, including those to be embedded in concrete. Primer shall be held back 2 inches from edges to be field welded. Comply with SSPC-PA 1 for shop painting.

3.05 FIELD QUALITY CONTROL AND REPAIR

A. Galvanized Surfaces: Apply galvanizing repair paint or other methods described in ASTM A 780.

B. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush to provide a minimum dry film thickness of 3.0 mils.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:

1. Baked on fluoropolymer coating systems on surfaces specified in respective technical Sections herein. (FC-1, FC-2)
2. Repair or refinishing of damaged finishes.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 05 50 00, Metal Fabrications.
2. Section 05 52 00, Metal Railings: Custom aluminum guardrails.
3. Section 07 62 00, Sheet Metal Flashing and Trim.
4. Section 08 44 10, Glazed Aluminum-Framed Storefronts and Curtain Walls.
5. Section 08 91 00, Louvers.

1.02 REFERENCES

A. Architectural Aluminum Manufacturer's Association (AAMA):


B. American Society for Testing and Materials International (ASTM)

1. ASTM B449 - Specification for Chromates on Aluminum
2. ASTM D1730 - Practice for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting.
3. ASTM D 2244 - Practice for Calculation of Color Differences and Color Tolerances from Instrumentally Measured Color Coordinates.

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Submit manufacturer's literature and technical data for each coating system.
1. Application instructions including mixing, surface preparation, compatible primers and topcoats, recommended wet and dry film thickness, recommended application methods.

2. Manufacturer's recommendations for use; include limitations.

C. Qualification Data - Applicator: Submit certification from the manufacturer stating that the applicator is an approved applicator of the material for work of this Section.

D. Samples: Submit samples of each specified finish in selected colors on 12-inch-long sections of extrusions and 12-inch-square heavy gage sheet metal. Furnish additional samples as required until colors and finishes are approved. Label samples with color number, name, and date.

E. Coating Touch-Up Procedures: Submit coating manufacturer's recommended touch-up procedures and instructions.

F. Warranty:
   1. Draft: Submit draft of warranty with required inclusions for review. Submit draft warranty with product data.
   2. Submit signed warranty at time of Project Closeout; include warranty in "Warranties Manual".

1.04 QUALITY ASSURANCE

A. Fluoropolymer Coating Applicator Qualifications: Engage an experienced coating applicator that is approved by fluoropolymer coating manufacturer. If requested, coating applicator shall furnish test results of previously tested production specimens within the last six months showing conformance with AAMA 2605

1. Coating system shall be factory applied and oven baked on pretreated and primed metal substrates. Coating on various portions of the work shall match in color and visual texture.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Wrap finished parts and package in such a way that exposed surfaces are protected.

1. Do not handle freshly painted members until paint has cured in accordance with manufacturer's recommendations for "to handle" curing. Adjust time requirements for ambient and surface temperature and relative humidity.

2. Packing and Shipping: Provide protective wrappings, cartons, dunnage between members, crating and the like as required to prevent damage to coating in shipping, delivery, and handling at the site.

3. Lifting - Shop and site:
1.06 WARRANTY

A. Special Warranty: Submit written warranty for a period of 20 years from date of Substantial Completion, stating that coating will not blister, peel, crack, chalk, change color, or have other forms of degradation for the full warranty period.

1. For the purpose of this warranty, color change is defined as not to exceed 5 CIELAB or Hunter units as determined in accordance with ASTM D2244.

2. In the event that any of the above coating failures occurs within the warranty period, the Contractor shall replace said item showing such failure, and shall assume full cost of labor and materials for such replacement. Replacement item(s) shall be new and be finished with same type of fluoropolymer coating meeting the requirements of herein. Any replacement item shall match its adjacent member within tolerances as specified herein.

3. Resident Engineer may, at its discretion, permit field repairs in lieu of replacement; provided the coating failure is minor in scope and the field repair material and method employed match its adjacent member.

4. Warranty shall be signed by the coating manufacturer, coating applicator and Contractor. Warranty shall be in addition to, and not a limitation of, other rights Sound Transit may have against the Contractor under the Contract Documents.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Resin - Provide Coatings manufactured with polyvinylidene fluoride resin made by one of the following:

1. Arkema: “Kynar 500”
2. Solvay Solexis: “Hylar 5000”
3. Approval equal

B. Acceptable Coating Producers (Tradenames) Include

1. PPG (Duranar®)
2. Valspar (Fluoropon®)
3. Akzo Nobel (Trinar®)
4. BASF (Fluoroceram®)
5. Approval equal

2.02 FLUOROPOLYMER COATINGS - “FC-#”

A. General: Factory applied, baked on fluoropolymer coating containing minimum 70 percent polyvinylidene fluoride (PVDF) by weight in resin system. Provide system consisting of primer and one or more topcoat(s) meeting or exceeding AAMA 2605.
B. Coil coatings: Dry film thicknesses specified below are spray coating thicknesses; manufacturer's standard thickness which meet performance requirements of AAMA 2605 are acceptable.

C. Spray (extrusion) Coatings: Meet or exceed AAMA 2605. Dry film thicknesses specified are minimum allowed.
   1. Powder coat systems containing 100 percent PVDF resin are acceptable in lieu of spray coatings, subject to color approval.

D. Standard (2-Coat) System:
   1. Dry Film Thickness: 0.25 mil (plus or minus 0.05 mil) primer coat, 1.0 mil color coat.
   2. Acceptable products include:
      a. PPG Industries "Duranar".
      b. Valspar: "Fluoropon".
      c. BASF "Fluoroceram".
      d. Approval equal
   3. FC-2 Color: TBD

E. 2-Coat Mica-Flake System: 0.25 mil (plus or minus 0.05 mil) primer coat, 1.0 mil color coat. Metallic appearance achieved by use of mica flakes in topcoat; no clearcoat required.
   1. Acceptable products include.
      a. PPG "Duranar Sunstorm".
      b. Valspar: "Fluoropon Classic II."
      c. BASF "Ultramet C".
      d. Approval equal
   2. FC-1 Color: TBD

F. Touch-Up Material: Fluoropolymer air-dried system, which is recommended and approved by fluoropolymer finish coating manufacturer.

2.03 FABRICATION

A. Spray or Coil Applied Systems: Pretreatment and coating application shall be in accordance with coating manufacturer's recommendations.

B. Metal Preparation and Pre-Treatment: Remove organic and inorganic surface soil, grease, oils, and other foreign materials using a chemical cleaning and pre-treatment process as recommended by coating manufacturer.
   1. Use a chemical conversion coating which conforms to ASTM D1730, Type B, Method 5 or Method 7.
2. Weight of chemical conversion coating shall conform to ASTM B449, Section 6, Class 1.

3. Processing shall conform to ASTM B449, Section 5.

C. Finishing: Apply coating by conventional air or electrostatic spray or by coil coating process over surfaces, which have been thoroughly cleaned, pretreated and primed according to specifications of the licensed formulator. Dipping and flowcoating are not permitted. Thermally cure (bake) coating immediately following application.

1. All coil coating shall be processed in one production lot to aid in eliminating color variations due to use of metallic coating.

2.04 SOURCE QUALITY CONTROL

A. General: Coating applicator shall maintain a Quality Assurance Log which reflects conditions under which production was made, including pretreatment cycles; coating conditions; cure temperature and time; random testing of dry film thickness, color and gloss; and selection of random production samples.

B. Surface Appearance: Cured coating must be visibly free from flowlines, streaks, blisters and other surface imperfections on exposed surfaces.

1. Surfaces shall have no signs of mill finish aluminum or galvanized material showing.

2. No "rack" or "gripper" marks caused by the finishing process on exposed aluminum surfaces will be permitted.

PART 3 - EXECUTION

3.01 REPAIR AND TOUCH-UP

A. Minor scratches and blemishes: Repair with coating manufacturer's recommended products or system. Provide repairs that:

1. Match original finish for color and gloss.

2. Adhere to original finish when tested in accordance with AAMA 2605.

3. Are not discernable when viewed at a distance of 5 feet.

3.02 PROTECTION

A. Protection:

1. Shortly before final completion of the project, examine surfaces for damage to coatings and restore coatings to new, undamaged condition.

2. Touch-up of minor damage will be acceptable where result is not visibly different from surrounding surfaces. Where result is different either in color, sheen, or texture, recoat entire surface or provide new building component.
SECTION 05 05 23
METAL FASTENINGS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for welding and bolting of structural steel and metal fabrications, and welding of sheet steel, as indicated. This Section also includes qualification of welders and welding procedures, and inspections, and tests of welding and bolting.

1. Materials for and fabrication and installation of welded-headed studs, deformed bar anchors, and concrete reinforcing steel anchors are covered in Section 03 15 20 Anchorage to Concrete.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 05 05 13, Shop Applied Coatings for Metal: Coatings for ferrous metal fabrications including galvanizing and shop primer.
2. Section 05 12 00, Structural Steel Framing.
3. Section 05 50 00 Metal Fabrications.
4. Section 05 51 00, Metal Stairs.
5. Section 05 51 33, Metal Ladders.
6. Section 05 52 00, Metal Railings.
7. Section 05 53 31, Steel Gratings.
8. Section 05 75 13, Architectural Decorative Metal.
9. Section 09 90 00, Painting and Coating: Paint finish.
10. Section 09 96 00, High-Performance Coatings.
11. Section 11 24 29, Facility Fall Protection.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Society for Nondestructive Testing (ASNT)
   a. Recommended Practice No. SNT-TC-1A
2. American Institute of Steel Construction (AISC)
   a. AISC 303 Code of Standard Practice for Steel Buildings and Bridges
3. American Society for Testing and Materials International (ASTM)
   a. ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   b. ASTM A307 Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
   c. ASTM A325 Standard Specification for Structural Bolts, Steel, heat Treated, 120/105 ksi Minimum Tensile Strength
   d. ASTM A490 Standard Specification for Structural Bolts, Steel, Heat Treated, 170 ksi Minimum Tensile Strength
   e. ASTM A563 Standard Specification for Carbons and Alloy Steel Nuts
   f. ASTM E94 Standard Guide for Radiographic Examination
   g. ASTM E164 Standard Practice for Contact Ultrasonic Testing of Weldments
   h. ASTM E165 Standard Practice for Liquid Penetrant Examination for General Industry
   i. ASTM E709 Guide for Magnetic Particle Examination
   j. ASTM E1032 Standard Method for Radiographic Examination of Weldments
   k. ASTM F436 Standard Specification for Hardened Steel Washers
   l. ASTM F844 Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use
   m. ASTM F959 Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners
   n. ASTM F1852 Standard Specification for “Twist Off” Type Tension Control Structural Bolt-Nut-Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

4. American Welding Society (AWS)
   a. ANSI/AWS A2.4 Standard Symbols for Welding, Brazing, and Nondestructive Examination
   b. ANSI/AWS A3.0 Standard Welding Terms and Definitions
   c. ANSI/AWS A5 Series Filler Metal Specifications
   d. ANSI/AWS B1.10 Guide for the Nondestructive Examination of Welds
   e. ANSI/AWS D1.1 Structural Welding Code - Steel
   f. ANSI/AWS D1.3 Structural Welding Code - Sheet Steel
   g. ANSI/AWS D1.6 Structural Welding Code – Stainless Steel
   h. ANSI/AWS D1.8 Structural Welding Code – Seismic Supplement
i. AWS QC1 Standard for AWS Certification of Welding Inspectors
5. Research Council on Structural Connections (RCSC)
a. Specification for Structural Joints Using ASTM A325 or A490 Bolts

1.03 DEFINITIONS
A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, that support design loads.
B. Seismic Load Resisting System (SLRS): Assembly of Structural Steel elements that resists seismic loads. Members of SLRS are indicated in the Contract Drawings.
C. Demand-Critical Welds: Welds in the SLRS including:
   1. Complete penetration welds in beam-to-column connections, including welds to flanges, webs, and flange reinforcement, stiffener, and doubler plates.
   2. Complete penetration welds of column splices and of columns to base plates.
   3. Fillet welds connecting braced frame gusset plates to braces, beams, and columns.
   4. Other welds indicated as “Seismic Demand Critical” on the Contract Drawings.
D. Protected Zones: Area of a member in which limitations apply to fabrication and attachments. See Part 3 of this Section.
E. Lowest Anticipated Service Temperature: 0 degrees Fahrenheit, as required by ANSI/AWS D1.8.

1.04 SUBMITTALS
A. Procedures: Section 01 33 00, Submittal Procedures.
B. Manufactured Products
   1. Welding Electrode: Manufacturer’s certification of conformance.
   2. High-Strength Bolts, Nuts, and Washers: Manufacturer’s mill certificates demonstrating conformance.
   4. Direct Tension Indicating Washers: Manufacturer’s mill certificates demonstrating conformance, if proposed for use.
   5. Tension Control Structural Bolt-Nut-Washer Assemblies: Manufacturer’s mill certificates demonstrating conformance, if proposed for use.
C. Qualifications: Current certification demonstrating qualifications for the following:
   1. Welders, welding operators, and tack welders
   2. Welding inspectors
   3. Personnel performing nondestructive testing
D. Welding Procedures

   a. Submit a WPS for each welded joint proposed for use whether prequalified or qualified by testing. Include all welding that will be performed in both the shop and the field.
   b. For welds to the SLRS, specify the additional requirements of ANSI/AWS D1.8.

   a. Submit a PQR for tests of procedures other than those prequalified.
   b. For welds to the SLRS, including Demand Critical Welds, include Charpy V-Notch (CVN) testing in conformance with ANSI/AWS D1.8.

E. Inspection and Test Reports: Forward the following inspection and test results to the Resident Engineer immediately after results are available. Results must state whether Work is conforming or nonconforming.

1. Source Quality Control
2. Field Quality Control

1.05 QUALITY ASSURANCE

A. Welders, Welding Operators, and Tack Welders: Current AWS certification for all types, positions, and sizes of welds performed as follows:
   1. Structural Steel: ANSI/AWS D1.1, and ANSI/AWS D1.6 and D1.8, as applicable to the Work.
   2. Metal Fabrications: ANSI/AWS D1.1
   3. Sheet Steel: ANSI/AWS D1.3

B. Welding Inspector: ANSI/AWS QC1 Certified Welding Inspector (CWI)

C. Personnel Performing Nondestructive Testing;
   1. ASNT Certified NDT
   2. Only personnel certified for NDT Level I and working under a certified NDT Level II person or persons may perform nondestructive testing.

D. Welding Procedures: Prequalified or qualified in conformance with ANSI/AWS D1.1.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle welding electrodes in conformance with ANSI/AWS D1.1.

B. Deliver, store, and handle bolts, nuts, and washers in conformance with RCSC Specification.
PART 2 - PRODUCTS

2.01 MANUFACTURED PRODUCTS

A. Welding Electrodes for Structural Shapes, Plates, and Bars:
   1. Conform to ANSI/AWS A5 Series Standards, with a minimum tensile strength of 70 ksi. Provide coated rods or wire of size and classification number as recommended by the manufacturer for the positions and other conditions of actual use. Match filler metal requirements in conformance with ANSI/AWS D1.1.

B. High-Strength Bolts:
   1. Bolts: ASTM A325 or ASTM A490, Type 1, heavy hex
   2. Nuts: ASTM A563 heavy hex
   3. Washers
      a. Plain: ASTM F436
      b. Direct Tension Indicating: ASTM F959, Type 325 compressible-washer type
   4. Finish:
      a. ASTM A325, hot-dip zinc coat in conformance with ASTM A153, Class C
      b. ASTM A490, plain

C. Tension Control Structural Bolt-Nut-Washer Assemblies:
   1. Bolts: ASTM F1852, Type 1, heavy hex head splined ends
   2. Nuts: ASTM A563 heavy hex
   3. Washers: ASTM F436

D. Mild Bolts: Provide mild bolts where noted A307
   1. Bolts: ASTM A307, Type A
   2. Nuts: ASTM A563A hex
   3. Washers: ASTM F884

2.02 FABRICATION

A. Shop Welding and Shop Welding Repairs
   1. Unless specifically noted as field-welded, welds may be shop or field welded at the Contractor’s option.
2. Perform shop welding as indicated in conformance with the following:
   a. Structural Steel: ANSI/AWS D1.1, and ANSI/AWS D1.6, D1.8, as applicable to the Work.
   b. Metal Fabrications: ANSI/AWS D1.1
   c. Sheet Steel: ANSI/AWS D1.3
3. Weld joints in conformance with approved WPS. Make WPS available to welders and inspectors during fabrication.
4. Provide complete joint penetration welds for groove welds indicated on the Contract Drawings unless noted otherwise. Select groove preparation in conformance with ANSI/AWS D1.1 and approved WPS.
5. Remove backing bars for complete joint penetration welds where indicated in the Contract Drawings or required for testing and inspection.
6. Mark welder ID adjacent to completed weld using metal stamp, metal engraving, keel, paint stick, or other appropriate marking means.
7. Repairs: ANSI/AWS D1.1. Reinspect or retest repaired or corrected welds as specified for the original weld.

B. Shop Bolting
   1. Drive bolts accurately into holes without damaging the thread. Protect bolt heads from damage during driving. Place washers and all bolt heads and nuts. Rest bolt heads and nuts squarely against the washers.
   2. High-Strength Bolting
      b. Pretension bolts unless noted otherwise.
      c. Prepare faying surfaces for joints indicated as Slip-Critical in conformance with Class C for galvanized items, and in conformance with Class A for non-galvanized items.
      d. Snug-tight connections may be used in beam-to-beam connections only if approved by the Resident Engineer.

2.03 SOURCE QUALITY CONTROL

A. Shop Welding Procedures and Personnel: Verify the following prior to and during fabrication:
   1. Welder qualifications and identifications.
   2. WPS has been provided to and reviewed with each welder performing the Work.
   3. Consumables meet WPS requirements.
   4. Joint fit-up meets WPS requirements. Mark joint prior to welding.
   5. Preheat and interpass temperatures and weld pass sequence meet WPS requirements.
B. Shop Welding Inspection and Testing

1. Visual Inspection: ANSI/AWS D1.1. Visually inspect 100 percent of welds, for both permanent and temporary Work.

2. Ultrasonic Testing: ANSI/AWS D1.1, and ASTM E164, as applicable. Ultrasonically test complete joint penetration groove welds as follows:
   a. 10 percent with material thickness equal to or less than 3/4 inch.
   b. 50 percent with material thickness greater than 3/4 inch and equal to or less than 1-1/2 inches.
   c. 100 percent for material thickness greater than 1-1/2 inches.

3. Magnetic Particle Inspection: ASTM E709. Inspect complete and partial joint penetration groove welds and fillet welds as follows:
   a. 20 percent of complete joint penetration groove welds of tee and corner joints.
   b. 10 percent of partial joint penetration groove welds and fillet welds.

4. Liquid Penetrant Inspection: ASTM E165. Liquid penetrant inspection may be used for detecting discontinuities that are open to the surface.


C. Shop Bolting Inspection and Testing

1. Torque Wrench Calibration
   b. Test the calibrating device for setting calibrated torque wrenches for accuracy using qualified personnel not more than 30 days prior to first use on the Work, and at intervals not more than six months thereafter.
   c. If the Resident Engineer has reason to question the accuracy of the calibrating device, return it to the manufacturer for certification of accuracy.

2. Visually inspect 100 percent of shop bolted connections.

D. Shop Inspection and Testing by the Resident Engineer

1. Allow the Resident Engineer access to perform independent verification inspection and testing.

2. All welded and bolted connections are subject to inspection and testing by the Resident Engineer. The Resident Engineer will inspect and test connections at random.

3. The Resident Engineer will make inspection and test results available to the Contractor.
PART 3 - EXECUTION

3.01 ERECTION

A. Field Welding and Field Welding Repairs: Perform field welding and field welding repairs as specified for shop welding and shop welding repairs.

B. Field Bolting: Perform field bolting as specified for shop bolting.

3.02 CONNECTIONS AT PROTECTED ZONES

A. Protected Zones are as indicated on the Drawings.

B. Within protected zones, discontinuities created by fabrication or erection operations, such as tack welds, erection aids, air-arc gouging and therman cutting shall be repaired as required by the Resident Engineer.

C. Welded shear studs and decking attachments that penetrate the beam flange shall not be placed on beam flanges within the Protected Zones. Decking arc spot welds as required to secure decking shall be permitted.

D. Welded, bolted, screwed or shot-in attachments for perimeter edge angles, exterior facades, partitions, duct work, piping or other construction shall not be placed within the protected zone.

3.03 FIELD QUALITY CONTROL

A. Field Welding Procedures and Personnel: Verify field welding procedures and personnel prior to and during field welding as specified for shop welding procedures and personnel.

B. Field Welding Inspection and Testing: Perform field welding inspection and testing as specified for shop welding inspection and testing.

C. Field Bolting Inspection and Testing: Perform field bolting inspection and testing as specified for shop bolting inspection and testing.

D. Verify all tests and inspections demonstrate conformance with the Contract Documents before loading structures, either temporary or permanent. Notify the Resident Engineer of the results.

E. Field Inspection and Testing by the Resident Engineer

1. Allow the Resident Engineer access to perform independent verification inspection and testing.

2. All welded and bolted connections are subject to inspection and testing by the Resident Engineer. The Resident Engineer will inspect and test connections at random.

3. The Resident Engineer will make inspection and test results available to the Contractor.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for furnishing, fabricating, and erecting structural steel as indicated in the Contract Drawings.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 03 62 00, Non-Shrink Grouting
2. Section 03 15 25, Anchorage to Concrete
3. Section 05 05 23, Metal Fastenings
4. Section 09 96 00, High-Performance Coatings

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Institute of Steel Construction (AISC):
   a. Code of Standard Practice for Steel Buildings and Bridges
   b. Specification for Structural Joints Using ASTM A325 or A490 Bolts

   a. ASTM A6 Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, Sheet Piling
   b. ASTM A36 Standard Specification for Carbon Structural Steel
   c. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   d. ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   e. ASTM A325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
   f. ASTM A490 Standard Specification for Structural Bolts, Steel, Heat Treated, 170 ksi Minimum Tensile Strength
   g. ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
   h. ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts
i. ASTM A572 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel

j. ASTM F436 Standard Specification for Hardened Steel Washers

k. ASTM F959 Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners

l. ASTM A992 Standard Specification for Structural Steel Shapes

   a. ANSI/AWS D1.1 Structural Welding Code-Steel
   b. ANSI/AWS A2.4 Standard Symbols for Welding, Brazing, and Nondestructive Examination

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Shop Drawings:
   1. Submit detailed shop drawings of structural steel work, showing sizes, details of fabrication and construction, methods of assembly, locations of hardware, anchors, and accessories, and erection sequence and details. Include procedures for heavy lifts and rigging.

   2. Welding Procedures: Submit welding procedures and overall fabrication methods in conformance with the current AWS D1.1. In areas where shrinkage or distortion is likely to affect the adequacy of the member or structure, the contractor shall include a welding sequence and distortion control program in accordance with AWS D1.1-3.4 “Control of Distortion and Shrinkage”.

   3. Include in shop drawings member identity, welding technique, cuts, copes, gussets, connections, holes, fasteners, camber, fabrication and erection tolerances, type of finish, paint system, weights of members, and critical clearances.

   4. Indicate welds, both shop and field, using standard welding symbols of ANSI/AWS A2.4. Show the size, length, and type of each weld on drawings.

   5. Indicate individual welders’ identification on Contract record drawing.

C. Working Drawings and Method Statements:
   1. Investigate stresses caused by the proposed erection procedure. Submit drawings showing details of required temporary supports, staying, and bracing. Include descriptive data and design calculations, to illustrate the erection, transportation, and handling procedures, including sequence of erecting and transfer of loads if applicable.

   2. Furnish setting diagrams, templates, and directions for the erection of structural framing, anchor bolts, bearing plates, and other embedded items.

D. Product Data: Submit manufacturer’s product data for each type of product.

E. Mill test reports of structural steel materials, showing:
1. Name, address and phone number of the steel manufacturer.

2. Statement identifying the type of steel referenced on the mill certification (for example: carbon plate, ASTM A36/ASME SA36).

3. Statement that the steel was melted and rolled in the USA.

4. Number of pieces represented by the mill certification (for example: 6 pieces, 12 feet by 12 feet by 6 inches).

5. Physical properties including; Heat Number, Yield Strength, Tensile Strength, Percentage of Elongation, Hardness (if applicable) and Bend Tests (if applicable).

6. Chemical Analysis as applicable for each type of steel and each heat number referenced on the mill certification including; Carbon, Manganese, Phosphorus, Sulfur, Silicon, Copper, Nickel, Vanadium, Columbium, Aluminum, Chromium, Molybdenum, and Cerium.

7. Signature of the person that prepared the mill certificate.

F. Welding Records, Certifications, and Data: Refer to Section 05 05 23, Metal Fastenings, for requirements.

G. Construction Sequence: Construction sequence for erection and disassembly of the shoring system. Indicate how sequence is coordinated with interim grading and drainage and the construction of the permanent structure.

H. Documentation of Steel Fabricator’s AISC Certification.

I. Documentation of Steel Erector’s AISC Certification.

1.04 QUALITY ASSURANCE

A. Fabricator and Erector Qualifications:

1. Companies specializing in performing work of the type specified in this section with not less than five years of documented experience.

2. Certification of Erectors: Erectors shall be AISC-Certified Steel Erectors (CSE).

3. Certification of Fabricators: Fabricators shall be AISC-Certified Steel Fabricators.

B. Certification of Welders and Welding Procedures: Conform to Section 05 05 23, Metal Fastenings.

C. Provide and fabricate structural steel members in accordance with “AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings” except where specified otherwise in this Section.

D. Comply with the provisions of “AISC Code of Standard Practice for Steel Buildings and Bridges” except where specified otherwise in this Section.

E. Mock-Ups: Provide mock-ups for evaluation of fabrication and workmanship as follows:

1. Locate mock-ups at locations approved or designated by Resident Engineer
2. Mock-ups are to demonstrate structural steel materials, connections, welding, fasteners, and primer coatings to be employed.

3. Mock-ups are to demonstrate installation methods.

4. Approved mock-ups may remain as part of the Work.

5. Mock-ups that are not approved shall be removed from site by the Contractor.

6. Resident Engineer shall be sole judge of acceptability of mock-ups.

7. Iron Work and Welding Mock-Up Requirement List. Provide mock-ups for all types of iron work, welding, and associated products specified in this Section, including:
   a. Mock-up of steel joints demonstrating horizontal, vertical and butt welds exposed to view at each of the following locations (with exposed joints ground flush and smooth with adjacent surfaces):
      1) Station Entrances within 20 feet of public walking surfaces.
      2) Systems Raceways within 20 feet of public walking surfaces.
      3) Interior Soffit Framing within 20 feet of public walking surfaces.
      4) Structural Steel Framing within 20 feet of public walking surfaces.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle structural steel materials in such a manner that the metal is kept clean and free from injury. Store materials above ground on platforms, skids, or other supports, and protect from corrosion.

B. Mark weight and piece (mark) number, corresponding to shop erection sequence drawing, on all members. Match-mark all shop pre-fitted members.

C. Ship small parts in boxes, crates, or barrels. Plainly mark with an itemized description of the contents on the outside of each container.

D. Pack separately each length and diameter of bolt and each size of nut and washer.

E. Store steel materials in reverse order of use so first used members are last to be stored, and can be retrieved without damage to other steel members.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Wide Flange Shapes: ASTM A992

B. Channels: ASTM A36

C. Angles: ASTM A36

D. Plate:
   1. ASTM A36 Unless noted otherwise
2. ASTM A572, Grade 50

E. Hollow Structural Sections

1. Rectangular: ASTM A500, Grade B, Fy = 46 ksi.

2. Round, diameter equal to or less than 20 inches: ASTM A500, Grade B, Fy = 42 ksi.

F. Pipe, diameter equal to or less than 12 inches: ASTM A53, Grade B, Fy = 35 ksi.

G. Unheaded anchor rods: ASTM F1554, Grade 36 unless otherwise noted on structural drawings. Finish: Plain

H. Headed anchor rods: ASTM F1554, Grade 36 unless otherwise noted on structural drawings. Finish: Plain

I. Threaded Rods: ASTM A36/A36M

J. Shear connectors: ASTM A108, Grades 1015 through 1020, headed stud type, cold-finished carbon steel; AWS D1.1, Type B.

K. Fasteners: Conform to Section 05 05 23, Metal Fastenings.

L. Welding Electrodes: Conform to Section 05 05 23, Metal Fastenings.

M. Grout: Conform to Section 03 62 00, Non-Shrink Grouting.

2.02 SOURCE QUALITY CONTROL

A. Fabricator's Facility:

1. Select a fabricator certified by AISC. Submit certification in accordance with Article 1.03 herein.

2. Provide the Resident Engineer access to inspect the AISC-Certified Fabricator's shop or facility before the start of fabrication work. Notify the Resident Engineer in writing at least ten days before the scheduled start of fabrication work.

B. Calibration of Torque Wrenches:

1. Check the calibrating device for setting calibrated torque wrenches for accuracy using qualified personnel not more than 30 days prior to its first use on the work, and at intervals not more than six months thereafter.

2. Provide copies of calibration records to the Resident Engineer.

3. If the Resident Engineer has reason to question the accuracy of the calibrating device, the Contractor may be required to return it to the manufacturer for certification of its accuracy.


C. Correct deficiencies in work that test reports and inspections indicate does not comply with the contract documents.

D. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding.
PART 3 - EXECUTION

3.01 FABRICATION

A. Protected Zones: Members and parts of members defined as Protected Zones in the Drawings, shall not have connections made into the protected zones and shall not be modified or damaged as indicated below. Protected Zones occur at braced frames as indicated on the Drawings. Within the protected zones, the fabrication and erection shall prevent the following:

1. Discontinuities created by fabrication or erection operations, such as tack welds, erection aids, air-arc gouging and thermal cutting shall not be made.

2. Welded shear studs and decking attachments that penetrate the beam flange shall not be placed on beam flanges within the protected zone. Decking arc spot welds as required to secure decking shall be permitted.

3. Welded, bolted, screwed or shot-in attachments for perimeter edge angles, exterior facades, partitions, duct work, piping or other construction shall not be placed within the protected zones.

B. Conform to the applicable requirements of the AISC Code of Standard Practice for Steel Buildings and Bridges.

C. Conform to the requirements of Section 05 05 23, Metal Fastenings.

D. Prefabricate and preassemble steel members and metal fabrications in the factory or shop as far as practicable.

E. Form and fabricate the work to meet installation conditions. Include accessories to adequately secure the work in place.

F. Straighten rolled material, if necessary, before it is laid out for fabrication, in a manner conforming to the mill tolerances specified in ASTM A6, and by a process and in a manner which does injure the material. Sharp kinks and bends is cause for material rejection. Do not use heat shrunk low-alloy structural steel.

G. Perform shearing, flame cutting, and chipping carefully and accurately so as not to induce residual stress in the metal being cut. Hold the radii of re-entrant gas-cut fillets not less than 3/4 inch and as much larger as practicable. Perform flame cutting in such manner that metal being cut is not carrying stress.

H. At Station Entrances, Systems Raceways, Interior Soffit Framing and any Structural Steel Framing within 20 feet of public walking surfaces, cut edges exposed in the finished work, machine cut, shear, or flame cut, grind flush and remove burrs.

I. Maintain all working points.

J. At Station Entrances, Systems Raceways, Interior Soffit Framing and any Structural Steel Framing within 20 feet of public walking surfaces, grind exposed joints flush and smooth with adjacent surface. Make exposed joint butt tight, flush, and hairline. Ease exposed sheared edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

K. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.
L. Fabricate bearing stiffeners and stiffeners intended as supports for concentrated loads as indicated. Mill or grind bearing surfaces of these stiffeners.

M. Bend load-carrying cold-rolled steel plates cold at right angles to the direction of rolling. Bend such that the radius of bend, measured to the concave face of the metal, is not less than indicated in the following table, in which T is the thickness of the plate.

<table>
<thead>
<tr>
<th>ANGLE THROUGH WHICH PLATE IS BENT</th>
<th>MINIMUM RADIUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>61 to 120 degrees</td>
<td>1.0 T</td>
</tr>
<tr>
<td>121 to 150 degrees</td>
<td>2.0 T</td>
</tr>
</tbody>
</table>

1. If a shorter radius is indicated, bend the plate hot. Before bending, round plate edges where bending occurs to a radius of 1/16 inch.

N. Bolt or weld connections as indicated.

O. At Station Entrances, Systems Raceways, Interior Soffit Framing and any Structural Steel Framing within 20 feet of public walking surfaces, do not use screws or bolts wherever welding can be performed at connections. When bolts must be used at connections, countersink heads and draw up tight; nick threads to prevent loosening.

P. Unless specific visual acceptance criteria for Weld Show-Through are specified in the Contract Documents, the members or components shall be acceptable as produced. At Station Entrances, Systems Raceways, Interior Soffit Framing and any Structural Steel Framing within 20 feet of public walking surfaces, minimize Weld Show-Through where exposed to view through use of intermittent welds, selection of weld type (i.e., gas shield instead of arc), and heat dissipation techniques employed in the fabrication and assembly process.

Q. Visible welds at Station Entrances, Systems Raceways, Interior Soffit Framing and any Structural Steel Framing within 20 feet of public walking surfaces: All welds that are exposed to view at Station Entrances shall be visually acceptable if they meet the requirements in AWS D1.1, except all groove and plug welds that are exposed to view shall not project more than 1/16 inch [2 millimeters] above the exposed surface. In addition:

1. Finished or grinding of fillet welds shall not be necessary, unless such treatment is required to provide for clearance or fit of other components.

2. With the exception of neatly-formed fillet welds, grind all welds smooth and remove weld spatter at all surfaces exposed to view.

3. Seal continuous welds to close any open gaps.

4. Close all weld access holes at full penetration welds.

5. Unless otherwise indicated on the drawings, weld all shop connections.

6. Tack welds shall be ground smooth and holes shall be filled with weld metal, “bondo”, or body solder and smoothed by grinding or filing.

R. Drill or punch holes at right angles to the surface of the metal and do not make or enlarge by burning. Drill holes in base or bearing plates. Provide holes in members to permit connecting the work of other trades. Punch or drill holes at 1/16 inch larger than the diameter of the bolt.
S. For high-strength bolting, assemble joints and install bolts in accordance with AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts. High-strength bolting will be inspected by a qualified inspector employed and paid for by Sound Transit.

T. For items bearing on concrete, provide steel bearing plates and anchors as indicated. Level base or bearing plates by means of adjustment nuts. Furnish Templates, together with instructions for setting of anchors, anchor bolts, and bearing plates. Set anchors and related items properly in concrete during the progress of the work.

U. Fabricate metal bearing surfaces that contact preformed elastomeric bearing pads or grout flat to within 1/8-inch tolerance in 12 inches and to within 3/16 inch overall.

V. Include reinforcing angles, clip angles, plates, punched straps, brackets, and hangers as required to complete the work as indicated.

W. Provide drainage holes in structural components where water may accumulate without escape.

X. Erection marks or other painted marks shall not be made on those surfaces of weathering steel members that are to be exposed in the completed structure. Unless otherwise specified in the Contract Documents, clean weathering steel members to meet the requirements of the Society for Protective Coatings (SSPC-SP6).

Y. At Station Entrances, Systems Raceways, Interior Soffit Framing and any Structural Steel Framing within 20 feet of public walking surfaces, stamped or raised manufacturer's identification marks shall be filled, ground, or otherwise removed.

Z. Seams of hollow structural sections shall be acceptable as produced. Seams shall be oriented away from view or as directed in the Contract Documents.

AA. Welded Headed Stud Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of heads stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.02 ERECTION AND INSTALLATION

A. Protected Zones: Members and parts of members defined as Protected Zones in the Drawings, shall not have connections made into the protected zones and shall not be modified or damaged as indicated below. Protected Zones occur at braced frames as indicated on the Drawings. Within the protected zones, the fabrication and erection shall prevent the following:

1. Discontinuities created by fabrication or erection operations, such as tack welds, erection aids, air-arc gouging and thermal cutting shall not be made.

2. Welded shear studs and decking attachments that penetrate the beam flange shall not be placed on beam flanges within the protected zone. Decking arc spot welds as required to secure decking shall be permitted.

3. Welded, bolted, screwed or shot-in attachments for perimeter edge angles, exterior facades, partitions, duct work, piping or other construction shall not be placed within the protected zones.

B. Reference Standards: Erect and install structural steel in conformance with the applicable requirements of AISC Code of Standard Practice for Steel Buildings and Bridges. Hold a readiness review meeting held by the Resident Engineer after shop drawings and erection plans are approved.
C. Special Care: Use special care in unloading, handling, and erecting the structural steel materials to avoid marking or distorting the structural steel. Care shall also be taken to minimize damage to any shop paint. If temporary braces or erection clips are used, care shall be taken to avoid the creation of unsightly surfaces upon removal. Plan and execute all operations in such a manner that the close fit and neat appearance of the structure will not be impaired.

D. Lines and Levels: Install structural steel accurately at established lines and levels. Install steel plumb and level before bolting is commenced. Install in accordance with accepted shop drawings and actual conditions, true and horizontal or perpendicular as the case may be, level and square, with angles and edges parallel with related lines of the building.

E. Temporary Bracing: Provide temporary bracing as required and keep in position until final completion. Brace and carefully handle shop fabricated items subject to damage to prevent distortions or other damage. Properly brace all items installed before concrete is placed to prevent distortion by pressure of concrete. Watch and maintain bracing during concreting operations.

F. Bases and Bearing Plates: Support bases and plates that require grouting at the correct level by means of adjustment nuts on anchor bolts. Set bases and plates accurately using a high-strength, non-shrink grouting mortar as specified in Section 03 62 00, Non-Shrink Grouting. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surfaces of base and bearing plates. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain.

G. Erection and Assembly: After erection and field assembly, align the various members forming parts of the completed structure and adjust accurately before fastening. Conform tolerances to the applicable requirements of AISC Code of Standard Practice for Steel Buildings and Bridges.

H. Drift Pins: Drift pins may be used only to bring together several parts or components. Do not use fit-up bolts and drift pins to bring out-of-tolerance fabricated members and components into alignment. Do not use drift pins with such force as to distort or damage the material.

I. Gas Cutting: Do not use gas-cutting torch in the field for correcting fabrication errors on any major member. Use gas-cutting torch only on minor members, when the member is not under stress.

J. Bolting: Drive bolts accurately into holes without damaging the thread. Protect bolt heads from damage during driving. Place washers under all bolt heads and nuts. Reset bolt heads and nuts squarely against the washers.

K. High-Strength Bolting: Assemble joints in accordance with AISC Specifications for Structural Joints Using ASTM A 325 or A490 Bolts.

M. Welded Headed Stud Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of heads stud shear connectors according to AWS D1.1 and manufacturer’s written instructions.

3.03 FIELD QUALITY CONTROL

A. Torque-test field-assembled and installed high-strength bolting in accordance with AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts.

B. Allow Resident Engineer access to perform independent verification testing and inspection.

C. Correct deficiencies in work that test reports and inspections indicate does not comply with contract documents.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for furnishing and installing metal roof deck, composite metal floor deck, and accessories as indicated.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 03 15 25, Anchorage to Concrete
2. Section 05 05 23, Metal Fastenings
3. Section 05 34 23, Acoustical Metal Roof Decking

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

   a. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
   b. ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

2. Steel Deck Institute (SDI):
   a. SDI Publication No. 31, "Design Manual for Composite Decks, Form Decks, Roof Decks and Cellular Floor Deck with Electrical Distribution"

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Shop Drawings: Submit shop drawings showing:
   1. Dimensioned deck layout noting deck type, profile, and gage.
   2. Locations of and details for deck supports, laps, edges, and openings.
   3. Locations of and details for deck attachments.
   4. Locations of and details for deck accessories.

C. Manufacturer’s Product Data
1. Metal Deck
   a. Profiles, properties, load and shear capacities of each type, profile, and gage used.
   b. Accessories.
   c. Manufacturer’s written instructions for storage, handling, and application.

2. Galvanizing Repair Compound
   a. Manufacturer’s written instructions for storage, handling, and application.

D. Field Quality Control test and inspection reports.


1.04 PERFORMANCE REQUIREMENTS:

A. Minimum deck gages are shown on the Drawings and are based on 2-span, unshored conditions. Heavier deck gages may be required for conditions other than these, depending on manufacturer’s layout and contractor’s layout. Deck supplier shall verify deck gages and capacities based on actual deck layout and span condition. Deviations in deck gages from those shown shall be submitted to the Resident Engineer, along with a valid ICC-ES/IAPMO-ES report for approval, prior to shop detailing.

B. In lieu of increasing deck gages, deck shoring may be used at Contractor’s option.

1.05 QUALITY ASSURANCE:

A. Qualifications of Welders and Welding Procedures: Section 05 05 23, Metal Fastenings.

B. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI’s “North American Specification for the Design of Cold-Formed Steel Structural Members.”

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store and handle products in conformance with manufacturer’s written directions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Metal Roof and Composite Floor Deck
   1. ASC Steel Deck; Product; www.ascsd.com.
2.02 MATERIALS

A. Metal Roof Deck

1. Fabricate panels without top-flange stiffening grooves in conformance with SDI Publication 31 Specifications and Commentary for Steel Roof Deck.

2. Galvanized Sheet Steel: ASTM A653/AS53M, Structural Steel, Grade 33, G90 zinc coating.

3. Deck Type: profile, type, and gage as indicated.

B. Composite Metal Floor Deck:

1. Fabricate panels with integrally embossed or raised pattern ribs and interlocking side laps in conformance with SDI Publication 31 Specifications and Commentary for Steel Composite Steel Floor Deck.

2. Galvanized Sheet Steel: ASTM A653/AS53M, Structural Steel, Grade 33, G90 zinc coating.

3. Deck Type: profile, type, and gage as indicated.

C. Noncomposite Form Deck:

1. Fabricate ribbed-steel sheet noncomposite form-deck panels in conformance with SDI Publication 31 Specifications and Commentary for Form Deck.

2. Galvanized Sheet Steel: ASTM A653/AS53M, Structural Steel, Grade 33, G90 zinc coating.

3. Deck Type: profile, type, and gage as indicated.

D. Accessories:

1. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon steel screws, No. 10 minimum diameter.

2. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self threading screws.

3. Provide closures and flashings as indicated or required for complete and finished installation and as required to prevent leakage of concrete.

4. Provide cover caps for covering abutting ends where required.

5. Provide accessories and flashings of the same material and finish as the deck and no lighter than 22-gage. Use the deck manufacturer's standard type, galvanized accessories as follows:

   a. Adjusting plates or segments of deck units in locations too narrow to accommodate full-size units;

   b. End closures to close the open ends at openings through the roof, where units terminate at exterior walls, and other locations where required

   c. Sump pans at drains as indicated, fabricated from metal not lighter than 14 gage. For drains, cut holes in the field.

7. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, with factory-punched hole of 3/8-inch minimum diameter.

E. Welding Electrodes: Section 05 05 23, Metal Fastenings.

F. Welded Headed Studs: Section 03 15 25 Anchorage To Concrete.

G. Galvanizing Repair Compound: ASTM A780

2.03 FABRICATION

A. Metal Deck And Associated Metal Fabrications: SDI Publication No. 31.

B. Welding and Welded Connections: Section 05 05 23, Metal Fastenings.

C. Prefabricate and preassemble in the shop as far as practicable.

2.04 SOURCE QUALITY CONTROL

A. Testing and Inspection:

1. Materials, fabrications, and welding are subject to inspections in the shop. Perform testing using an approved independent testing laboratory.

2. Weld Inspection: Section 05 05 23, Metal Fastenings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Locate deck bundles to prevent overloading of supporting members.

B. Provide deck and accessories in conformance with the approved Shop Drawings.

C. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer’s written instructions, and requirements in this Section.

D. Place deck panels flat and square and fasten to frame without warp or deflection.

E. Do not stretch or contract side lap interlocks when placing.

F. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints butted.

G. Floor-Deck Closures: Weld steel sheet column closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

H. Fasten deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: 1/2 inch, effective.
2. Weld Pattern:
   a. Roof Deck: As indicated on Drawings.
   b. Floor Deck: As indicated on Drawings.

I. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches, and as follows:
   1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
   2. Mechanically clinch or button punch.

J. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
   1. Install reinforcing channels or zees in ribs to span between supports and weld.

K. Do not hang any mechanical systems, electrical systems, plumbing systems, architectural systems, etc. directly to roof deck that is not filled with concrete.

3.02 WELDING

A. Weld deck to supports in conformance with the approved Shop Drawings.

B. Procedures: Section 05 05 23, Metal Fastenings.

3.03 GALVANIZING REPAIR:

A. Repair galvanized surfaces damaged from welding, handling, or installation immediately after installation

B. Apply galvanizing repair compound in conformance with manufacturer’s written instructions.

C. Complete all galvanizing repair before concrete is placed.

3.04 FIELD QUALITY CONTROL

A. Inspect field welds and shear studs as specified in Section 05 05 23, Metal Fastenings.

B. Remove and replace work that does not comply with specified requirements.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:

1. Load-bearing, cold-formed steel studs for interior and exterior walls, stair framing and soffit framing as indicated on Drawings.

2. Cold-formed steel joist framing and bridging as indicated on the drawings, including but not limited to the areas listed below:
   a. Approved framing for AWP-1 as specified in Section 09 54 50, Specialty Metal Ceilings and Wall Panels.
   b. Approved framing for concrete unit veneer masonry supported by cold-formed wall stud metal framing as specified in Section 04 20 00, Unit Masonry.
   c. Approved support framing for stainless steel kiosks and ticketing walls specified in Section 05 75 00, Architectural Decorative Metal.
   d. Approved support framing for stainless steel escalator shrouds as specified in Section 05 75 00, Architectural Decorative Metal.
   e. Approved support framing for stainless steel bulkheads and soffits as specified in Section 05 75 00, Architectural Decorative Metal.
   f. Approved support framing for stainless steel panels at Elevator shafts as specified in Section 05 75 00, Architectural Decorative Metal.
   g. Approved support framing for MP-1 Wall panels as specified in Section 07 42 13, Metal Wall Panels.
   h. Approved support framing for interior tile walls as specified in Section 09 30 00, Tiling.
   i. Approved support framing for Cement Plaster Walls as specified in Section 09 24 23, Portland Cement Stucco.
   j. Approved supplemental framing, blocking or metal reinforcement as required to support electronic signage or information displays provided.
   k. Other miscellaneous cold-formed support framing as detailed on the Drawings.

B. Structural design of cold-formed steel framing system components of this Section.

C. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
1. Section 04 20 00, Unit Masonry: Concrete unit veneer masonry supported by cold-formed wall stud metal framing.

2. Section 05 05 23, Metal Fastenings: Fasteners and fastening methods for work of this Section.

3. Section 05 50 00, Metal Fabrications: Frames or members supporting work or materials of this Section.

4. Section 05 75 00, Architectural Decorative Metal: Miscellaneous items to be supported by work of this Section.

5. Section 07 42 13, Metal Wall Panels.


7. Section 09 30 00, Tiling.

8. Section 09 54 50, Specialty Metal Ceilings and Wall Panels.

9. Section 14 31 00, Escalators: Supporting structures for materials and work of this Section.

1.02 REFERENCES

A. This Section incorporates by reference the latest revision of following documents.

1. American Iron and Steel Institute (AISI)
   a. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute
   b. AISI SG-971 - Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute

   b. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   c. ASTM C 955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
   d. ASTM C 1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.

3. American Welding Society (AWS)
   a. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.

4. Society of Protective Coatings (SSPC)
a. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings.


1.03 SYSTEM DESCRIPTION

A. For ventilation shafts and plenums, design and size wall framing to withstand the following load requirements without damage or permanent set:

1. Positive Design Wind Load (inward): 48.0 pounds of force per square feet.

2. Negative Design Wind Load (outward): 53.0 pounds of force per square feet.

3. Positive Design Wind Load at Corners (inward): 48.0 pounds of force per square feet.

4. Negative Design Wind Load at Corners (outward): 60.0 pounds of force per square feet.

5. In addition to the above, design to resist flexural, shear, and torsional stresses caused by all loads in accordance with the current International Building Code, whichever load is the greater.

B. For exterior exposures, not associated with ventilation shafts and plenums, size and design wall framing to resist flexural, shear, and torsional stresses caused by all positive and negative wind loads in accordance with the current International Building Code, for wind criteria shown on the contract drawings.

C. For interior applications, not associated with ventilation shafts or plenums, design and size wall framing to withstand the following load requirements without damage or permanent set:

1. Differential pressures, positive or negative of 15.0 pounds of force per square feet.

2. In addition to the above, design framing to resist flexural, shear, and torsional stresses caused by all loads in accordance with the current International Building Code, whichever load is the greater.

D. Horizontal Deflection: Design to permit maximum deflection of 1/240 of span.

E. Vertical Deflection: Design non-axial load-bearing framing to accommodate not less than 1/4 inch vertical deflection.

F. Design wall system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.

G. Design wall framing system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

H. Design supplemental framing and furring applied to escalator assemblies and trusses to support stainless steel sheet cladding materials.

1. Coordinate with escalator assembly design documents as necessary.
2. Total dead load of sheet cladding and metal framing applied to escalator truss not to exceed 10 pounds per square foot of sheet metal surface.

I. Design supplemental framing, blocking or metal reinforcement as required to support electronic signage or information displays provided by others.

1. Obtain signage design dead loads form signage subcontractor.
2. Coordinate with electronic signage assembly design documents as necessary.

1.04 SUBMITTALS

A. Procedures: See Section 01 33 00, Submittal Procedures.
B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations and span tables.
C. Product Data: Provide manufacturer’s data on factory-made framing connectors, showing compliance with requirements.
D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
   1. Indicate stud and ceiling joist layout.
   2. Indicate furring and framing layout for escalator sheet metal shroud support.
   3. Describe method for securing studs to tracks and for bolted framing connections.
   4. Provide design engineer’s stamp, registered in Washington, on shop drawings.
E. Manufacturer’s Installation Instructions: Indicate special procedures, conditions requiring special attention, and any other instructions.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Washington.
B. For cold-formed steel-framed members and sizes that are not indicated on Drawings, refer to and comply with requirements found in General Structural Notes, Item 30, on Sheet S1.00 of Drawings; in addition to requirements of this Section.
C. Calculate structural properties of framing members in accordance with requirements of AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
D. Manufacturer: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.
E. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.
F. Design structural elements under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Washington.
G. Regulatory Requirements:
   1. Framing system shall meet the requirements of the jurisdictional code authorities.
   2. Furnish all calculations, engineer's stamps, drawings, and other items required by the code authorities to obtain approval of the installation.

1.06 PROJECT CONDITIONS
   A. Verify that field measurements are as indicated on the drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
   A. Metal Framing, Connectors, and Accessories:
      3. Telling Industries
      4. Unistrut Corporation http://unistrut.org

2.02 MATERIALS
   A. Framing System
      1. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.
   
   B. Framing Materials
      1. Studs and Track: ASTM C 955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
         a. Gage and depth: As required to meet specified performance levels.
         b. Galvanized in accordance with ASTM A 653/A 653M G90/Z275 coating.
      3. Framing Channels: Unistrut p-1000 HG used for OCS supports weighing less than 500 pounds.
   
   C. Fasteners
      1. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized in accordance with ASTM A 153/A 153M. Submit each type and size proposed for approval.
      2. Anchorage Devices: Powder-actuated fasteners by Hilti Co. or equal approved by Resident Engineer. Submit each type and size proposed for approval.
2.03 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

B. Plates, Gussets, Clips: Formed Sheet Steel, thickness determined for conditions encountered; finish to match framing components.

C. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Fasteners at Protected Zones

1. Do not fasten to Protected Zones of steel braced frames as defined in Section 05 05 23.

B. Studs

1. Install components in accordance with manufacturers’ instructions and ASTM C 1007 requirements.

2. Place studs at 16 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using clip and tie method.

3. Construct corners using minimum of three studs. Install double studs at wall openings and door and window jambs.

4. Install load bearing studs full length in one piece. Splicing of studs is not permitted.

5. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.


7. Install intermediate studs above and below openings to align with wall stud spacing.

8. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

9. Attach cross studs to studs for attachment of fixtures anchored to walls.
10. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

11. Install approved supplemental stud framing, blocking or metal reinforcement at cold-formed framing construction to support electronic signage or information displays provided by others.

12. Touch-up field welds and damaged galvanized surfaces with primer.

C. Soffit Joists

1. Install framing components in accordance with manufacturer's instructions.


3. Place soffit joists at 16 inches on-centers; not more than 2 inches from abutting walls. Connect joists to supports using fastener method.

D. Escalator Shrouds

1. Install shroud support components in accordance with manufacturers' recommendations and ASTM C 1007 requirements.

2. Place components at not more than 16 inches on center; not more than 2 inches from escalator assembly and at each side of openings. Connect studs to furring tracks using clip and tie method or other method as approved by Resident Engineer.

3. Coordinate with escalator assembly design documents and field conditions as necessary.

4. Install cross-framing between framing studs for attachment of mechanical and electrical or other items, and to prevent stud rotation.

3.03 FIELD QUALITY CONTROL

A. Erection Tolerances

1. Maximum Variation from True Position: 1/4 inch.

2. Maximum Variation of any Member from Plumb: 1/8 inch in 10 feet.

3. Maximum Variation of any Member from Level: 1/8 inch in 10 feet.

END OF SECTION
SECTION 05 43 21
METAL STRUT FRAMING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for final engineering (delegated design), furnishing and installing continuous slot, bolted metal framing channels and all associated fittings and hardware.

1. Support framing for miscellaneous items.
2. Trapeze type supports for cable tray, conduit, pipe and other similar systems.
3. Bolted metal framing as a surface metal raceway.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 03 15 25 Anchorage to Concrete.
2. Section 26 05 26 Grounding and Bonding.
   a. Electrical grounding required for metal strut framing located within 15-foot radius of centerline of track.

1.02 REFERENCES

A. This Section incorporates by reference the latest revision of the following documents.

1. American National Standard (ANSI)
   a. ANSI/NFPA 70– National Fire Protection Association (National Electrical Code)

2. American Iron and Steel Institute (AISI)
   a. AISI Specification for the Design of Cold-Formed Steel Structural Members

3. American Society for Testing and Materials International (ASTM)
   a. ASTM A653, General Requirements for Steel Sheet, Zinc-Coated Galvanized by the Hot-Dip Process
   b. ASTM A1008, Specification for Steel, Sheet and Strip, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
   c. ASTM F1136, Standard Specification for Chromium/Zinc Corrosion Protective Coatings for Fasteners
d. ASTM A907 - Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot-Rolled, Structural Quality

e. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel

4. Metal Framing Manufacturers Association (MFMA)
   a. MFMA-4, "Metal Framing Standards Publication"
   b. MFMA-103, Guidelines for the Use of Metal Framing; Metal Framing Manufacturers Association

B. SSPC: The Society for Protective Coatings:
   1. SSPC-SP 6/NACE No. 3: Commercial Blast Cleaning

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Submit on strut channels including, but not limited to, types, materials, finishes, gauge thickness, and hole patterns. For each different strut cross-section, submit cross-sectional properties including Section Modulus ($S_x$) and Moment of Inertia ($I_x$).

C. Shop Drawings: Submit drawings of strut and accessories including clamps, brackets, hanger rods, and fittings.

D. Calculations: Submit calculations stamped by a Professional Engineer licensed in the State of Washington for struts and accessories demonstrating adequacy to support imposed loads. At a minimum, include the following:
   1. Design Criteria
   2. Selection of framing members, fittings and accessories
   3. Stress and deflection analysis
   4. Reactions and imposed loads transmitted to primary structure.

1.04 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in the manufacture of bolted metal framing of the types required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Engineer: Select a licensed structural engineer currently registered in the state of Washington as a Professional Engineer.

C. MFMA Compliance: Comply with the latest revision of MFMA Standards Publication Number MFMA-4.

D. NEC Compliance: Comply with the latest revision NFPA 70 - Article 352 "Surface Metal Raceways and Surface Nonmetallic Raceways".

E. Bolted framing channels and fittings shall have the manufacturer’s name, part number, and material heat code identification number stamped in the part itself for identification.
Material certification sheets and test reports must be made available by the manufacturer upon request.

F. Pre-Installation Conference: Comply with requirements specified in Section 01 31 19, "Project Meetings".

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver strut systems and components carefully to avoid breakage, denting, and scoring finishes. Do not install damaged equipment.

B. Store strut systems and components in original cartons and in clean dry space; protect from weather and construction traffic.

1.06 METAL STRUT FRAMING SYSTEM DELEGATED DESIGN REQUIREMENTS

A. Meet the following criteria:


2. American Iron and Steel Institute (AISI) Specification for the Design of Cold-Formed Steel Structural Members, latest edition

3. Manufacturer’s published design criteria

4. For the strut system at the ceiling of the station platform, design the system to support the following loads:

a. Gravity Loads: Strut system self-weight, plus the greater of the following:

   1) Uniform load of 10 pounds per square foot.

   2) Uniform load of 5 pounds per square foot, plus a concentrated load of 500 pounds located to produce the maximum stress in the element being designed.

   3) Actual weights of supported elements.

b. Seismic loads generated by the masses of the specified gravity loads.

   1) Seismic loads in the path of exiting will be designed with an importance factor of 1.5

5. For Metal Strut Framing Systems used for locations other than at the station platform ceiling, as indicated on the drawings, design the systems to support the following loads:

a. Gravity Loads: Strut system self-weight, plus the greater of the following:

   1) A concentrated load of 250 pounds located to produce the maximum stress in the element being designed.

   2) Actual weights of supported elements.

b. Seismic loads generated by the mass of the system self-weight plus the actual weights of the supported elements.
1) Seismic loads in the path of exiting will be designed with an importance factor of 1.5

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with these specifications, strut systems to be installed shall be as manufactured by
   1. Cooper B-Line, Inc.
   2. Flex-Strut, Inc.
   3. Powerstrut Corp.
   4. Thomas & Betts Corp
   5. Unistrut Division of Tyco, Inc.
   6. Unitron Products, Inc.

2.02 STRUT CHANNELS AND COMPONENTS

A. Slotted Channel Framing: 1-5/8 inch wide cold-formed metal channels with continuous slot complying with MFMA-4.

B. Material: Steel complying with ASTM A 1008/A 1008M, commercial steel, Type B; 0.0677-inch minimum thickness.

C. Finish:
   1. For all channels and components other than concrete inserts, one of the following:
      a. Flat black polyester powder coat.
      b. Flat black epoxy coating.
   2. For concrete inserts: Pre-galvanized zinc complying with ASTM A653.

2.03 FASTENERS

A. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563 ; and, where indicated, flat washers.

B. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

2.04 FINISH

A. Preparation:
1. Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

2. Treat prepared metal with iron-phosphate pretreatment, rinse, and seal surfaces.

B. Finish all components except fasteners with flat black coating; manufacturer's option of the following:

1. Powder coat: Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils

2. Epoxy: Apply epoxy primer and topcoats to surfaces. Apply at spreading rates recommended by coating manufacturer.

2.05 FABRICATION, GENERAL

A. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

B. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

C. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

C. Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

D. Install strut in accordance with MFMA-103; in accordance with equipment manufacturer's recommendations, and with recognized industry practices

E. Tighten nuts and bolts to the following values:
<table>
<thead>
<tr>
<th>Bolt Size</th>
<th>Torque (ft-lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4 - 20</td>
<td>6</td>
</tr>
<tr>
<td>5/16 - 18</td>
<td>11</td>
</tr>
<tr>
<td>3/8 - 16</td>
<td>19</td>
</tr>
<tr>
<td>1/2 - 13</td>
<td>50</td>
</tr>
</tbody>
</table>

3.02 FINISH REPAIR

A. Clean and touch up drilled holes, cuts, and minor abrasions in finishes with air dried coating that matches color and gloss of, and is compatible with the factory-applied finish coating.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for, but is not limited to: all miscellaneous shop-fabricated ferrous metal and aluminum work indicated or otherwise required to complete the work, except as otherwise indicated.

B. Shop-fabricated steel, aluminum, and other miscellaneous metal items, including:
   1. Shop-fabricated elevator pit steel ladders as detailed or indicated on Drawings
   2. Loose bearing and leveling plates
   3. Framing and supports for:
      a. Overhead Coiling Doors
      b. Overhead Coiling Grilles
      c. Elevator sills, and guide rail supports
      d. Applications not specified in other Sections
   4. Miscellaneous steel trim.
   5. Canopies.
   6. Trench Drain Body
   7. Metal Nosings  Applicable for N140; Not applicable for N150

C. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 03 30 00, Cast-in-Place Concrete: Placement of metal fabrications in concrete.
   2. Section 03 45 00, Precast Architectural Concrete:
   3. Section 03 62 00, Non-Shrink Grouting.
   4. Section 04 20 00, Unit Masonry: Placement of metal fabrications in masonry.
   5. Section 05 05 13, Shop Applied Coatings for Metal: Coatings for ferrous metal fabrications including galvanizing and shop primer.
   6. Section 05 05 14: Fluoropolymer Coatings: Coatings for aluminum fabrications.
   7. Section 05 05 23, Metal Fastenings.
8. Section 05 12 00, Structural Steel Framing.
9. Section 05 51 00, Metal Stairs.
10. Section 05 51 33, Metal Ladders.
11. Section 05 52 00, Metal Railings.
12. Section 05 53 31, Steel Gratings.
13. Section 05 75 13, Architectural Decorative Metal.
14. Section 06 10 00, Rough Carpentry.
15. Section 08 33 23, Overhead Coiling Doors.
16. Section 08 33 26, Overhead Coiling Grilles.
17. Section 08 56 29, Heat Resistive Window Wall System
18. Section 08 91 00, Louvers: Fabricated supports for louvers.
19. Section 09 90 00, Painting and Coating: Paint finish.
20. Section 09 96 00, High-Performance Coatings.
21. Section 11 24 29, Facility Fall Protection.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Architectural Manufacturers Association (AAMA)

g. ASTM A 325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2005.
h. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2003a.
i. ASTM A 653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009.

3. American Welding Society (AWS)

4. Military Specifications (MIL)
a. MIL-C-882E - Military Specification, Cloth, Duck, Cotton or Cotton-Polyester Blend, Synthetic Rubber, Impregnated, and Laminated, Oil Resistant.

B. Performance Requirements

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Provide data on manufactured products; describe materials and finish, product criteria, limitations.

C. Bearing Material and Assemblies: Provide manufacturer’s data demonstrating conformance with these Specifications. Provide manufacturer’s written directions for fabricating, shipping, storing, and protecting bearing assemblies.

D. The submission of metal product data is to be in conjunction with the painting and coating or high-performance coating submittals that are to be used to paint or coat the metal in...
order to confirm that the shop applied steel primer is compatible with the intermediate coat and final paint coats. This submittal will not be considered complete and acceptable if either product is not compatible with each other.

E. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Provide templates for anchors and bolts specified for installation under other sections.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

F. Calculations: Submit structural calculations sealed by a Professional Engineer registered in the State of Washington showing that the railings and their connections meet the structural performance requirements identified in the Section.

G. Certifications:

1. Welders and welding procedures: Submit certifications as specified in Section 05 05 23, Metal Fastenings.

1.04 QUALITY ASSURANCE

A. Fabricator: Company specializing in manufacturing the types of products specified in this section, and with minimum five years of documented experience.

B. Installer: Company specializing in performing the work of this section with minimum four years of experience.

C. See Section 05 05 23, Metal Fastenings for requirements for welders, welding procedures, and inspections.

D. Design Metal Fabrications under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Washington. Include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the engineer.

1.05 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction work which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication, delivery and installation schedule with construction progress to avoid delay of work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction with work of other trades to ensure that actual dimensions correspond to guaranteed dimensions. Allow for fitting and trimming.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metal Surfaces
1. For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.

B. Steel

1. Steel Sections: ASTM A 36/A 36M.
2. Rolled Steel Floor Plates: ASTM A 786
3. Wire Rod for Grating Cross Bars: ASTM A 510
4. Steel Tubing: ASTM A 500, Grade B cold-formed structural tubing.
5. Uncoated Steel Sheet: Commercial quality, cold rolled sheet in accordance with ASTM A 366. Hot rolled sheet in accordance with ASTM A 569.
6. Galvanized Steel Sheet:
   a. Structural Quality: ASTM A 446, Grade A with G90 coating unless noted otherwise.
   b. Commercial Quality: ASTM A 526, G90 coating unless noted otherwise
11. Malleable Iron Castings ASTM A 47, Grade 32510
12. Brackets, Flanges, and Anchors: Cast or formed of the same type material and finish as supported rails, unless otherwise indicated.
13. Concrete inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron (ASTM A 47) or cast steel (ASTM A 27). Provide bolts, washers, and shims as required, hot-dip galvanized in accordance with ASTM A 153.
14. Fasteners: As indicated and specified herein.
15. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, galvanized to ASTM A 153/A 153M where connecting galvanized components.
16. Welding Materials: AWS D1.1; type required for materials being welded.

C. Stainless Steel

1. Bar Stock: ASTM A 276, Type 316. Type 316 Active for exterior applications.
2. Plate: ASTM A 167, Type 302 or 316 Type 316 active for exterior applications.
3. Rolled Shapes: ASTM A 276, Type 316. Type 316 Active for exterior applications.

4. Finishes: All exposed stainless steel to be No. 4: Brushed Finish.

D. Aluminum

3. Welding Materials: AWS D1.1; type required for materials being welded.

E. Grout and Anchoring Cement

1. Non-shrink-non-metallic Grout: Specified in Section 03 62 00, Non-Shrink Grouting.
2. Erosion-Resistant Anchoring Cement: Factory prepackaged, non-shrink, non-staining, hydraulic controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.
   a. Interior Anchoring Cement:
      1) Bonsal Anchor Cement, W. R. Bonsal Co.
      2) Por Rok, Minwax Construction Products Division
      3) Approved equal
   b. Erosion Resistant Anchoring Cement:
      1) Super Por Rok. Minwax Construction Products Division
      2) Approved equal

F. Fasteners

1. Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
2. Bolts and Nuts: Regular hexagon head type ASTM A 307 Grade A.
3. Lag Bolts: Square Head type: FS FF-B-561.
5. Wood Screws: Flat head carbon steel FS FF-S-111
6. Plain Washers: Round, carbon steel FS FF W 92
7. Expansion Anchors: Expansion anchors to concrete shall meet the requirements of Section 03 15 25.

G. Metal Nosings: Applicable for N140; Not applicable for N150
1. Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.

2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above aluminum extrusion.

3. Nosings: Two-piece units, 3 inches wide, with subchannel for casting into concrete steps and replaceable abrasive filler.

4. Aluminum finish: Mill.

5. Abrasive color: Black.

6. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

H. Apply clear lacquer to concealed surfaces of extruded units. Paint:

1. Bituminous paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

2. Shop Primer for Steel Fabrications: Specified in Section 05 05 13, Shop Applied Coatings for Metal.

I. Concrete Fill and Reinforcing

1. Comply with Section 03 30 00, Cast-In-Place Concrete, for normal weight ready-mix concrete with minimum 28-day compressive strength of 3,000 pounds per square inch.

2. Non-slip aggregate finish: Factory graded, packaged material containing fused aluminum oxide grits or crushed emery as abrasive aggregate; rust-proof and non-glazing; unaffected by freezing, moisture, or cleaning materials.

3. Reinforcing Bars: ASTM A 615 Grade 60. Reinforcing bars shall meet the requirements of Section 03 20 00.

J. Fabricated Items

1. Rough Hardware: Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Section 06 10 00, Rough Carpentry. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2. Nosings: Fabricate curb and dock edge nosings from structural steel shape as indicated, of all welded construction with mitered corners and continuously welded joints. Provide anchor welded to nosings for embedding in concrete or masonry construction, spaced not more than 6 inches from each curb end, 6 inches from corners and 24 inches on center, unless otherwise indicated. Provide galvanized nosings at all exterior locations and at interior locations as indicated.
3. Loose bearing and leveling plates: Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

4. Miscellaneous Framing and Supports: Provide steel framing and supports for applications indicated or which are not a part of the structural steel framework, as required to complete work. Coordinate with other trades for scope. Fabricate units to sizes, shapes, and profiles indicated or required to receive adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Galvanize miscellaneous framing and supports at all exterior locations and at indicated interior locations.

5. Miscellaneous Steel Trim: Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other work.

6. Ladders Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; Support at top, bottom, and 5 feet 0 inches on center intermediate points by means of welded or bolted brackets. Extend side rails 42 inches above top rung, and return rails to wall or structure, unless other secure hand holds are provided.
   a. Side Rails: 1/2-inch by 2-1/2 inch-members spaced at 18 inches apart.
   b. Rungs: one inch diameter solid round bar spaced 12 inches on center.
   c. Space rungs 7 inches from wall surface.

7. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking, joists, and masonry; prime paint finish. Fabricated from sizes indicated and for attachment to concrete framing. Provide slotted holes to receive 3/4 inch bolts, space not more than 6 inches from ends and not more than 24 inches on center, unless indicated otherwise. For cavity walls, provide vertical channel brackets to support shelf and relief angles from backup masonry and concrete. Align expansion joints in angles with indicated expansion joints in masonry and concrete. Galvanize shelf angles to be installed on exterior concrete framing. Furnish wedge-type inserts, with fasteners for attachment of shelf angles to cast-in place concrete.

8. Lintels: Provide as scheduled in General Structural Notes with shop prime paint finish on stainless steel. Provide loose structural stainless steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form single units where indicated. Size loose lintels for equal bearing of one inch per foot of clear span, but not less than 8 inches bearing at each side of each opening, unless otherwise indicated.

9. Door Frames for Overhead Door Openings, Wall Openings, and other Openings as detailed: Channel, angles and HSS sections; galvanized finish.
10. **Elevator Hoistway Beams**: Beam sections as indicated; prime paint finish.

11. **Steel Pipe Railings and Handrails**: See Section 05 52 00, Metal Railings for requirements.

12. **Other fabricated items as required or detailed on Drawings**: See Schedule at end of this Section.

**K. Cold-Formed Channel**

1. **Material**: ASTM A 1101 SS Grade 33 or ASTM A 653 SS, Grade 33, mill galvanized in conformance with coating designation G90.

2. **Shape**: 1 5/8” x 1 5/8” x 12 gage.

**L. Bearing Materials**

1. **PTFE**: ASTM D 4894 or ASTM D 4895, 100% virgin (unfilled) polytetrafluorethylene

2. **Elastomeric Bearing Pad**: MIL-C-882E

3. **Stainless Steel**: Type 316 ASTM A 167 or A 264

4. **Mounting Plates**: ASTM A 36

5. **Neoprene Bearing Pad**: ASTM D 4014, Shore A Durometer hardness of 70

**2.02 FABRICATION**

**A.** Form metal fabrications from materials of size, thickness, and shapes indicated but not less than sizes required to comply with performance requirements indicated. Work to dimensions indicated, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

**B.** Form exposed work true to line and level with accurate angles and surfaces and straight, sharp edges.

**C.** Allow for thermal movement resulting from the following maximum change in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

1. **Temperature Change (Range)**: 100 degrees F

**D.** Shear and punch metals cleanly and accurately. Remove burrs.

**E.** Ease exposed edges to a radius of approximately 1/32 inch unless otherwise indicated. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.

**F.** Remove sharp or rough areas on exposed traffic surfaces.

**G.** Weld corners and seams continuously to comply with AWS recommendations and the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

5. On all steel members exposed to exterior, weld all joints and seams continuously all around to prevent moisture penetration of joints or seams.

H. Fit and shop assemble items in largest practical sections, for delivery to site. Minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

I. Fabricate items with joints tightly fitted and secured.

J. Continuously seal joined members by intermittent welds and plastic filler.

K. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

L. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

M. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

N. Fabrication Tolerances
   1. Squareness: 1/8 inch maximum difference in diagonal measurements.
   5. Maximum Deviation from Plane: 1/16 inch in 48 inches.

2.03 BEARING ASSEMBLIES

A. PTFE: Bond to recessed mounting plate in conformance with manufacturer's written directions.

B. Stainless Steel: Provide 8 microinch RMS finish on face in contact with PTFE. Bond to mounting plate in conformance with manufacturer's written directions.

C. Elastomeric Bearing Pad: Bond to mounting plates in conformance with manufacturer's written directions.

D. Finish: Finish bearing assemblies in conformance with manufacturer's written directions.
2.04 FINISHES

A. Steel: See Section 05 05 13, Shop Applied Coatings for Metal.
   1. Hot-dip galvanize all steel fabrications not scheduled for a paint finish unless noted otherwise.
   2. Primer paint finish is required at all other steel surfaces.

B. Aluminum: See Section 05 05 14, Fluoropolymer Coatings.
   1. High Performance Organic Coating System: AAMA 2604 multiple coat, thermally-cured fluoropolymer system; color as selected from manufacturer's standard colors.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.
   1. Check elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 ERECTION

A. Tolerances
   1. Maximum Variation from Plumb: 1/4 inch per story, non-cumulative.

3.04 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connections as required.

C. Perform cutting, drilling, and fitting required for installation of metal fabrications. Set metal fabrications accurately in location, alignment and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

F. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

G. Coat concealed surfaces of aluminum, steel and stainless steel that will come into contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

H. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

   1. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout. Use non-metallic non-shrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

J. Install items plumb and level, accurately fitted, free from distortion or defects.

K. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

L. Perform field welding in accordance with AWS D1.1.

M. Bearing Assemblies:
   1. Install bearing assemblies in conformance with manufacturer’s written directions.
   2. Protect bearing assemblies until all Work is complete in conformance with manufacturer’s written directions.

N. Obtain written approval from Resident Engineer prior to site cutting or making adjustments not scheduled.
3.05 ADJUSTING
A. Obtain approval prior to site cutting or making adjustments not scheduled.

3.06 CLEANING
A. After erection, clean field welds, abrasions, and surfaces not shop primed or galvanized, in accordance with Section 05 05 13, Shop Applied Coatings for Metals.

3.07 SCHEDULES
A. The following list of metal fabrications and finishes are examples of what would be found in this section:

1. Elevator pit ladders: galvanized finish only
2. Elevator sill supports: shop-primed finish
3. Steel pipe bollards: galvanized and painted finish
4. Overhead equipment supports: galvanized or shop-primed finish where scheduled.
5. Supports for overhead coiling grills: galvanized finish only - N150; Shop primed and painted finish - Applicable for N140
6. Steel tube supports for HM doors: galvanized and painted finish – N150; Shop primed and painted finish – Applicable for N140
7. Trench Drain Body: galvanized finish only
8. Metal Nosings: extruded aluminum Applicable for N140

END OF SECTION
1.01 SUMMARY
   A. This Section includes Specifications for steel stairs with poured-in-place concrete pan treads and landings; structural steel stair framing and supports; steel pan landings to receive concrete fill; and specifies engineering design of fabricated stairs and components.

1.02 RELATED SECTIONS
   A. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

   1. Section 03 05 15, Portland Cement Concrete
   2. Section 04 20 00, Unit Masonry
   3. Section 05 05 23, Metal Fastenings
   4. Section 05 05 13, Shop Applied Coatings for Metal
   5. Section 05 12 00, Structural Steel Framing and Section 03 45 00, Precast Architectural Concrete
      a. Stair Numbers 5 and 6
   6. Section 05 50 00, Metal Fabrications
   7. Section 09 06 00, Schedule for Finishes
   8. Section 09 90 00, Painting and Coating: Primer touch up and finish painting.

1.03 REFERENCES
   A. This Section incorporates by reference the latest revisions of the following documents.

   1. American Society for Testing and Materials International (ASTM)
      a. ASTM A36/A36M Standard Specification for Carbon Structural Steel
      b. ASTM A53/A 53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
1.04 SYSTEM DESCRIPTION

A. Design and fabricate stair system from steel or aluminum to support a uniform live load of 100 pounds per square foot (lb/sq ft) and a concentrated load of 300 pounds (lb). Deflection of treads, stringers or landing framing shall not exceed 1/360 of span under design live loading.

B. Stair systems shall include stairs, landings, handrails, guardrails, nosings, floor edge channels or angle, and all supports and anchors to adjacent construction. Handrails as indicated on Drawings. Where handrails are attached to walls, include metal backing within walls.

C. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
D. Design details indicated may be modified by the fabricator subject to the specified requirements.

E. Fabricate metal stairs to comply with NAAMM AMP 510, Class: Architectural.

F. Floor construction, as indicated on the Contract Drawings, includes bearing capacity to support steel stairs and design live loading, except for slab edge supports which are to be provided under the work of this Section. Stair system shall accommodate the surrounding construction indicated. All modifications to structure as required to support or otherwise accommodate the design/build stairs shall be the responsibility of the Contractor. Changes in dimension or location of finish surfaces indicated are subject to prior approval by Resident Engineer.

G. Railing Reactions:
   1. Railing attachments shall be capable of resisting a force of 200 lbs at all points in any direction without damage or permanent set.
   2. Railing attachments shall be capable of resisting a force of 50 lbs per lineal foot in any direction without damage or permanent set.

H. Interior stair treads, nosings, and landing surfaces shall be concrete-filled steel pans or shop-cast concrete treads as indicated and detailed on Contract Drawings. Risers shall have closed design as detailed. Exterior treads and landings shall be concrete as detailed or indicated on Contract Drawings.

I. Regulatory Requirements:
   1. Pre-engineered Metal Stairs shall meet the requirements of the Seattle Building Code and WISHA requirements for service stairs.
   2. Furnish all calculations, engineer's stamps, drawings, and other items required by the code authorities to obtain approval of the installation.

1.05 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Shop drawings for bidder-designed elements shall include stamp or seal of a Professional Engineer registered in the State of Washington on each sheet of the shop drawings.

C. Delegated Design Data: As required by Seattle Department of Planning and Development (DPD).

D. Certifications:
   1. Welders and welding procedures: Submit certifications as specified in Section 05 05 23, Metal Fastenings.

E. Closeout Submittal:
1. Submit certification by the registered Professional Engineer responsible for this work that all products and all installations for bidder-engineered metal stair items comply with all design requirements.

1.06 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State of Washington, or personnel under direct supervision of such an engineer.

B. See Section 05 05 23, Metal Fastenings for requirements for welders, welding procedures, and inspections.

C. Testing and Inspection: All metal fabrications are subject to special inspection as specified in Section 01 45 00, Quality Control.

D. Regulatory Requirements:


2. Furnish all calculations, engineer's stamps, drawings, and other items required by the code authorities to obtain approval of installations.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Metal Stair and Stair Tower Fabricators:

1. The Sharon Companies Ltd. (Medina OH; 330-723-3225).

2. American Stair Corporation (Romeoville, IL; 800-872-7824).

3. O'Keeffe's, Inc. (San Francisco, CA; 415-822-4222).

4. Substitutions: See Section 01 60 00, Product Requirements.

2.02 DESIGN-BUILD METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.

1. Regulatory Requirements: Provide stairs complying with the most stringent requirements of local, State, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the Contract Documents.

2. Structural Design: Provide complete stair assemblies complying with the following:

a. Stair Capacity: Uniform live load of 100 lb/sq ft and a concentrated load of 300 lb with deflection of stringer or landing framing not to exceed 1/360 of span for live loads.

b. Seismic importance factor for stairs is 1.25.

4. Shop-assemble components; disassemble into largest practical sections suitable for transport and access to site.

5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.

6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:

1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
   a. Welded Joints: Continuously welded and ground smooth and flush.
   b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
   c. Exposed Edges and Corners: Eased to small uniform radius.
   d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.

2. Service: Exposed joints tight with face surfaces aligned; underside of stair not covered by soffit is not considered exposed to view.
   a. Welded Joints: Welded on back side wherever possible.
   b. Welds Exposed to View: Ground smooth; not required to be flush.
   c. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts or screw threads.
   d. Metal Surfaces to be Painted: Sanded smooth, suitable for satin or matte finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.03 METAL STAIRS WITH CONCRETE PAN TREADS

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: Closed.

C. Metal Pan Treads: Metal pan with field-installed concrete fill.
   1. Concrete Depth: 2 inches, minimum.
   2. Tread Pan Material: Steel sheet.
   3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum.
   4. Pan Anchorage to Stringers: Continuously welded, from top or bottom.
5. Concrete Reinforcement: Welded wire mesh.

6. Concrete Finish: Steel-troweled.

D. Risers: Same material and thickness as tread pans.
   1. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.
   2. Nosing Depth: Not more than 1-1/2 inch overhang.
   3. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.

E. Stringers: Hot-Rolled steel channels or plates.
   1. Stringer Depth: As indicated on Contract Drawings but not less than 12 inches.
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Same metal pan construction as treads, supported and reinforced as required to achieve design load capacity.

G. Under-Side of Stair: Where exposed to view, to be finished same as specified for other exposed to view surfaces.

2.04 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Plates: ASTM A283.

C. Ungalvanized Steel Sheet: ASTM A1008/A1008M, Designation SS, Grade 33, Type 1.

D. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G40/Z120 coating.

E. Gratings: Bar gratings complying with NAAMM MBG 531 or NAAMM MBG 532, whichever applies based on bar sizes.

F. Concrete Fill: Minimum 28-day compressive strength of 3,000 psi as specified in Section 03 05 15, Portland Cement Concrete.

G. Concrete Reinforcement: Mesh type as specified in Section 03 20 00, Concrete Reinforcing.

H. Steel Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.

I. Welding Materials: AWS D1.1; type required for materials being welded.

2.05 SHOP FINISHING

A. Shop finishing of ferrous metal items is specified in Section 05 05 13, Shop Applied Coatings for Metal. No shop finishing, other than cleaning is required for aluminum items.
2.06 COMPONENTS
A. Metal Pan Stair Treads: Concrete in metal pan; 2 inches deep; smooth surface; non-slip edge.

2.07 FABRICATION - GENERAL
A. Fit and shop assemble components in largest practical sections, for delivery to site.
B. Fabricate components with joints tightly fitted and secured.
C. Continuously seal joined pieces by intermittent welds and plastic filler (bondo).
D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
G. Fabricate components accurately for anchorage to each other and to building structure.

2.08 FABRICATION - PAN STAIRS AND LANDINGS
A. Fabricate interior stairs and landings with closed risers and treads of metal pan construction using ungalvanized steel sheet, ready to receive concrete.
B. Fabricate exterior stairs and landings with closed risers and treads of metal pan construction using galvanized steel sheet, ready to receive concrete.
C. Form treads and risers with minimum 18 gage sheet steel stock.
D. Secure reinforced tread pans to stringers with clip angles; welded in place.
E. Form stringers with hot-rolled steel channels, 12 inches deep. Weld fascia plates to channels using 14 gage steel sheet across channel toes.
F. Form landings with minimum 18 gage sheet stock. Reinforce underside with angles to attain design load requirements.

PART 3 - EXECUTION

3.01 EXAMINATION
A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION
A. When field welding is required, clean and strip primed steel items to bare metal.
B. Supply items required to be cast into concrete and embedded in masonry with setting templates.
3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on Contract Drawings. Perform field welding in accordance with AWS D1.1.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset from True Alignment: 1/4 inch.

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 05 51 33
METAL LADDERS

PART 1 - GENERAL

1.01 SUMMARY
A. Section includes:
   1. Interior aluminum hatch ladder.
B. Related Sections:
   1. Section 05 12 00 – Structural Steel Framing.
   2. Section 05 50 00, Metal Fabrications

1.02 REFERENCES
A. This Section incorporates by reference the following documents.
   1. American Welding Society
      a. AWS A2.4 – Standard Symbols for Welding, Brazing, and non-destructive examination.

1.03 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
C. Shop Drawings: Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
D. Design Data: Submit design calculations.

1.04 FIELDS REQUIREMENTS
A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.01 MANUFACTURER
A. Precision Ladders, LLC, Morristown, Tennessee. Phone: 1-800-225-7814
C. Substitutions: Section 01 25 00, Substitution Procedures.
2.02 HATCH LADDER

A. Materials:

   1. Stringers (Side rail):
      a. Aluminum channel. (6005-T5)
      b. 2 ½” x 1 1/16” x 1/8”
      c. 1/8” molded polyurethane safety cap at top.
      d. Outside width of the ladder: 24”

   2. Treads:
      a. Extruded aluminum (6005-T5)
      b. 2 1/4” x 3/4” x 1/4”
      c. Treads deeply serrated for safety.

   3. Mounting Brackets:
      a. 8 ½ ” x 4 ½ ” x 3” x 1/4” aluminum angles.
      b. Floor mounting brackets.

   4. Safety Post:
      a. LadderUP, Aluminum Model LU-4, as manufactured by The Bilco Company.
      b. Substitutions: Section 01 25 00, Substitution Procedures.

2.03 FABRICATION

A. Fit and shop assemble components in largest practical sections, for delivery to site.

B. Fabricate components with joints tightly fitted and secured.

C. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as ladder fabrication, except where specifically noted otherwise.

2.04 FINISH

A. Mill finish.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify field conditions are acceptable and are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer’s written instructions.
3.03 CONSTRUCTION

A. Section 01 43 00 – Quality Assurance: Tolerances.

B. Maximum Offset From Alignment: 1/4 inch.

END OF SECTION
SECTION 05 52 00
METAL RAILINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Delegated engineering design of metal railings.
   2. Stair railings and guardrails as detailed on Drawings.
   3. Wall-mounted handrails.
   4. Free-standing railings at steps and level floors.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 03 30 00, Cast-in-Place Concrete: Placement of anchors in concrete
   2. Section 04 20 00, Unit Masonry: Placement of anchors in masonry
   3. Section 05 05 23, Metal Fastenings
   4. Section 05 51 00, Metal Stairs
   5. Section 05 40 00, Cold-Formed Metal Framing: Placement of backing plates in stud wall construction
   6. Section 09 90 00, Painting and Coating: Finish for Interior Handrails and Guardrails.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

   1. American Society for Testing and Materials International (ASTM)
      c. ASTM A 554: Specification for Welded Stainless Steel Mechanical Tubing
1.03 DESIGN REQUIREMENTS

A. Structural Performance: Engineer, fabricate, and install metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each metal fabrication.

1. Top of guardrail systems: Concentrated load at any point, of 300 lb-ft or uniform load of 100 plf applied non-concurrently, vertically, downward, or horizontally. Concentrated and uniform loads need not be assumed to act concurrently.

2. Handrails not serving as top rails: Concentrated load at any point, of 200 lb-ft or uniform load of 50 plf applied non-concurrently, vertically, downward, or horizontally. Concentrated and uniform loads need not be assumed to act concurrently.

3. Infill area of guardrail systems: Capable of withstanding a horizontal concentrated load of 200 lb applied to one sq. ft. at any point in the system including panels, intermediate rails, balusters, or other elements composing the infill area.

4. An additional load of 25 pounds per square foot (psf) acting horizontally over the entire tributary area including openings shall be applied simultaneously with the load on the top rail.

1.04 SUBMITTALS

A. Procedures: Section 01 33 00 Submittal Procedures.

B. Shop Drawings:

1. Indicate dimensions, materials, profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

2. Indicate welded connections with standard AWS welding symbols. Indicate net weld lengths.

3. Include erection drawings, elevations, and details as necessary to completely show each installation.

4. Indicate fabrication and installation of handrails and railings, including plans, elevations, sections, details of components, and attachments to other units of Work.

e. ASTM A 264 - Specification for Stainless Chromium-Nickel Steel-Clad Plate; 2009.


2. American Welding Society (AWS)

a. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

b. AWS D1.6 “Structural Welding Code – Stainless Steel”
5. Include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.

C. Licenses and Certifications: Submit for:
   1. Delegated design engineer license
   2. Welders and welding procedures: Submit certifications as specified in Section 05 05 23, Metal Fastenings.

D. Samples: Submit four each, 8 inch long samples of handrail. Submit four each samples of elbow, wall bracket, and end stop.

1.05 QUALITY ASSURANCE

A. Delegated Design Engineer: Employ a registered structural engineer, licensed in the State of Washington, to engineer structural components of the metal railings, including, attachments and anchorages to the primary building structure. This engineer shall prepare, stamp, and sign required structural calculations; this same engineer shall also approve the fabricator's shop drawings.

B. See Section 05 05 23, Metal Fastenings for requirements for welders, welding procedures, and inspections.

C. Mock-Ups: Provide the following mock-ups for evaluation of fabrication, and workmanship:
   1. Locate mock-ups at locations approved or designated by Resident Engineer
   2. Provide mock-ups for guard rail and associated products specified in this Section.
   3. Mock-ups are to demonstrate materials, connections, welding, fasteners, coatings, and installation methods to be employed.
   4. Mock-ups are to demonstrate installation methods.
   5. Approved mock-ups may remain as part of the Work.
   6. Mock-ups that are not approved shall be removed from site by the Contractor.
   7. Resident Engineer shall be sole judge of acceptability of mock-ups.

D. List of Ornamental Metals Mock-Up Requirements:
   1. GDR-3

1.06 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls, slabs, framing, and other construction to which work of this section must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication, delivery and installation schedule with construction progress to avoid delay of work.

   1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction with work of other trades to ensure that
actual dimensions correspond to guaranteed dimensions. Allow for fitting and trimming.

PART 2 - PRODUCTS

2.01 STEEL RAILING MATERIALS
   A. Steel Tube: ASTM A 500, Grade B cold-formed structural tubing.
   B. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.
   C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
   D. Exposed Fasteners: No exposed bolts or screws allowed.
   E. Mounting: Adjustable Brackets and flanges, with steel inserts for casting in concrete.
   F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of US Environmental Protection Agency (EPA).

2.02 STAINLESS STEEL HANDRAIL MATERIALS
   A. Fabricate from Type 316 stainless steel tubing, meeting ASTM A 554.

2.03 FABRICATION
   A. Accurately form components to suit specific project conditions and for proper connection to building structure.
   B. Fabricate to comply with requirements indicated for architectural design, dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacing and anchorage, but not less than that required to support all structural loads.
      1. Connect members by butt welding, unless indicated otherwise.
      2. Change directions by insertion of elbow fittings or by radius bends.
      3. Form curved sections by rolling produce uniform curvature indicated without buckling, twisting, or otherwise deforming exposed surfaces of railing component.
      4. Provide wall returns at ends of wall mounted handrails.
      5. Close exposed ends of pipe by welding 3/16 inch steel plate in place or by use of prefabricated fittings.
      6. For steel railings and handrails formed from steel pipe with galvanized finish, galvanize fittings, brackets, fasteners, sleeves and other ferrous components.
      7. For interior steel railings formed from black steel pipe, provide non-galvanized ferrous metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
      8. For interior steel railings formed from stainless steel pipe, provide stainless steel metal fittings, brackets, fasteners, and sleeves. Applicable for N150 and N140.
C. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.

2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.

3. For anchorage to metal-framed walls, provide backing plates, for bolting anchors.

4. Fillers: Provide steel sheet or plate fillers of size and thickness indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses. Size fillers to produce adequate bearing to prevent bracket rotation and overstressing of substrate.

D. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

E. Fit and shop assemble components in largest practical sizes for delivery to site.

F. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

G. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.

H. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.

I. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

J. Accurately form components to suit specific project conditions and for proper connection to building structure.

K. Shear and punch metals cleanly and accurately. Remove burrs.

L. Ease exposed edges to a radius of approximately 1/32 inch unless otherwise indicated. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.
B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

C. Apply one coat of bituminous paint to concealed aluminum, steel and stainless steel surfaces that will be in contact with cementitious or dissimilar materials.

3.03 INSTALLATION

A. Install in accordance with fabricators and/or manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

D. Field weld anchors as indicated on Contract Drawings. Touch-up welds with primer. Grind welds smooth.

E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

F. Pipe railings and handrails: Adjust railings prior to anchoring to ensure matching alignment of abutting joints. Space posts at spacing indicated or as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building as follows:

1. Secure to concrete by epoxy anchoring system. Cover anchorage joint with round steel flange attached to post with set screws.

2. Secure handrails to walls with wall brackets and end fittings. Provide 1-1/2 inch clearance between inside face of handrail and finished wall surface. Locate brackets as indicated, or as required to support structural loads. Secure wall brackets and wall return fittings to building construction as follows:

   a. Use bracket with flange tapped for concealed anchorage to threaded hanger bolt.

   b. For concrete and solid masonry, use drilled-in expansion shield and hanger bolt or lag bolt as applicable.

   c. For hollow masonry anchorage, use toggle bolts having square heads.

   d. For steel framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to support structural loads.

G. Assemble with spigots and sleeves to accommodate tight joints and secure installation.

3.04 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset from True Alignment: 1/4 inch.

3.05 SCHEDULE

<table>
<thead>
<tr>
<th>Railing Type</th>
<th>Material</th>
<th>Finish</th>
<th>Location</th>
<th>Project</th>
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</thead>
<tbody>
<tr>
<td>HNDRL-1</td>
<td>BLACK STEEL PIPE</td>
<td>SHOP-PRIMED AND PAINTED</td>
<td>BACK OF HOUSE</td>
<td>N140, N150</td>
</tr>
<tr>
<td>HNDRL-2</td>
<td>STAINLESS STEEL</td>
<td>BRUSHED</td>
<td>PUBLIC AREAS</td>
<td>N140, N150</td>
</tr>
<tr>
<td>GDR-1</td>
<td>BLACK STEEL PIPE</td>
<td>SHOP-PRIMED AND PAINTED</td>
<td>BACK OF HOUSE</td>
<td>N140, N150</td>
</tr>
<tr>
<td>GDR-2</td>
<td>STAINLESS STEEL</td>
<td>BRUSHED</td>
<td>BACK OF HOUSE</td>
<td>N150</td>
</tr>
<tr>
<td>GDR-3</td>
<td>STAINLESS STEEL WITH PERFORATED</td>
<td>BRUSHED</td>
<td>INTERMEDIATE LANDINGS</td>
<td>N140, N150</td>
</tr>
<tr>
<td></td>
<td>INFILL PANELS – MATCH MC-6</td>
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<td></td>
<td></td>
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<tr>
<td>GDR-4</td>
<td>STEEL PIPE</td>
<td>SHOP-PRIMED AND PAINTED</td>
<td>PUBLIC GUARDRAILS</td>
<td>N150</td>
</tr>
<tr>
<td>GDR-5</td>
<td>BLACK STEEL WITH STAINLESS STEEL</td>
<td>SHOP-PRIMED AND PAINTED</td>
<td>CATWALK</td>
<td>N140</td>
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<tr>
<td></td>
<td>CABLE INFILL PANELS</td>
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</tr>
</tbody>
</table>

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 05 53 31
STEEL GRATINGS

PART 1 - GENERAL

1.01 SUMMARY
A. This Section includes specifications for steel bar gratings.
   1. GRTG-1: Painted
   2. GRTG-2:
   3. GRTG-3: Galvanized
B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 03 15 25, Anchorage to Concrete
   2. Section 05 05 23, Metal Fastenings.

1.02 REFERENCES
A. This Section incorporates by reference the latest revisions of the following documents.
   1. American Society of Mechanical Engineers (ASME)
      a. ASME B18.21: Lock Washers (Inch Series)
      a. ASTM A 36/A 36M: Specification for Carbon Structural Steel
      b. ASTM 304 or 316 for Stainless Steel
      c. ASTM A 123/A 123M: Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
      d. ASTM A 307: Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
      e. ASTM A 510: Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel
      f. ASTM A 563: Specification for Carbon and Alloy Steel Nuts
      g. ASTM A 780: Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
      h. ASTM A 1011/A 1011M: Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
i. ASTM B 633: Specification for Electrodeposited Coatings of Zinc on Iron and Steel
j. ASTM F 593: Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
k. ASTM F 594: Specification for Stainless Steel Nuts

3. National Association of Architectural Metal Manufacturers (NAAMM)
a. NAAMM MBG 531: Metal Bar Grating Manual

4. The Society for Protective Coatings (SSPC)
a. SSPC-Paint 20: Paint Specification No. 20: Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic")

1.03 SUBMITTALS
A. Procedures: Section 01 33 00, Submittal Procedures
B. Manufacturer’s Product Data: Submit manufacturer’s product data for the following, including written directions for storage, handling, and installation.
   1. Steel grating
   2. Anchorage devices.
   3. Galvanizing repair paint
C. Shop Drawings: Submit shop drawings showing:
   1. Dimensioned grating layout noting grating type and size.
   2. Locations of and details for grating supports, grating anchors, concrete anchors, edges, and openings.
D. Certifications:
   1. Manufacturer’s certification that materials used conform to these Specifications.
   2. Welders and Welding Procedures: Section 05 05 23, Metal Fastenings.

1.04 QUALITY ASSURANCE
A. Steel Grating Standards: Conform to NAAMM MBG 531, "Metal Bar Grating Manual."
B. Qualifications of Welders and Welding Procedures: Section 05 05 23, Metal Fastenings

1.05 PROJECT CONDITIONS
A. Field Measurements: Verify actual locations of construction contiguous with gratings by field measurements before fabrication.

1.06 COORDINATION
A. Coordinate installation of anchorages for gratings, grating frames, and supports. Deliver such items to Project site in time for installation.
PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Alabama Metal Industries Corporation; a Gibraltar Industries company.
   2. Grating Pacific, Inc.
   3. IKG Industries; a division of Harsco Corporation.
   4. Ohio Gratings, Inc.
   5. McNichols, Inc.

2.02 FERROUS METALS
A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
B. Steel Bars for Bar Gratings: ASTM A 36/A 36M or steel strip ASTM A 1011/A 1011M
C. Wire Rod for Bar Grating Crossbars: ASTM A 510.

2.03 FASTENERS
A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 at exterior walls. Select fasteners for type, grade, and class required.
B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts, and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 2.
E. Concrete Anchors: 03 15 25, Anchorage to Concrete
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 unless otherwise indicated.

2.04 MISCELLANEOUS MATERIALS
A. Welding Rods and Bare Electrodes: 05 05 23, Metal Fastenings
B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
2.05 FABRICATION

A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

D. Fit exposed connections accurately together to form hairline joints.

E. Shop Welding: 05 05 23, Metal Fastenings

F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

2.06 STEEL GRATINGS

A. Welded Steel Grating

1. Provide steel gratings of type and size as noted on the Contract Documents.

2.07 GRATING FRAMES AND SUPPORTS

A. Frames and Supports for Metal Gratings: Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.

1. Unless otherwise indicated, fabricate from same basic metal as gratings.

2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.

2.08 STEEL FINISHES

A. Finish gratings, frames, and supports after assembly.

B. Galvanizing: Hot-dip galvanize gratings, frames, and supports in conformance with ASTM A 123/A 123M.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.

D. Fit exposed connections accurately together to form hairline joints.
   1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: 05 05 23, Metal Fastenings:

3.02 INSTALLING STEEL GRATINGS

A. General: Install gratings to comply with recommendations of referenced steel grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.03 ADJUSTING AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for custom fabricated light and systems armature consisting of the following principal components

1. Formed sheet and extruded aluminum enclosures.
2. Perforated metal speaker grilles.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. ASTM B209 - 10 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
2. ASTM B221 - 08 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
6. UL-1685 - Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables
8. SSPC-SP 1, Surface Preparation Specification No. 1: Solvent Cleaning; SSPC: The Society for Protective Coatings.

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal light and speaker assemblies including, connectors. Provide comprehensive engineering analysis by an engineer using performance requirements and design criteria indicated.
B. Structural Performance: Metal light and speaker assemblies, including anchors and connections, shall withstand the effects of gravity loads and the following loads and stresses without exceeding the allowable design working stress of materials involved and without exhibiting permanent deformation in any components.

2. Maximum vertical load imposed on any given support structure by the lighting system should not exceed 300 pounds.
3. Assumed self-load of enclosures: Not to exceed 12 pounds per lineal foot including collateral loads of light fixtures, PA speakers, fire alarm speakers, radio antennae, CCTV cameras, ambient noise sensors, paging speakers, conduit and wiring.

C. Seismic Performance: Formed metal light and speaker assemblies, including anchors and connections, shall withstand the effects of earthquake motions determined according to the Seattle Building Code.

1. Component Importance Factor is 1.0.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 100 degrees F, ambient.

E. UL listed: Light and systems armature is to be UL listed and meet all applicable codes including NFPA 70.

1.04 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: For each type of product indicated. Include finishing materials.

C. Shop Drawings: Show fabrication and installation details for formed metal armature.

1. Include plans, elevations, component details, and attachments to other work.
2. Indicate materials and profiles of each metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.

D. Samples for Verification: For each type of exposed finish required, prepared on 6-inch-square Samples of metal of same thickness and material indicated for the Work.

E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. At a minimum, include the following:

1. Design Criteria
2. Selection of load-carrying members, components and connectors
3. Stress and deflection analysis
4. Reactions and imposed loads transmitted to primary and secondary structure.
5. Certification of approval from listing agency.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal armature similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Powder-Coating Applicator Qualifications: A firm experienced in successfully applying powder coatings of type indicated to metals of types indicated and that employs competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.

C. Engineer Qualifications: A licensed structural engineer currently registered in the state of Washington.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups for the following types of decorative formed metal:
   a. Two 8-foot long sections, to include steel support system, speaker and lighting enclosure assembly, representative lighting fixtures and at least one speaker box enclosure and cover plate (speaker is NIC).
   b. Provide two elbow units.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver decorative formed metal products wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.

B. Store products on elevated platforms in a dry location.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum:


2.02 MANUFACTURED COMPONENTS

A. Perforated Metal For Speaker Grilles:
1. Aluminum sheet, 0.040 inch thick perforated with 1/8 inch diameter holes at 3/16 inch 60-degree staggered centers.

2.03 MISCELLANEOUS MATERIALS

A. Sealants, Interior: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834; of type and grade required to seal joints in decorative formed metal; and as recommended in writing by decorative formed metal manufacturer.

B. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as necessary for strength, corrosion resistance, and compatibility in fabricated items.

1. Use filler metals that will match the color of metal being joined and will not cause discoloration.

C. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.

1. Provide concealed fasteners for interconnecting decorative formed metal items and for attaching them to other work unless exposed fasteners are unavoidable or are the standard fastening method.


E. Sound-Deadening Materials:


F. Backing Materials: Provided or recommended by decorative formed metal manufacturer.

G. Laminating Adhesive: Adhesive recommended by metal fabricator that will fully bond metal to metal and that will prevent telegraphing and oil canning and is compatible with substrate and noncombustible after curing.

2.04 METAL LIGHT AND SYSTEMS ARMATURE

A. Form assemblies from metal of type and thickness indicated below. Coordinate size of fixtures, and all device location of cutouts for electrical wiring, and method of attachment of installed components

1. Aluminum Sheet or extruded shape.

   a. Finish: Baked enamel or powder coat.

2. Fabricate formed metal light and speaker assemblies with swaged slip joints to facilitate assembly and allow thermal movement.

3. Provide factory endcaps.

4. Apply manufacturer's recommended sound-deadening material to internal surfaces.
2.05 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Apply organic finishes to formed metal after fabrication unless otherwise indicated.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.06 ALUMINUM SHEET FINISHES

A. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 2 "Hand Tool Cleaning," or with SSPC-SP 3 "Power Cleaning."

B. Pretreatment: Immediately after cleaning, apply a conversion coating of type suited to organic coating applied over it.

C. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

1. Color and Gloss: Match PNT-2, PNT-7 and PNT-8 specified in Section 09 90 00

D. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils. Prepare, treat, and coat metal to comply with resin manufacturer's written instructions.

1. Color and Gloss: Match PNT-2, PNT-7 and PNT-8 specified in Section 09 90 00

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative formed metal.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Locate and place decorative formed metal items level and plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install decorative formed metal.
1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where needed to protect metal surfaces and to make a weathertight connection.

C. Form tight joints with exposed connections accurately fitted together.

D. Install concealed gaskets, joint fillers, sealants, and insulation, as the Work progresses, to make interior decorative formed metal items soundproof or lightproof as applicable to type of fabrication indicated.

3.03 ADJUSTING AND CLEANING

A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.04 PROTECTION

A. Protect finishes of decorative formed metal items from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for the following, as detailed or indicated on the Contract Drawings:
   1. Roofing nailers.
   2. Preservative-treated wood materials.
   4. Communications and electrical room mounting boards.
   5. Concealed wood blocking, nailers, and supports.
   6. Miscellaneous wood nailers, furring, and grounds.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 05 50 00, Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing at mechanical equipment units or penetrations.
   3. Section 07 54 23, Thermoplastic Polyolefin Roofing: Wood roof curbs and blocking.
   4. Section 07 62 00, Sheet Metal Flashing and Trim: Sill flashings.
   5. Section 09 21 26, Gypsum Board Assemblies.

1.02 REFERENCES

A. This Section incorporates by reference the following documents.
   1. American Society for Testing and Materials International (ASTM)
   2. American Wood Protection Association (AWPA)
   3. American Softwood Lumber Standard (ASLC)
a. PS 20-10 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 2010.

4. Western Wood Products Association (WWPA)
   a. WWPA G-5 - Western Lumber Grading Rules; Western Wood Products Association; 2011.

1.03 SUBMITTALS
A. Procedures: Section 01 33 00, Submittal Procedures.
B. Product Data: Provide technical data on wood preservative materials, application instructions, and fire-retardant wood materials.

1.04 QUALITY ASSURANCE
A. Lumber: Comply with PS 20-10 and approved grading rules and inspection agencies.
   1. Lumber of other species or grades, or graded by other agencies, is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
   2. Inspection Agencies:
      a. WCLIB - West Coast Lumber Inspection Bureau.
      b. WWPA - Western Wood Products Association.
B. Plywood Product Standards: Comply with DOC PS 1-95, or, for products not manufactured under applicable APA Performance Standard for type of panel indicated.
C. Grade Marks:
   1. Identify lumber and plywood by official grade mark.
   2. Lumber: Include symbol of grading agency, mill name, grade, species, grading rules, and condition of seasoning at time of manufacturer.
   3. Plywood: Include type, class identification index, and agency mark.
   4. Pressure treatment: Include quality mark of grading agency which maintains continued supervision, testing, inspection, and re-examination service over product quality as described in AWPA standards.
D. AWPA Use Categories:
   1. (PT) Treatment: UC2, Interior, subject to dampness.
   2. (FRT) Treatment: UCFA, Fire protection, weather shielded.
E. Certificates of Compliance:
   1. Submit manufacturer’s certification that products furnished for Project meet or exceed specified requirements.
3. Provide proof of Compliance with EPA directive to eliminate chromated copper arsenate (CCA) treated wood products.

F. Fire-retardant treated wood: Imprint each piece with mark attesting to FR-S rating.


1.05 DELIVERY, STORAGE & HANDLING

A. Delivery: Deliver treated materials bundled and marked to identify treatment.

B. Storage: Store treated materials for easy identification and protect from moisture; provide well-ventilated dry storage.

C. Handling: In accordance with AWPB standards. In addition to materials used in treatment, furnish additional material for field treatment of cuts.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20-10 and requirements of specified grading agencies.

1. Species: Douglas Fir-Larch, unless otherwise indicated.

2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:

1. Lumber: S4S, No. 2 or Standard Grade.

2. Boards: Standard or better.

D. Construction Panels:

1. General: Identify each panel with appropriate APA trademark.

2. Plywood for Backing of Electrical or Communication Equipment: APA Rated Sheathing 32/16, C-C, DOC PS 27-94, Exposure 1, 4-feet x 8-feet x 3/4-inch thick; fire-retardant treated.

2.03 MISCELLANEOUS MATERIALS

A. Anchorages and Fastening Devices:
1. Provide all anchoring devices required for proper installation and anchorage of work. Use only hot-dipped galvanized fasteners for exterior locations, except as indicated otherwise. Use anchor bolts and expansion shields for anchoring wood members to concrete, size and quantity required or as shown, to draw and hold members rigidly and permanently in place.
   a. Screws: ASME B18.6.1; galvanized sheet metal screws, self-tapping, intended for use with studs shown.
   b. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers

2. Hot-Dip Zinc Coating: Comply with ASTM A 153/A 153M for weight of zinc coating on individual components, except use Type 304 stainless steel where exposed in cavities or where chemical formulations of wood preservatives include one of the following:
   a. Alkaline copper quat (ACQ)
   b. Copper azole (CA types A and B), and
   c. Sodium borate (SBX).

3. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
   b. Material for Exterior Applications: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

4. Shapes and Connectors: Commercial Quality: ASTM A653, G90, zinc coating, hot dip galvanized, flattened sheets, except G185, minimum wherever ACQ, CA and SBX wood preservatives are used.

5. Other Materials: Provide other miscellaneous materials shown or required for rough carpentry installation.

### 2.04 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited Independent Testing Laboratory, certifying level and type of treatment in accordance with AWPA standards for lumber exposed to weather or in contact with concrete or masonry units.
PART 3 - EXECUTION

3.01 INSTALLATION

A. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

B. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

C. Construction Panels

1. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   a. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   b. Install adjacent boards without gaps.
   c. Size and Location: As indicated on drawings.

D. Blocking, Nailers, and Supports

1. Provide fire-treated blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

2. Specifically, provide the following non-structural framing and blocking for the following:
   a. Cabinets and shelf supports.
   b. Wall brackets.
   c. Handrails.
   d. Grab bars.
   e. Wall-mounted door stops.
   f. Wall-mounted display or information boards.

E. Roof-Related Carpentry

1. Provide preservative-treated lumber and plywood for roof-related carpentry.

2. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

4. Provide miscellaneous members as indicated or as required to support finishes, fixtures, specialty items, and trim.
3.02 APPLICATION

A. Site-Applied Wood Treatment

1. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

2. Allow preservative to dry prior to erecting members.

3.03 CONSTRUCTION

A. Tolerances

1. Framing Members: 1/4 inch from true position, maximum.

2. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

END OF SECTION
SECTION 06 16 43
GYPSUM SHEATHING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for gypsum sheathing board and accessories behind exterior wall systems to receive direct application of water and air barrier indicated in related section, and used behind:

1. Metal cladding (MP-#) assemblies as indicated.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 05 40 00, Cold-Formed Metal Framing: Exterior wall framing.
2. Section 07 25 10, Air and Weather Barriers: Membrane weather protective system (WAB-1) for application over sheathing
3. Section 07 42 13, Metal Wall Panels: Metal cladding (MP-#) assemblies

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Society for Testing and Materials International (ASTM)
   b. ASTM C 1002, Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
   c. ASTM C 1177, Glass Mat Gypsum Substrate Used as Sheathing.

2. Gypsum Association (GA)
   a. GA-253, Application of Gypsum Sheathing

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Submit manufacturer’s literature on products handling, storage, and installation (cutting and fastening) requirements to be used under this Section, clearly marked and fully described and as required under material exposure warranty.

1.04 COORDINATION WITH OTHER TRADES

A. Installation Precautions: Follow manufacturer’s installation instructions including the following:
1. For installation of surface applied flashings, trim and membrane waterproofing flashing, coordinate locations of concealed blocking and nailers for full support of applied materials with structural stud Installer.

2. Within 30 days of sheathing installation cover the sheathing with specified water and air barrier.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver gypsum sheathing board and related materials in original packages bearing brand name and identification of manufacturer.

B. Store gypsum sheathing board so that it is protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum sheathing boards flat on leveled supports off the ground under protective covering. Handle gypsum sheathing board to prevent damage to edges, ends, and surfaces.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Gypsum Sheathing Board: ASTM C 1177, fire resistant Type “X”, formulated water resistant throughout entire panel meeting performance criteria.

1. Acceptable Products:
   a. USG “Securerock Glass Mat Sheathing"
   b. Georgia-Pacific “Dens-Glas Gold”
   c. BPB America, Inc. “Glas-Roc Sheathing”
   d. Substitutions: Section 01 25 00, Substitution Procedures

2. Thickness/Width: 5/8 inch thick by 48 inches wide; maximum permissible lengths, except as otherwise indicated.

3. Finish Edge and End Configuration: “Square” shaped edges and ends.

B. Accessories:

   a. Length as required by sheathing manufacturer, but not less than 1-1/4 inch long as required to obtain 3/8-inch penetration in metal studs.
   b. Finish: Galvanized or corrosion-resistant polymeric coating, coating, rated 2000 hours of salt-spray before developing 5 percent red rust when tested in accordance with ASTM B 117.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine metal framing to ensure concealed blocking and nailers are in place, and that framing is ready for installation of sheathing. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved. Commencement of work constitutes acceptance of conditions.

3.02 INSTALLATION

A. General: Except as otherwise indicated, comply with manufacturer's instructions, GA-253, and the following for the installation of gypsum sheathing.

1. Cut boards using manufacturer's approved method at penetrations, edges and other obstructions of the work; fit tight against abutting work.

2. Coordinate installation of sheathing with installation of flashing, joint sealers and water and air barrier installation so that these combined materials are installed in the sequence and manner which prevents exterior moisture from passing through completed exterior gypsum assembly to the interior.

3. Apply fasteners so that screw heads bear tightly against face of gypsum sheathing boards, but do not cut into substrate.

B. Installation of Sheathing: Apply sheathing in as longest lengths as practicable with orientation of boards running in manufacturer's approved direction, either vertically or horizontally and with smooth face to exterior.

1. All finish edges shall occur centered over flanges of metal framing; staggering of joints in adjacent rows is not required, unless required to achieve component wind resistant data submitted as part of system design.

2. At end joints; bring end joints into contact with each other without forcing. Cut and fit snugly around all openings.

3. Fasten sheathing to metal framing with specified fasteners. Drive fasteners in field of panel first, working toward ends and edges. Space fasteners max. 12 inches o.c. for walls and soffits with perimeter fasteners at least 3/8 inch from edge and less than 5/8 inch from ends and edges with framing at maximum 24 inches o.c. for walls and 12 inches for soffits. Drive screws so heads are flush with surface.

3.03 PROTECTION

A. Protect exterior gypsum sheathing from damage and soiling.

END OF SECTION
SECTION 06 41 16
PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for plastic laminate (PLAM-) faced wood millwork units for following locations:
   1. Counters in FCC room.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 06 10 00, Rough Carpentry: Concealed wood blocking, furring and grounds.

1.02 REFERENCES

A. This Section incorporates by reference the latest revision of the following documents.
   1. American National Standard (ANSI)
      a. ANSI A208.2 for Medium Density Fiberboard for Interior Use; 2002.
   2. Architectural Woodwork Institute (AWI) and Architectural Woodwork Manufacturers Association of Canada (AWMAC)
      a. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated;
   3. National Electrical Manufacturers Association (NEMA)
      a. NEMA LD 3 - High-Pressure Decorative Laminates
   4. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce)

1.03 SUBMITTALS

A. Shop Drawings: Show dimensioned plans, elevations and sections; types and thicknesses of materials, details of fabrication, joinery and assembly methods; note finishes, materials, and material colors for exposed and semi-exposed surfaces; indicate field dimensions where critical for satisfactory fabrication or installation.
   1. Show location and sizing of reinforced backing in walls to support wall mounted cabinets and exposed shelf standards; reinforcement backing furnished and installed by other trades.
   2. Show millwork hardware details, including types and manufacturer's; show quantity and locations of door hinges, pulls and drawer slides.
3. Indicate type, size and spacing of screws for attachment of millwork to building structure.

4. Indicate cut outs for plumbing fixtures and faucets being installed into millwork and requiring coordination of other trades.

B. Samples for Verification:

1. Plastic Laminate: Submit two samples of each color and pattern selected.

2. Low Pressure Laminates: Submit two samples of each color and pattern selected.

1.04 QUALITY ASSURANCE

A. Quality Standards: Conform to AWI/AWMAC (QSI) "Custom Grade" standards for materials, fabrication, finishing, certification, and installation.

1.05 DELIVERY, STORAGE & HANDLING

A. Delivery and Handling: Protect all items during transit, delivery, storage and handling to prevent damage, soiling and deterioration. Delay delivery of millwork until installation locations are ready. Do not install until room finishes have been applied and allowed to dry or cure and building's design humidity and temperature levels have been achieved and maintained at those levels in installation areas.

B. Storage: If, due to unforeseen circumstances, items must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

C. Upon delivery, inspect millwork for damage, quantity discrepancies, irregularities or defects. Do not proceed with the Work until delivered materials are acceptable to Installer.

1.06 PROJECT CONDITIONS

A. Conditioning:

1. Millwork Fabricator shall advise Contractor of temperature and humidity requirements for millwork storage and installation. Do not install millwork until required temperature and relative humidity have been stabilized and will be maintained in installation areas through remainder of construction period.

2. Allow millwork to acclimate to the above conditions for 72 hours prior to installation, unless millwork items have been stored off-site in a controlled environment and installation is to take place immediately upon delivery.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Laminate Plastic ("PLAM-#"): High pressure decorative laminate (HPDL), conforming to NEMA LD-3; provide the following types:

1. Types:
a. Vertical Surfaces: General purpose type GP28, nominal 0.028 inch thick.

b. Horizontal Surfaces: General purpose type GP50, nominal 0.050 inch thick.

2. Color, Pattern, and Texture: TBD

B. Balancing Sheet: High pressure laminate, type CL20 conforming to NEMA standards for cabinet liner, 0.020 inch thick.

C. Core Material: Interior grade, medium density fiberboard (MDF) complying with ASTM D1037 and ANSI A208.2-2002, premium Grade 140 MDF.

1. Provide exterior grade MDF for countertops.

2. Density: Minimum of 48 pounds per cubic foot.

D. Adhesive: Type II (moisture resistant) type as selected by Fabricator, except the use of urea formaldehyde resin adhesive is not permitted.

1. Bonding Process: Performed in controlled environment between 40-60 percent relative humidity at temperature above 60 degrees F., at a pressure not less than 15 psi.

2.02 CABINET FABRICATION, GENERAL

A. Pre-Assemble: Complete fabrication and assembly in the shop to the maximum extent possible before shipment to building. Disassemble components only as necessary for handling and ship in unitized or panelized form ready for field installation.

B. Pre-Cut Openings: Fabricate millwork items with pre-cut openings, where possible, to receive sinks, electrical work and similar items. Locate openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of all cutouts.

2.03 LAMINATED PLASTIC CASEWORK COUNTERTOPS & SHELVES

A. General: Comply with "Custom Grade" standards as established in AWI Section 400C and produce individual counters in one continuous length without visible joints. Field seams are not acceptable.

B. Core (Tops, Vertical Support Cleats): Nominal 3/4 inch thick MDF of types as previously specified.

C. Covering: Cover exposed to view surfaces and edges of tops with plastic laminate; apply balancing sheet to underside of tops and backside of splashes. Countertops requiring more than one sheet of laminate shall be fabricated from the longest sheet lengths available from manufacturer.

D. Edges: Provide square self-edged with matching plastic laminate in same thickness.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Determine that conditions are acceptable to receive the work of this Section. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer. Starting of the work will be construed as acceptance of conditions.

3.02 INSTALLATION

A. General: Install millwork in accordance with requirements specified in AWI Section 1700 for "Custom Grade" quality.
   1. Install in accordance with approved shop drawings.
   2. Install millwork plumb, level, true and straight with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line; shim as required using concealed shims.
   3. Assemble and install work without machine and tool marks.
   4. Neatly fit and scribe work to adjacent surfaces.

B. Anchor millwork to anchors or blocking built-in or directly attached to substrate. Secure with concealed fasteners.

C. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
   1. Align adjacent surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
   2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line; meeting edges shall not vary more than 0.10 inches.
   3. Secure backsplashes to countertops in shop as indicated above.
   4. Fill space between backsplash, cutouts and wall with sealant specified in Division 7 Section "Joint Sealants."

3.03 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

A. Cover completed work with 4 mil polyethylene film protective enclosure, applied in a manner which will allow easy removal and without damage to casework. Place cover to permit ventilation. Remove cover at time of final cleaning.

B. A final dusting of exterior and interior surfaces shall be carefully done including the removal of fingerprints or other marks.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for furnishing and installing the permanent waterproofing system and seepage management system for cut-and-cover structures. The waterproofing system is installed under invert slabs, on roof slabs and between support of excavation and at structural walls. Perform, at minimum, the following activities:

1. Preparation of the surface.
2. Waterproofing system and seepage management system installation.
3. Protection of the waterproofing system.
4. Inspection of the waterproofing system and seepage management system for damage.
5. Leak remediation.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor’s responsibility to perform all the Work required by the Contract Documents.

1. Section 03 15 13, Waterstops
2. Section 03 30 00, Cast-in-Place Concrete
3. Section 22 14 01, Drainage System for Structures
4. Section 31 23 33, Trenching and Backfilling
5. Section 31 50 00, Excavation Support and Protection

1.02 REFERENCES

A. This Section incorporates by reference the latest revision of the following documents.

1. American Society for Testing and Materials (ASTM)

a. ASTM D374 Standard Test Method for Thickness of Solid Electrical Insulation
b. ASTM D568 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Flexible Plastics in a Vertical Position
c. ASTM D638 Standard Test Method of Tensile Properties of Plastics
d. ASTM D1593 Standard Specification for Nonrigid Vinyl Chloride Plastic Sheeting

e. ASTM D1621 Standard Test Method for Compressive Properties of Rigid Cellular Plastics


g. ASTM D1785 Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120

h. ASTM D3776 Standard Test Methods for Mass per Unit Area (Weight) of Woven Fabric

i. ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics - Diaphragm Bursting Strength Tester Method

j. ASTM D4533 Standard Test Method of Trapezoid Tearing Strength of Geotextiles

k. ASTM D4632 Standard Test Method for Breaking Load and Elongation of Geotextiles (Grab Method)
l. ASTM D4716 Standard Test Method for Transmissivity

2. Deutsches Institut für Normung (DIN)
a. DIN 4102-1, Fire behavior of building materials and building components - Part 1: Building materials; concepts, requirements and tests

b. DIN 16726-5.12 Mechanical Puncture Resistance

1.03 DEFINITIONS

A. Control and Grouting Pipes: Pipes typically installed near water barrier. If leakage should occur the pipes are used for remedial grouting.

B. Double Weld: Machine welded seams achieved by use of automatic hot-double-wedge welding equipment.

C. Geodrain: Composite panel providing a groundwater drainage channel and protection for the synthetic membrane from sharp projections on the surface to which membrane is applied.

D. Geotextile: Non-woven fabric providing a groundwater drainage channel and protection of the membrane from sharp projections on the surface to which the membrane is applied.

E. Leakage: Damp spots or water seeping from the structure walls, slabs, joints or control and grouting pipes.

F. Membrane: Synthetic waterproofing membrane specifically formulated for sealing underground structures against intruding groundwater.

G. Membrane Protection Layer: A PVC membrane layer specifically designed to be attached to and completely cover the membrane to protect it from damage.
H. Patent Strip: Channel shaped stainless steel bar with pre-punched holes used to achieve a tight fit at waterproofing terminations.

I. Protective Boards: Rigid material, for example plywood or Styrofoam, used in conjunction with a membrane protection layer to protect the membrane from damage during backfilling and other construction activities detrimental to the integrity of the membrane.

J. Protective Concrete: Concrete placed on waterproofing installed below the invert slab and on the roof slab to prevent damage.

K. Protective Metal Sheet: Lightweight metal sheet used to protect membrane, at terminations near the ground surface.

L. Regroutable Hose: Hose installed at invert slab joints and along the slurry wall as shown in the Contract Documents which must be grouted and flushed for reuse.

M. Sealant Strip: Polymer swelling gasket strip applied in conjunction with patent strips at waterproofing terminations.

N. Sectioning: Water barriers arranged to seal off individual membrane sections. Used in conjunction with control and grouting pipes.

O. Seepage Management: Layered system consisting of synthetic membrane and geodrain to collect water that leaks through the slurry walls and to transport it to the structure’s drainage system, thus preventing groundwater intrusion into the interior of the finished structures.

P. Single Weld: Hand welded seam consisting of a tack weld, a thin continuous weld and a rolled end weld. Single seams are sealed with liquid PVC at membrane welds.

Q. Temporary Construction Drainage: Contractor designed perforated drain pipe buried in a layer of crushed stone at the toe of the support of excavation wall to divert water run off to the temporary sump pumps.

R. Temporary Relief Pipe: Temporary groundwater relief pipe installed in the invert or side walls as needed to relieve groundwater pressure during construction.

S. WA Anchor: Rigid plastic shell with an inside threads, for steel rod attachment, and membrane flange used to create watertight penetrations through the membrane.

T. Water Barrier: A base seal waterstop welded to the membrane.

U. Waterproofing: Layered system consisting of membrane, geodrain, protective layers, water barriers, control and grouting pipes, regroutable hoses, and other sealing products, combined which prevent intrusion of groundwater into the interior of the finished structures.

1.04 SYSTEM REQUIREMENTS

A. Performance Requirements

1. No water leakage shall be acceptable through the waterproofing.
1.05 SUBMITTALS

A. Qualifications including a resume listing applicable project experience, position held, duration and project description.

1. Waterproofing Installer
2. Waterproofing Supervisor
3. Remedial Grout Supervisor

B. Product Data for the Following: Include, where applicable, catalogue cuts, MSDS sheets, certification of compliance, manufacturers recommendations for storage, handling, installation and protection, testing, welding, detection for damage and repair:

1. Geotextile
2. Geodrain
3. Membrane
4. Membrane Protection Layer
5. Water Barrier
6. Control and Grouting Pipe Assembly
7. WA Anchor
8. Patent Strip
9. Sealant Strip
10. Remedial Grout
11. Regroutable Hose

C. Shop Drawings. Include plans, sections and details showing as a minimum:

1. Sequence of waterproofing installation relative to construction sequence.
2. Typical sheet layouts. Include splice locations and types of welds.
3. Build-up of layered waterproofing in invert, at support of excavation, and on roof slabs.
4. Layout of water barriers for sectioning including location of control and grouting pipes.
5. Layout of regroutable hoses and junction boxes with labeling system to identify each hose and its location as well as fixation.
7. Waterproofing at all penetrations.
8. Waterproofing at corners.
10. Control and grouting pipe assembly including protection from concrete intrusion during concrete pours.

D. Waterproofing and Seepage Management 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, backfilling, and grading.

E. Waterproofing Installer certification from the membrane supplier.

F. Material Samples:
   2. Geodrain: One square foot.
   3. Membrane: One square foot including double welded seam one foot long.
   4. Membrane Protection Layer: One square foot attached to membrane.
   5. Protective Metal Sheet: One square foot.
   6. Attachment Assembly: Three each.
   7. Water Barrier: One foot length welded to membrane.
   8. Control and Grouting Pipe: One foot length (including flange, attachments, inside thread and cap).
   10. Circumferential Metal Clamp: One each.
   11. WA Anchor: One each (including threaded rod).
   13. Polymer Sealant Strip: One foot length.
   14. Regroutable Hose: One foot length
   15. Junction Box: Three pieces including cover.

G. Field Samples:
   1. Double weld samples, three feet long, from each double wedge welding machine, prior to the start of daily shift.
   2. Prepare and submit field samples daily prior to seam welding.

H. Reports/Records/Forms:
   1. Surface Acceptance Form completed and signed prior to start of installation.
   2. Waterproofing Installation Acceptance Form completed and signed immediately after completion of an installation / testing area.
3. Waterproofing Condition Form completed and signed prior to placing concrete or backfill material against the waterproofing system and prior to installing the architectural finishes in front of the seepage management system.

4. Test (including Re-Tests) and Repair Reports.

I. As-built drawings:

1. Control and Grouting Pipes:
   a. Location and elevation of control and grouting pipes.
   b. Date of pipe installation.
   c. Date of concreting.
   d. Names of workers and supervisors for respective work.

2. Water Barriers: Location and elevation of water barriers and size of sections.

3. Regroutable Hose:
   a. Location and elevation of junction boxes, where regroutable hoses start and terminate.
   b. Location and elevation of regroutable hoses.
   c. Labeling system to correspond with labels attached to hoses in the field.

J. Leak Remediation Plan:

1. Submit leak remediation plan prior to the start of any work associated with stopping leakage.

2. Include product data for all materials and equipment proposed, narrative outlining procedures and stages for grouting, coordination with other work, location, as-built locations of the water barriers within the area of sectioning targeted, and the details associated with grouting and cleaning regroutable hoses.

1.06 QUALITY ASSURANCE

A. Waterproofing Supervisor shall have a minimum five years experience in the installation of waterproofing systems for underground structures using membrane and associated waterproofing materials indicated.

B. Waterproofing Installer shall be trained for installation and testing operations proposed, and have a minimum of five years of experience in the installation of flexible membranes in underground waterproofing installations.

C. Remedial Grouting Supervisor shall have minimum five years experience with grouting of flexible membrane and regroutable hoses using the grout materials indicated.

D. Perform test welding, using the membrane and equipment planned for the production work, for all types of welds. Perform and test the welds in the presence of the Resident Engineer prior to production installation.

E. Readiness Review Meetings:
1. Before installation of waterproofing and concrete over same, meet at project site with waterproofing installer, waterproofing installation supervisor, and other entities concerned with waterproofing installation performance, and Resident Engineer.

2. Record discussions and agreements and furnish copy to each participant.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled packages.

B. Store, and handle materials and products in strict accordance with manufacturer's instructions, recommendations, and material safety data sheets.

1. Place material on smooth surface free of rocks or other protrusions which may damage the material.

2. Protect from damage from sunlight, weather, excessive temperatures, chemicals, and construction operations.

3. Remove damaged material from the site and dispose of in accordance with applicable regulations.

C. Store all flammable materials in a cool, dry area distant from sparks and open flames.

1.08 SITE CONDITIONS

A. Refer to Geotechnical Conditions Summary (Appendix A).

B. Refer to As-Built Drawings from the N120 Contract.

C. Provide sufficient access for Resident Engineer during and after installation of waterproofing systems, to allow for inspection of the work

D. Install waterproofing at surfaces only after the surface is in compliance with smoothness criteria shown on the Contract Drawings and has been accepted by the Waterproofing Installer and Resident Engineer in writing with a Surface Acceptance Form.

E. Prior to waterproofing installation, prove the absence of any continuing and significant deflection or increase of stress.

F. Prior to waterproofing installation, install contractor-designed temporary construction drainage system.

1.09 WARRANTY

A. Provide a warranty for the water tightness of the structure up to two years beyond the final contract completion date.
PART 2 - PRODUCTS

2.01 MATERIALS

A. Geotextile: Non-woven polypropylene geotextile of uniform thickness and surface texture with the following minimum physical properties and testing methods:

<table>
<thead>
<tr>
<th>PHYSICAL PROPERTIES</th>
<th>VALUES</th>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>285 mil</td>
<td>ASTM D1777</td>
</tr>
<tr>
<td>Unit Weight</td>
<td>22 oz./sqyd.</td>
<td>ASTM D3776</td>
</tr>
<tr>
<td>Grab Tensile Strength</td>
<td>285 pounds lbs.</td>
<td>ASTM D4632</td>
</tr>
<tr>
<td>Elongation</td>
<td>85 percent</td>
<td>ASTM D4632</td>
</tr>
<tr>
<td>Trapezoid Tear Strength</td>
<td>135 lbs.</td>
<td>ASTM D4533</td>
</tr>
<tr>
<td>Burst Strength</td>
<td>400 psi</td>
<td>ASTM D3786</td>
</tr>
<tr>
<td>Chemical Resistance</td>
<td>pH-value 2 to 13</td>
<td></td>
</tr>
</tbody>
</table>

B. Geodrain: Composite panel consisting of a rigid drain core and filter fabric bonded on one side with the following minimum physical properties and testing methods:

1. Fabric

<table>
<thead>
<tr>
<th>PHYSICAL PROPERTIES</th>
<th>VALUES</th>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Weight</td>
<td>4 oz./sqyd.</td>
<td>ASTM D3776</td>
</tr>
<tr>
<td>Grab Tensile Strength</td>
<td>110 lbs</td>
<td>ASTM D4632</td>
</tr>
<tr>
<td>Elongation</td>
<td>60 percent</td>
<td>ASTM D4632</td>
</tr>
<tr>
<td>Trapezoid Tear Strength</td>
<td>50 lbs.</td>
<td>ASTM D4533</td>
</tr>
<tr>
<td>Burst Strength</td>
<td>215 psi</td>
<td>ASTM D3786</td>
</tr>
</tbody>
</table>

2. Core Properties:

<table>
<thead>
<tr>
<th>PHYSICAL PROPERTIES</th>
<th>VALUES</th>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>0.45 inch</td>
<td>ASTM D3776</td>
</tr>
<tr>
<td>Compressive Strength</td>
<td>15,000 psi</td>
<td>ASTM D1621 (Mod.)</td>
</tr>
<tr>
<td>Flow Capacity</td>
<td>15 gpm/ft.</td>
<td>ASTM D4716</td>
</tr>
</tbody>
</table>

C. Membrane for Waterproofing System: Polyvinyl chloride (PVC), waterproofing membrane or approved equal, of uniform thickness and surface texture and whose double weld seams are tested as described in Section 3.03 B.2. PVC membrane is non-reinforced with the following minimum physical properties and testing methods:
<table>
<thead>
<tr>
<th>PHYSICAL PROPERTIES</th>
<th>VALUES</th>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>100 mil</td>
<td>ASTM D374</td>
</tr>
<tr>
<td>Ultimate Tensile Strength</td>
<td>2200 psi</td>
<td>ASTM D638</td>
</tr>
<tr>
<td>Ultimate Elongation</td>
<td>210 percent</td>
<td>ASTM D638</td>
</tr>
<tr>
<td>Low Temperature Impact</td>
<td>pass at -20 degrees F</td>
<td>ASTM D1593</td>
</tr>
<tr>
<td>Chemical Resistance</td>
<td>pH-value 2 to 13</td>
<td></td>
</tr>
<tr>
<td>Flammability</td>
<td>self extinguishing</td>
<td>ASTM D568</td>
</tr>
</tbody>
</table>

D. Membrane Protection Layer: 60 mil thick PVC membrane that is a different color than the waterproofing membrane, such as PVC REPRO PRODUCT # 1842 as manufactured by HPG International or approved equal.

E. Attachments: Membrane attachment disk manufactured of membrane compatible material with minimum 3-inch diameter with one steel washer embedded in disk. Attachment of disks with minimum 1-1/4 inch nails.

F. Water Barrier: Continuous PVC strip weldable to membrane with embedment ribs of the following minimum dimensions:

1. 10.8-inch width and four ribs of 1.4 inch minimum rib height (including base).
2. Intersections pre-fabricated on site or by manufacturer.

G. Control and Grouting Pipes: 1-inch nominal pipe size flexible polyvinyl chloride (PVC) pipe with open mesh polyester braiding encapsulated in the pipe wall such as Nylobraid as manufactured by New Age Industries or approved equal. Length as shown on the Contract Drawings. Pipes must have secure fittings with inside thread and a removable cap.

H. WA Anchor:

1. Rigid plastic shell with inside thread and 12 inches diameter membrane compatible flange for attachment to waterproofing and seepage management membranes. Rigid plastic shell minimum 8-inches long with outside grooves and 5/8 inch diameter inside thread for application of threaded steel rod.
2. Use epoxy resin to grout rigid shell and flange in place prior to attachment to membrane.

I. Protective Metal Sheet: Lightweight metal sheet of dimensions on the Contract Drawings; minimum 24 gage.

J. Protective Concrete: As specified in Specification Section 03 30 00, Cast-in-Place Concrete.

K. Temporary Relief Pipe: 1-inch to 8-inch nominal size polyvinyl chloride (PVC) pipe Schedule 40, ASTM D1785; each with fitted cap.

L. Patent Strip: 14 gage channel shaped stainless steel bar, 1-inch wide, pre-punched one inch on center, used at membrane termination.

M. Sealant Strip: Polymer based seal, designed to undergo controlled expansion in the presence of moisture, Type Duroseal Expansion Waterstop, by BBZ or approved equal.
1. Minimum dimensions: 0.8 inch wide by 0.4 inch thick.

2. Designed to perform in salt water and shall have a water pressure resistance of 75 psi.

3. Compatible with membrane.

N. Perforated Pipe: 4-inch nominal diameter, flexible, corrugated, perforated pipe with circumferential perforations, Type N12 by Advanced Drain Systems, Incorporated or approved equal.

O. Non-Perforated Pipe: 4-inch nominal diameter smooth pipe to be compatible with the perforated pipe.

P. Regroutable Hose: FUKO Type II, by BBZ USA, Inc. or approved equal.

1. Minimum 1-inch outside diameter PVC hose, consisting of a solid core with lateral openings covered by neoprene strips and the entire system wrapped with a webbed nylon mesh, suitable for injection with resin grouts.

2. Equipped with color coded injection and ventilation ends, closure plugs and anchoring system.

3. Anchoring system shall not puncture the waterproofing membrane.

Q. Junction Box: Heavy duty plastic box with removable cover compatible with the regroutable hose system and of sufficient size to accommodate injection and ventilation ends of hoses.

R. Remedial grout:

1. Ultra-fine micro-fine cement grout compatible with the regroutable hose, consisting of a one component, injection grout mix of ultra-fine slag and Portland cement particles, mixed with water and dispersant to form grout for low pressure injection methods such as Tricodur Micro-cement by BBZ/Greenstreak or approved equal.

2. Water soluble, hydrophilic, acrylate ester resin compatible with the regroutable hose such as Duroseal Inject 2000 by BBZ/Greenstreak, HA Flex LV by DeNeef, or approved equal.

**PART 3 - EXECUTION**

3.01 PREPARATION

A. Prepare surfaces which receive membrane according to the criteria specified herein and shown in the Contract Drawings.

1. All surfaces shall be free of oils, grease, and gasoline.

2. Install Contractor-designed temporary construction drainage as necessary.

3. Install 1-inch by 1-inch chamfer at all inside corners of the invert and roof slabs unless otherwise shown.

4. Provide a smooth finish of horizontal and inclined concrete surfaces such as the invert mud slab and the roof slab equivalent to a smooth float finish or better.
5. Repair all joints, offsets, voids, cracks and spalled areas which are greater than ½ inch in width or depth with quick setting grout, mortar, or approved equal.

6. Remove all loose shotcrete, concrete, and debris.

7. Any protrusions of more than 1/2 inch shall be covered with shotcrete, quick setting grout, or formwork such that no sharp edges are observed.

8. For overall smoothness of support of excavation surface apply General Smoothness Criteria as shown in the Contract Drawings with the exception of the invert, where a level surface has to be provided to avoid standing water.

9. Apply leveling material to all areas that do not conform the above requirements.

B. Surface Inspection and Acceptance:

1. Inspect all surfaces to which waterproofing and seepage management systems will be applied to, in the presence of the Waterproofing Installer and Resident Engineer.

2. Correct deficiencies identified during inspection and re-inspect after corrective action has been taken.

3. Complete Surface Acceptance Forms to release an area for waterproofing system installation, and obtain the Waterproofing Supervisor’s, Waterproofing Installer’s, and Resident Engineer’s signatures on the Surface Acceptance Form.

4. Distribute signed Surface Acceptance Forms in accordance with Specification Section 01 45 00, Quality Control.

3.02 INSTALLATION

A. Install waterproofing systems only after Surface Acceptance Form has been signed by the Resident Engineer.

B. Install waterproofing systems as soon as practical following completion of Surface Acceptance Form.

C. Installation of geotextile, geodrain, and membrane:

1. Attachment:
   a. Place attachment assemblies in surface depressions to achieve tight fit of geotextile and geodrain.
   b. Provide attachments on vertical walls at maximum 2-foot centers horizontally and vertically. At invert and roof slabs, provide attachments as required. Provide a uniformly snug fit to receiving surfaces.
   c. Provide additional attachment where necessary to achieve secure support and tight fit to support of excavation.

2. Geotextile and geodrain:
   a. Place geotextile or geodrain prior to the installation of waterproofing membrane.
b. Use geodrain in lieu of geotextile at open cut excavation support where groundwater infiltration is noticeable.

3. Membrane:
   a. Install membrane with sufficient overlap for welding. Trim overlap if necessary to achieve snug fit.
   b. Provide double wedge welded seams unless otherwise approved.
   c. Test all welds as specified.
   d. Terminate as shown on the Contract Drawings.

D. Installation of water barriers for sectioning:
   1. Install at locations and elevations shown on the Contract Drawings.
   2. Weld water barriers to membrane with one single weld on each side.
   3. Clean water barriers from dirt, debris, and concrete, prior to concrete pour.
   4. At areas where waterproofing is installed on the completed structure wall, place water barriers in form work prior to wall pours.
   5. At roof slabs, place water barriers on reinforcement and vibrate into concrete during pour to achieve proper embedment of the water barrier ribs.

E. Installation of control and grouting pipes:
   1. Install control and grouting pipes as shown on the Contract Drawings prior to concrete placements.
   2. Arrange exact location of control and grouting pipes to avoid interference with rebar or embedments.
   3. Protect control and grouting pipes from damage, from filling up with concrete, or from becoming dislodged during concrete pour.

F. Installation of regoutable hoses:
   1. Install regoutable hose in the invert slab as shown on the Contract Drawings.
   2. Fasten regoutable hose with manufacturer recommended anchor clips to hold the hose in place during application of concrete.
   3. Provide junction boxes to house injection and ventilation ends of hose in the topping slab as shown on the Contract Drawings.
   4. Provide a labeling system for regoutable hoses and maintain written records of their locations for inclusion on the as-built drawings.

G. Protect all membrane during installation and concrete placement:
   1. Protect invert and roof slab waterproofing by placing protective concrete over it as soon as practical after installation.
   2. Place membrane protection as soon as practical after installation of membrane and prior to starting any work which might damage the membrane.
3. Do not drill holes through concrete that has been placed over membrane.

4. Where reinforcement is placed, use approved methods to achieve required spacing between membrane and rebar.

5. Relieve water build-up behind membrane through use of temporary relief pipes and pumps, prior to concrete pours.

6. Do not penetrate membrane for other than permanent purposes with approved methods or temporary purposes authorized by the Resident Engineer.

7. Do not allow construction debris or equipment to accumulate on the waterproofing membrane.

8. Check integrity of waterproofing during installation of rebar, formwork, and during pouring concrete.
   a. Inspect waterproofing for damage prior to placement of concrete in the presence of the Waterproofing Supervisor and the Resident Engineer.
   b. Note location of any breach, damaged areas, or potentially damaged membrane on as-built drawings.
   c. Repair immediately any damage to membrane, prior to placement of concrete over it.
   d. Complete Waterproofing Condition Form to release an area for concrete placement, and obtain the Waterproofing Supervisor’s and Resident Engineer’s signatures on the Waterproofing Condition Form.

3.03 FIELD QUALITY CONTROL

A. Installation inspection shall confirm or otherwise document the following:

1. Use of specified materials.

2. Proper storing and handling of material.

3. Ambient temperature.

4. Adequate supervision by Waterproofing Supervisor.

5. Approved Waterproofing Installer has passed the daily welding test.

6. Seam direction and layout as shown on shop drawings.

7. Number and layout of attachments.

8. Overlap of membrane at seams for welding.

9. Application of welds as specified.

10. Penetrations are performed as shown on shop drawings.

11. Installation of corner patches.

12. Location, type, and elevation of water barriers. Provide as-built documentation as specified.
13. Location and elevation of control and grouting pipes and regrowable hoses. Provide as-built documentation as specified.


B. Testing of Membrane Welds:

1. General:
   a. Perform tests in the presence of Resident Engineer.
   b. Perform tests as installation progresses. Repair and retest seams that fail before continuing installation.
   c. Maintain records of test results, repairs, and retesting. Retain records on site and provide copies to the Resident Engineer upon request.

2. Double Welds: Perform test by applying internal air pressure between seams as follows:
   a. Test Pressure: 30 psi.
   b. Hold pressure for 10 minutes.
   c. Acceptance criteria: Air pressure loss shall be less than 10 percent after 10 minutes.

3. Single Welds including corners and water barriers:
   a. Check all welds for continuity by either of the following inspection methods. Single welds at membrane splices or patches to be tested prior to the application of liquid PVC:
      1) Run a rounded screwdriver along the joint after the weld has cooled.
      2) Blow stream of air under high pressure against the weld and observe opening of the weld. Re-weld and test any discontinuity.

4. Replace or repair sections of the membrane determined to be defective then re-test.

3.04 GROUTING

A. Remedial Grouting Supervisor to oversee the grouting of all regrowable hoses after structural concrete has obtained the required 28-day strength.

B. Determine injection pressure by means of on-site demonstration; do not exceed structural capacity of the structure.

C. Grout all regrowable hoses with cementitious grout.

D. Clean hoses and pipes after grouting.

3.05 REPAIR/RESTORATION

A. Leak Remediation
1. Observe structure interior and control and grouting pipes by regular inspection for water leakage until the final contract completion date.

2. If structure roof slabs or control and grouting pipes indicate water leakage undertake remedial measures including:
   a. Grouting first through regROUTable hoses as required and then through control and grouting pipes using suitable remedial grout within the section that indicates the leak.
   b. Determine injection pressure by means of on-site demonstration; do not exceed structural capacity of the structure.
   c. Clean hoses and pipes after grouting and repeat grouting operation if leak persists.

3. Do not penetrate or puncture membrane except for permanent purposes using proven water tightness techniques to be approved by Resident Engineer.

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 07 17 16
BENTONITE COMPOSITE SHEET WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for bentonite composite sheet waterproofing where shown on the contract drawings.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 03 30 00, Cast-in-Place Concrete: Waterstops and concrete placement.
   2. Section 07 10 00, Waterproofing and Seepage Management: Below-grade waterproofing for tunnel and station.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.
   1. American Society for Testing and Materials International (ASTM)

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: For each type of product indicated. Include product specifications and manufacturer's written installation instructions.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain bentonite waterproofing system from single source from single manufacturer. Obtain accessory products used with bentonite waterproofing from sources acceptable to bentonite waterproofing manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original unopened and undamaged containers.

B. Store materials in a dry, well-ventilated space.
C. Remove and replace bentonite materials that have been prematurely exposed to moisture.

1.06 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit bentonite waterproofing to be installed according to manufacturers’ written instructions and warranty requirements.

1. Do not apply waterproofing materials to surfaces where ice or frost is visible. Do not apply bentonite waterproofing materials in areas with standing water.

2. Placing bentonite clay products in panel or composite form on damp surfaces is allowed if approved in writing by manufacturer.

PART 2 - PRODUCTS

2.01 BENTONITE COMPOSITE SHEETS

A. Composite HDPE/Bentonite Membrane: Minimum of 1.1 lb/sq. ft. of bentonite clay granules bonded to nonwoven geotextile polypropylene fabric, with HDPE sheet on opposite side.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. CETCO; Voltex DS.

   b. Tremco; Paraseal LG

2. Minimum Grab Tensile Strength: 120 pounds force according to ASTM D 4632.


4. Maximum Vapor Permeance: 0.031 perms according to ASTM E 96.

2.02 INSTALLATION ACCESSORIES

A. Bentonite Mastic: Trowelable consistency, bentonite compound, specifically formulated for application at joints and penetrations.

B. Granular Bentonite Tubes: Manufacturer’s standard 2-inch- diameter, water-soluble tube containing approximately 1.5 lb/ft. of bentonite; hermetically sealed; designed specifically for placing on wall footings at line of joint with exterior base of wall.

C. Masonry Fasteners: Case-hardened nails or hardened-steel, powder-actuated fasteners. Depending on manufacturer’s written requirements, provide 1/2- or 1-inch- diameter washers under fastener heads.

D. Sealants: As recommended in writing by waterproofing manufacturer. Comply with requirements specified in Section 07 92 00, Joint Sealants.

E. Tapes: Waterproofing manufacturer’s recommended tape for joints between sheets, membranes, or panels.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate preparations affecting performance of bentonite waterproofing.

B. Verify that substrate is complete and that work that will penetrate waterproofing is complete and rigidly installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Coordinate work in the vicinity of waterproofing to ensure proper conditions for installing the waterproofing system and to prevent damage to waterproofing after installation.

B. Formed Concrete Surfaces: Remove fins and projections. Fill voids, rock pockets, form-tie holes, and other defects with bentonite mastic or cement grout patching material according to manufacturer's written instructions.

C. Horizontal Surfaces: Remove debris, standing water, oily substances, mud, and similar substances that could impair the effectiveness of waterproofing. Fill voids and other defects with compacted granular material according to manufacturer's written instructions.

3.03 INSTALLATION, GENERAL

A. Install waterproofing and accessories according to manufacturer's written instructions.

B. Apply granular bentonite tubes, bentonite mastic, or both at changes of plane, construction joints in substrate, projections, and penetrations.

C. Protect waterproofing from damage and wetting before and during subsequent construction operations. Repair punctures, tears, and cuts according to manufacturer's written instructions.

3.04 COMPOSITE BENTONITE MEMBRANE INSTALLATION

A. General: Install a continuous layer of waterproofing membrane with ends and edges lapped a minimum of 3 inches. Stagger end joints between membranes. Seal joints with permanent seam tape.

B. Below Slabs-on-Grade: Apply waterproofing membrane with HDPE side down and staple ends and edges.

1. Install under footings, grade beams, and pile caps; or continue waterproofing through key joints between footings and foundation walls, and extend a minimum of 8 inches up or beyond perimeter slab forms.

2. Protect waterproofing from damage caused by reinforcing bar supports with sharp edges.
C. Concrete Walls: Starting at bottom of wall, apply waterproofing membrane with HDPE side facing Installer; overlap sheets 3 inches. Secure with powder-actuated fasteners or case-hardened nails. Extend to bottom of footing, grade beam, or wall, and secure.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for furnishing and applying water repellents and sacrificial and non-sacrificial graffiti-resistant coatings applied to exterior and interior surfaces exposed to public view at locations as specified, scheduled or indicated on Contract Drawings.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 03 30 00, Cast-In-Place Concrete: Substrates for work of this Section.
2. Section 03 35 00, Concrete Finishing
3. Section 04 20 00, Unit Masonry: Substrates for work of this Section.
4. Section 05 75 00, Architectural Decorative Metal: Substrate for materials of this Section.
5. Section 07 92 00, Joint Sealants: Compatibility with materials of this Section.
6. Section 08 11 13, Hollow Metal doors and Frames: Substrate for materials of this Section.
7. Section 08 56 29, Heat Resistive Window Wall Systems.
8. Section 08 80 00, Glazing: Substrate for materials of this Section and additional information on graffiti-resistant coatings on glass.
9. Section 09 30 00, Tiling: Substrate for materials of this Section.
10. Section 09 90 00, Finish and Color Schedule: Locations and extent of graffiti-resistant coatings and types required.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Society for Testing and Materials International (ASTM)
2. Northwest Air Quality Management District (NWAQMD)
a. NWAQMD - Rule 113 Architectural Coating

### 1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Provide product description.

C. Manufacturer’s Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.

D. Manufacturer’s Certificates:
   1. Certify that products meet or exceed specified requirements.
   2. Provide certificate from manufacturer confirming qualifications and competence of authorized coating applicator.

E. Manufacturer’s Warranty: Submit sample of manufacturer’s standard ten year warranty against product failure of water and graffiti repellents.

### 1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section approved by manufacturer.

C. Sound Transit reserves the right to provide continuous independent inspection of surface preparation and application of water repellent.

### 1.05 MOCK-UPS

A. Prepare a representative surface 6 x 6 feet in size using specified materials and preparation and application methods on all surfaces identical to those to be coated; approved mock-ups constitutes standard for workmanship. Demonstrate materials and methods to be employed for the removal of graffiti that is caused by spray paint, felt marker, lipstick, paint balls and grease.

B. Locate where directed by Resident Engineer. Approved mock-ups may remain as part of the Work.

C. Graffiti-Repellent Mock-up Test Surfaces: Prepare reviewed and accepted test surface with graffiti-resistant coating to represent standard of texture and workmanship for the Work. Coat surface as specified and in accordance with manufacturer's recommendations. Allow coating to cure, apply graffiti as directed by the Resident Engineer, and then remove graffiti. Cleaned surface – Undamaged and displaying no graffiti “shadows” or “ghosts.” Do not apply graffiti-resistant coating to the Work before sample surface has been reviewed and accepted by the Resident Engineer. Provide the following mock-ups. Identify which to employ sacrificial (WGR-4) and which to be non-sacrificial (WGR-3) products at each mock-up, in accordance with Manufacturer’s recommendations.
   1. Concrete masonry.
   2. Acoustical wall panels.
3. Hollow metal doors and frames.
4. Metal Wall Panels
5. Heat resistive window wall system CW-1
7. Tiling (on vertical surface only).

D. Proposed Substitutions: For proposed substitutions, prepare side-by-side mock-ups of specified and substitute products. See Section 01 25 00, Substitution Procedures.

1.06 DELIVERY, STORAGE AND HANDLING

A. General: Comply with requirements specified in Section 01 60 00.

B. Deliver materials to site in sealed, original, labeled containers bearing manufacturer's name, type of material, brand name, and instructions for mixing. Store materials off-ground, and under cover. Conform to any additional recommendations of the manufacturer regarding storage and handling of the materials.

C. Architect and Owner’s Representative reserves the right to inspect the containers prior to their opening, to review accompanying bills of lading, and to reject materials in opened containers

1.07 PROJECT CONDITIONS

A. Environmental Requirements
   1. Protect liquid materials from freezing.
   2. Do not apply water repellent when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.
   3. Provide adequate ventilation and safety precautions as recommended by coating manufacturer.

1.08 WARRANTY

A. Special Finish Warranty: Provide manufacturer’s special finish warranty covering failure of finish to protect against graffiti damage within 10 year period from date of Substantial Completion

B. Prior to Substantial Completion, submit specified manufacturer’s 10-year warranty and ensure that forms have been completed in Sound Transit’s name and are registered with manufacturer of each material utilized.

C. See Section 01 77 00, Closeout Procedures for additional warranty requirements.

1.09 MAINTENANCE

A. Extra Materials: Provide 5 gallons of each type of water and graffiti repellent.
PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. WGR-1: Clear water repellent for exterior concrete, masonry, and unglazed tile:
   1. Description: First coat of WGR-3 product described below.

B. WGR-2: Clear water repellent for floor tiles, unit pavers and grouts.
   1. Description: Modified silane penetrating solution that offers invisible protection and low volatility.

C. WGR-3: Non-Sacrificial Graffiti-Resistant Coatings.
   1. Description: Minimum two coat water-based, clear, non-sacrificial film forming a non-glossy, non-darkening, non-yellowing, non-flammable, non-toxic coating that will resist penetration of graffiti from spray paint, liquid shoe polish, lipstick, magic markers, oils and greases. Note: Single coat application of product is water repellent WGR-1 described above.
   2. Basis-of-Design Product: PermaShield (permanent coating) as manufactured by Monopole Inc., Accepted options are Super Kote A-G-5 as manufactured by Ven-Chem Co; and Professional Water Sealant, Super Strength as manufactured by Professional Products of Kansas. Meet NWAQMD VOC equivalent.

D. WGR-4: Sacrificial Graffiti-Resistant Coatings.
   1. Description: Optically-clear, distortion-free, sacrificial coating, which when applied, provides a significant resistance to etching and scratching of the underlying surface.

E. Substitutions: See Section 01 25 00, Substitution Procedures.

2.02 MATERIALS

A. Exact product to be used will be determined by side-by-side mock-up testing of at least 3 products meeting specified requirements; prepare mock ups as specified above; submit cost breakdown for each product used in mock-up, including both unit and total costs.

   1. Clear, containing 100 percent alkyltrialkoxysilanes; with 350 g/L or less of VOCs when tested in accordance with South Coast Air Quality Management District standards.

C. Non-Sacrificial Graffiti-Resistive Coating (WGR-3): RTV Silicone resin based; colorless.
   1. VOC Content: Less than 250 grams per Liter, when tested in accordance with ASTM D 3690 or D 5095.
   2. Solids by Volume: 5 percent, minimum.

   1. 6-mil total thickness with scratch resistant hard outer coating.

E. Substrate Cleaner: Compatible with substrate and approved by coating manufacturer.

F. Graffiti Removers: Type(s) recommended by coating manufacturer(s).

**PART 3 - EXECUTION**

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify joint sealants are installed and cured prior to application.

C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water or graffiti repellent.

3.02 PREPARATION

A. Protect adjacent landscaping, property, and vehicles from drips and overspray.

B. Protect adjacent surfaces not intended to receive water or graffiti repellent.

C. Prepare surfaces to be coated as recommended by water repellent or graffiti manufacturer for best results. Do not use acid to clean surfaces.

D. Do not start work until masonry mortar substrate is cured a minimum of 60 days.

E. Pressure wash surfaces to be coated with detergent wash and warm water rinse. Avoid excessive pressure that may damage surfaces being cleaned.

F. Coordinate CMU cleaning requirements with Section 04 20 00, Unit Masonry.

G. Concrete: High-pressure-wash at 1500 to 4000 pounds per square inch (psi), at 6 to 12 inches from surface.

H. Firm Masonry (Concrete Masonry Units): High-pressure wash at 1500 to 4000 pounds per square inch (psi), at 6 to 12 inches from surface.

3.03 APPLICATION

A. Apply Water and Graffiti Repellents in accordance with manufacturer's instructions, using procedures and application methods recommended for best results.

B. Apply graffiti-resistant coating only after sealant work has been completed and sealant has fully cured.

C. Apply non-sacrificial coating WGR-3 by brush, roller or spray. Use brush or roller if overspray would affect adjacent materials and if spraying is not practical. Comply with coating manufacturer's recommendations for spray nozzle type and orifice size and rate of coverage and number of coats.
D. Apply graffiti-resistant coatings to next adjacent joint line or break line of material.

E. Protect treated surfaces from traffic, rain, and other surface water as recommended by coating manufacturer.

F. Apply non-sacrificial graffiti-resistant coating (WGR-3) to masonry, concrete, stone, and as indicated on Contract Drawings.

G. Apply sacrificial graffiti-resistant coatings (WGR-4) to metal panels, doors, glass surfaces, site furnishings, or as indicated on Contract Drawings. Apply sacrificial coating in accordance with manufacturer’s written installation instructions.

H. Apply Water Repellent at rate used for mock-up and as recommended by manufacturer, continuously over entire surface of work except at locations described in Item I. below.

I. Apply Sacrificial (WGR-4) and Non-Sacrificial (WGR-3) Graffiti Repellents on vertical concrete and concrete masonry surfaces, glazing, and doors, within 9 feet of floor or grade surfaces accessible to general public. If height of top of glass pane or metal panel or other work element receiving this material exceeds 9 feet, extend material to top of the element up to a height of 12 feet to avoid abrupt termination of material. Apply water specified repellent (WGR-1) material only to surfaces above same areas, and to other surfaces indicated or scheduled.

J. Provide manufacturer's field service representative to inspect preparation and application work during installation to ensure that manufacturer's "best practices" for preparation and application are being followed.

K. Apply approved water and graffiti repellent and water repellent sealer to materials indicated in Section 09 06 00, Schedules for Finishes.

3.04 CLEANING AND PROTECTION OF ADJACENT WORK

A. Protect adjacent landscaping, property, and vehicles from drips and overspray.

B. Protect adjacent surfaces not intended to receive water or graffiti repellent.

C. Remove water or graffiti repellent from unintended surfaces immediately by a method instructed by water or graffiti repellent manufacturer.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for batt/blanket insulation and rigid insulation as indicated on Contract Drawings, including, but not limited to:

1. **INSUL-1**: Polyisocyanurate foam plastic boards installed outboard of framing of walls enclosing conditioned space.

2. **INSUL-2**: Tapered rigid insulation at roof, specified and installed per Section 07 54 23.

3. **INSUL-3**: Fire rated mineral wool insulation.

4. **INSUL-4**: Thermal batt/blanket insulation installed within framing of walls enclosing conditioned space.

5. **INSUL-5**: Polyisocyanurate foam plastic boards with metal face for exposed underside of ceiling slab with conditioned space below. Impaled installation. NOT APPLICABLE TO N150.

6. **INSUL-6**: Semi-rigid glass fiber insulation with black facer (duct liner), 2" thick

7. Accessories for installation as indicated.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 07 54 23, Thermoplastic Polyolefin (TPO) Roofing; Tapered insulation at roof.

2. Section 09 21 16, Gypsum Board Assemblies

3. Section 22 07 00, Plumbing Insulation

4. Section 23 07 00, HVAC, Insulation

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents:

1. American Society for Testing and Materials International (ASTM)


   b. ASTM C 665: Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
c. ASTM C 1289: Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

d. ASTM E84: Test Method for Surface Burning Characteristics of Building Materials

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Submit manufacturer's product data for each different type of insulation, impaling pins with self-locking washers, and fire resistant seal compound verifying compliance with specifications herein. Submittal shall include spacing of impaling pins for each different type of insulation.

1.04 DELIVERY, STORAGE & HANDLING

A. Protect insulation from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

B. Protection for Plastic Insulation:
   1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site until site is prepared for installation. Complete installation and concealment of plastic materials as rapidly as possible in each area of work.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide insulation in performed units from manufacturer's standard thicknesses, widths, and lengths sized to fit applications indicated. Insulation between metal studs shall be friction fit type.

B. "R" values for various insulation types are listed under each insulation type. "R" values listed are at 75 degrees F mean temperature.

C. Insulation types and locations are indicated on Contract Drawings.

2.02 BATT/BLANKET INSULATION (THERMAL INSULATION)

A. (INSUL-3) Foil Scrim Polyester (FSP) or Foil Scrim Kraft (FSK) Faced Mineral Wool Insulation for impelling pin installation:
   1. ASTM C665, Type III, Class A, Category 1.
   2. Surface Burning Characteristics: As tested ASTM E84.
      b. Smoke Developed: Maximum 50.

B. (INSUL-4) Unfaced Glass Fiber Insulation; Flame resistant thermal glass batt/blanket type insulation without facers conforming to ASTM C665, Type I.
2.03 RIGID POLYISOCYANURATE FOAM PLASTIC BOARDS

A. **(INSUL-1)** Foil-Faced, Polyisocyanurate Board Insulation: ASTM C 1289, Type I, Class 1 or Class 2, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, in accordance with ASTM E 84.

B. **(INSUL-5)** Rigid polyiso-cyanurate foam plastic boards, reinforced with glass fibers with white embossed acrylic coated aluminum facing.
   1. Fire Classification: Flame spread rating of 25 or less and a smoke development of 450 or less when tested in accordance with ASTM E84; complying with ICC Evaluation Report ER-3223, waiving thermal barrier as stated.
   2. Manufacturer/Product: Dow Chemical "Thermax Heavy Duty Insulation/Finish Board", or "R-Max "TSX-8500", or approved equal.

2.04 SEMI-RIGID GLASS FIBER INSULATION (FACING TO EXTERIOR): APPLICABLE FOR N140

A. **(INSUL -6)**: Acoustical Control glass fiber insulation, faced with FRK facing, conforming to ASTM C612, Type IB; minimum 2 inches thick, density 6.0 pounds per cubic foot and meeting the following requirements:
   1. Fire Classification: Flame spread rating of 25 or less and a smoke development of 50 or less when tested per ASTM E84.
   2. Odor Emissions: Passed per ASTM C1304.
   4. Color: Black
   5. Recycled Content (Fiber): 25%, minimum.
   6. Acceptable Produces:
      a. Owens Corning, “Select Sound Theater Board”.

2.05 MISCELLANEOUS MATERIALS

A. Impaling Pins and Washers: AGM Industries, Inc. "Tactoo Insul-Hangers Series T" (glue-on) and "Series TSA" (weld-on), or approved equal meeting the following requirements:
   1. Anchor Pins: Minimum 12 gage with manufacturer’s standard corrosion resistant coating. Provide pins with 2-inch square perforated base plate of galvanized steel for glue-on application to concrete, and weld pins for attachment to metal deck. Provide pins in lengths as required.
   2. Self-Locking Washers: Provide all anchors with insulation washers. For ceiling areas and walls above 7 feet, use AGM Industries, Inc. “RC-150”, 1-1/2 inch diameter, 0.015 inch thick, galvanized steel washers, or approved equal. For walls up to a height of 7 feet, use AGM Industries, Inc. “RC-100” galvanized steel washers with cupped heads for exposed ends of pins, or approved equal.

B. Miscellaneous Materials: Materials such as fasteners, retainers and splicing and patching tape, not specially described but required for a complete installation of building insulation, shall be as recommended by the insulation manufacturer. Wire for tying shall be 18 gage galvanized, soft annealed wire.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installing insulation, carefully inspect and verify the completion of the installed work of other trades. Verify adjacent materials are dry and that building insulation may be installed in accordance with the original design and manufacturer's recommendations.

B. Verify that inspections and approval required for work to be concealed by insulation have been completed prior to beginning insulation installation.

C. Discrepancies: In the event of discrepancies in other trade's work, immediately notify the Resident Engineer and do not proceed with installation until discrepancies have been corrected.

3.02 INSTALLATION (GENERAL)

A. General: Apply insulation by methods indicated complying with manufacturer's recommended procedures. Friction fit batt/blanket insulation between framing members.

1. Extend insulation full thickness as shown over entire area to be insulated, using a single layer wherever possible to provide "R" values or thickness indicated. Cut insulation neatly to fit tightly around obstructions.

2. Completely seal off and fill all voids in insulated areas to preclude direct passage of air between interior and exterior spaces.

3. Remove projections, which interfere with placement.

3.03 INSTALLATION OF BATT/BLANKET INSULATION

A. Thermal Batt/blanket Insulation (Walls): Install batt/blankets between studs using friction method; install full width batt/blankets to heights as indicated on Contract Drawings. Install insulation type at exterior walls where interior side is covered with gypsum wallboard and elsewhere as indicated.

1. Place insulation with vapor retarder facing interior side (warm side) of building heated spaces. Do not obstruct ventilation spaces.

2. Form tight seal between insulation and surrounding construction. Tape joints and ruptures in vapor retarders to ensure vapor-tight installation.

3. At locations where no framing is present to support the insulation, provide metal impaling clips or wire supports to hold the insulation in position. Mechanically or adhesively bond the clips to the substrate in accordance with the manufacturer's recommendations to seal penetration points.
4. For continuity between wall and roof edge, strip in a separate vapor retarder sheet matching insulation facing and overlap onto underside of roof deck and secure in place with adhesives or other anchorage systems as recommended by vapor retarder manufacturer for the type of installation.

5. Repair punctures and tears in vapor retarders immediately before concealment by gypsum wallboard. Cover with adhesively applied vapor retarder material or with self-adhesive vapor retarder tape.

6. Where insulation edges are exposed (unframed), extend facing onto substrates and seal entire perimeter with manufacturer’s approved seam tape.

B. Installation of Insulation over Ceilings: Install blanket insulation loose laid with ends and edges tightly butted over entire ceiling area in thicknesses indicated.

3.04 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION (INSUL-2)

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

3.05 INSTALLATION OF RIGID POLYISOCYANURATE FOAM PLASTIC BOARDS (INSUL-5)

A. Thermal Semi-Rigid Insulation: Install insulation type using impaling pins and washers fasteners. Adhere anchors in place, spaced a maximum of 12 inches on center in one direction and 24 inches on center in the other direction; provide additional anchors as required.

1. Install panels full width and in largest lengths to limit end joints; provide supplementary adhesive recommended by insulation board manufacturer to prevent sagging.

2. Place un-faced side of insulation directly against concrete slab with aluminum facing down and seal exposed ends and meeting edges of insulation with matching seam tape.

3.06 PROTECTION

A. General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes performance specifications for:

1. Water-Resistive Rainscreen Barrier: Under exterior wall cladding, over sheathing or other substrate; not air-tight or vapor retardant.

2. Sheet Seals for Roofing applications: Materials to make ridges, valleys, edges and low slope roofing areas water vapor-resistant.


4. Air Barriers: Sprayed or sheet materials to stop passage of exterior air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 06 16 43, Exterior Gypsum Sheathing
2. Section 07 92 00, Joint Sealants

1.02 REFERENCES

A. This Section incorporates by reference the following documents.

1. American Association of Textile chemists and Colorists (AATCC)


4. ICC Evaluation Service (ICC-ES)


1.03 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers or vapor retarders.

B. Air Barrier: Air-tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.

C. Vapor Retarder: Air-tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.

1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture-resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.04 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Provide manufacturer’s data for materials to be used that fully describes material characteristics.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Manufacturer’s Installation Instructions: Indicate preparation and installation recommendations.

1.05 QUALITY ASSURANCE

A. Vapor Permeability (Perm): Measure in accordance with ASTM E 96 Procedure E.

1.06 PROJECT CONDITIONS

A. Environmental Requirements
1. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

1.07 WARRANTY

A. General: Provide manufacturer’s single-source two year warranty for each of the materials provided in this section. Warranties to cover the following:

1. Material and labor to remedy any air and weather system failures.

2. Material and labor to repair or replace water-resistive barrier joints that are seamed with tape as a part of the assembly.

PART 2 - PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. Water-Resistive Barrier: Provide on exterior walls under exterior cladding.

1. Use sheet materials unless otherwise indicated on Drawings or specified elsewhere.

2. Under siding, use two separate layers of building paper.

B. Air Barrier:

1. Provide in exterior wall assemblies at locations as detailed on Contract Drawings.

C. Interior Vapor Retarder:

1. On inside face of masonry and concrete walls use vapor retarder coating.

D. WATER RESISTIVE RAINSCREEN BARRIER MATERIALS (NEITHER AIR BARRIERS NOR VAPOR RETARDER) Building Paper: Asphalt-saturated kraft building paper complying with requirements of ICC-ES AC38 Grade D.

1. Water Resistance: 60 minutes, minimum, when tested in accordance with ASTM D 779.

2. Manufacturers:


   b. Substitutions: See Section 01 60 00, Product Requirements.

E. Plastic Sheet: Polymeric-based sheet complying with requirements of ICC-ES AC38 Grade D with 60-minute water-resistance; do not use polyethylene sheet.

1. Manufacturers:


   b. Substitutions: See Section 01 60 00, Product Requirements.

2.02 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier Sheet, Mechanically-Fastened:
1. Air Permeance: 0.004 cubic feet per square foot, maximum, when tested in accordance with ASTM E 2178.

2. Water Vapor Permeance: 20 perms, minimum, when tested in accordance with ASTM E96/E 96M Procedure A (desiccant method).

3. Water Penetration Resistance: Withstand a water head of 21 inches, minimum, for minimum of 5 hours, when tested in accordance with AATCC 127.

4. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 4 months weather exposure.
   a. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 50 or less, when tested in accordance with ASTM E 84.

B. Air Barrier Coating:

1. Material: Water-based acrylic or polymer-modified bitumen, with VOC content of zero.

2. Acceptable Substrates: Stated by manufacturer as suitable for installation on damp surfaces and green concrete without requiring a primer.

3. Air Permeance: 0.004 cubic feet per square foot, maximum, when tested in accordance with ASTM E 2178.

4. Water Vapor Permeance: 20 perms, minimum, when tested in accordance with ASTM E96/E 96M Procedure A (desiccant method).

C. Sheet Seal Materials

   a. Thickness: 40 mil, nominal.
   b. Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E 96/E 96M.

2. Sheet Seal for Wall Opening Applications: Rubberized asphalt bonded to sheet polyethylene, self-adhesive.
   b. Maximum Vapor Permeability (Perm): 1 ng/S/m/pa.

2.03 SPRAY-APPLIED VAPOR RETARDER COATING

A. Vapor Retarder Coating: Sprayed, elastomeric, UV-resistant coating capable of being applied to outside surface of gypsum wall sheathing, or to damp masonry and green
concrete without adverse effect on adhesion; complying with requirements of ASTM C 836 except for minimum film thickness.

1. Film Thickness: 8 mils, minimum.
2. Water Vapor Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E 96/E 96M.
3. Adhesion: Not less than 350 pounds-force per square inch when tested in accordance with ASTM D 4541.
5. Application Temperature: As recommended by Manufacturer.
6. VOC Content: Less than 600 g/L when tested in accordance with 40 CFR 59 Subpart D (EPA Method 24).
7. Suitable for use on concrete, masonry, and gypsum sheathing.
8. Acceptable Products:
10. Substitutions: See Section 01 60 00, Product Requirements.
11. Joint Tape: As recommended by coating manufacturer and suitable to the substrate.
12. Joint Filler: As recommended by coating manufacturer and suitable to the substrate.

2.04 APPLICATIONS

A. Inside Surface of Exterior Metal-Framed or Stud Walls: Sheet seal applied to stud faces.

B. Outside Surface of Gypsum Wall Sheathing: Sprayed coating.

1. Sprayed Coating: Elastomeric, UV-resistant coating capable of being applied to damp masonry and green concrete without adverse effect on adhesion; complying with requirements of ASTM C 836 except for minimum film thickness.
   a. Film Thickness: 10 mils, minimum.
   b. Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E 96/E 96M.
   c. Adhesion: Not less than 350 pounds-force per square inch when tested in accordance with ASTM D 4541.
   e. VOC Content: Less than 600 g/L when tested in accordance with 40 CFR 59 Subpart D (EPA Method 24).
   f. Suitable for use on concrete, masonry, and gypsum sheathing.
2. Joint Tape: As recommended by coating manufacturer and suitable to the substrate.
3. Joint Filler: As recommended by coating manufacturer and suitable to the substrate.

2.05 ACCESSORIES


B. Thinners, Cleaners and Primers: As recommended by material manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove loose or foreign matter which might impair adhesion of materials.

B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Air Barriers: Install continuous air-tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Mechanically Fastened Sheets - On Exterior:
   1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
   2. Overlap seams as recommended by manufacturer but at least 6 inches.
   3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
   4. For applications specified to be air-tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
   5. Install air barrier and vapor retarder under jamb flashings.
   6. Install head flashings under weather barrier.

D. Mechanically-Fastened Sheets - Vapor Retarder on Interior:
   1. When insulation is to be installed in assembly, install vapor retarder over insulation.
   2. Seal seams, laps, perimeter edges, penetrations, tears, and cuts with self-adhesive tape, making air-tight seal.
3. Locate laps at a framing member; at laps fasten one sheet to framing member then tape overlapping sheet to first sheet.

4. Seal entire perimeter to structure, window and door frames, and other penetrations.

5. Where conduit, pipes, wires, ducts, outlet boxes, and other items are installed in insulation cavity, pass vapor retarder sheet behind item but over insulation and maintain air-tight seal.

E. Self-Adhesive Sheets:

1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.

2. Lap sheets shingle-fashion to shed water and seal laps air-tight.

3. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.

4. At wide joints, provide extra flexible membrane allowing joint movement.

F. Coatings:

1. Prepare substrate in manner recommended by coating manufacturer; fill and tape joints in substrate and between dissimilar materials.

2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over masonry; seal around anchors airtight.

3. Sprayed Coating: Install to thickness recommended by manufacturer.

4. Use self-adhesive sheet flashing to seal to adjacent construction and to bridge joints.

G. Openings and Penetrations in Exterior Weather Barriers:

1. Install self-adhesive flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.

2. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using self-adhesive flashing at least 9 inches wide, covering entire depth of framing.

3. At head of openings, install self-adhesive flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.

4. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.

5. Service and Other Penetrations: Form self-adhesive flashing around penetrating item and seal to weather barrier surface.

H. Install air and vapor seal materials and assemblies in conjunction with materials described in other sections to provide continuous sealed barrier in the exterior enclosure of the building.
I. Sheet Seal:
   1. Inside of Metal Stud-Framed Walls: Attach sheet seal to stud faces with adhesive; lap edges over stud faces, seal laps with tape; lap ends onto adjacent construction; seal ends with sealant.
   2. Solid Substrates: Install sheet seal in full bed of adhesive; seal laps with sealant; seal to adjacent construction with sealant.

J. Self-Adhesive Sheet Seal: Install over entire surface, sealing laps airtight; seal to adjacent construction.

K. Mastic Coating: Install by trowel or roller to minimum thickness of 1/4 inch; use sheet seal to join to adjacent construction, seal airtight with sealant.

L. Sprayed Coating: Fill large joints; tape joints in substrate and between dissimilar materials; install sprayed coating over entire exterior surface; seal to adjacent construction with compatible sheet.

M. Exterior Masonry Veneer: Install masonry anchors before installing air/vapor retarder; seal around anchors airtight.

N. At junction of exterior wall and roof join wall seal to roof deck and seal.

O. At Roof/Wall transitions, Roof eaves, roof valleys, hips, ridges, and low-slope roofs, install 36 inches wide sheet seal (40 mil product) in accordance with manufacturer’s instructions.

P. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.

3.04 FIELD QUALITY CONTROL

A. Do not cover installed weather barriers until substrates are installed and approved by Resident Engineer.

B. Take digital photographs of each portion of the weather barrier installation prior to covering up. Submit to Resident Engineer.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than one week or period recommended by manufacturer, whichever is the least.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:

1. MP-1: SST Kiosk Enclosures for Systems Information; SST Wall Panels at Station Entry Ticketing/Information Panels; SST Column Wrap at Platform and North Entry Lobby.

2. MP-2: Porcelain Enamel panels (Ceramic Steel) interior cladding.

3. MP-3: Perforated stainless steel exterior screen panels, orbital finish.

4. MP-4: SST Wall Panels at Station Entry Ticketing/Information Panels, Perforated and interior of N140 Escalator “Tubes”.

5. MP-5: SST Elevator Bevels.

6. MP-6: SST Metal Escalator Enclosure Panels secured to the sides and underside of escalator truss.

7. MP-7: SST Wall Panels at Station box walls between ribs. Up to 30 feet above track level. Micro perforated.

8. MP-8: SST Wall Panels at Station box walls between ribs above MTL-5A.

9. MP-9: Porcelain Enamel (Ceramic Steel) exterior cladding.

10. MP-10: Precoated sheet steel exterior cladding at shaft enclosure walls above roofs.

11. MP-11: Aluminum flat wall panel at roof plenum cladding.

12. MP-12: Perforated stainless steel wall panel with acoustical backing material.


B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work

1. Section 05 40 00, Cold-Formed Metal Framing: Structural support under wall panel substrate.

2. Section 06 16 43, Gypsum Sheathing: Substrate for installation of Metal Wall Panels.

3. Section 07 21 00, Thermal Insulation: Rigid board insulation.
4. Section 07 25 10, Air and Weather Barriers: Rainscreen sheet seal between wall sheathing and metal panels.

5. Section 07 62 00, Sheet Metal Flashing and Trim: Coordination with work of this Section.

6. Section 07 92 00, Joint Sealants.

7. Section 09 21 16, Gypsum Board Assemblies: Sheathing behind metal wall panels.

1.02 REFERENCES

A. This Section incorporates by reference the following documents.


2. National Association of Architectural Metal Manufacturers (NAAMM)

3. NAAMM Metal Finishes Manual

1.03 SYSTEM DESCRIPTION

A. Design Requirements

1. Components: Provide certified test results from an Independent Testing Laboratory in accordance with the following test methods:

   a. Air Infiltration: ASTM E 283-73: 0.06 cubic feet per minute per square foot at 1.57 pounds per square foot.
   b. Water Penetration: ASTM E 332-70: no leakage at 6.24 pounds per square foot.
   c. Allowable load: Must exceed 50 pounds per square foot for a 7 foot span.


3. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
4. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.

5. Provide continuity of air barrier and vapor retarder seal at building enclosure elements in conjunction with materials specified in Section 07 25 10, Weather and Air Barriers.

1.04 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Provide product data for all items included in this section, including certified test results, installation instructions, and recommendations applicable to materials and finishes for each component and for the complete panel system.

C. Shop Drawings: Indicate dimensions, layout of panels, joints, construction details of edge conditions, methods of anchorage, trim, flashing, and other special details. Contract Drawings will clearly illustrate all elements, including attachment and/or bracing members, methods employed to assure performance integrity of the system component as it relates to surrounding work, specific dimensional tolerances allowed, and specific benchmark locations to be met.

1. Provide fully coordinated drawings of all exterior cladding and glazing systems. Any submittal for one or more of the above mentioned systems not included in a fully coordinated submittal package will be considered incomplete, and will be returned to the Contractor without review.

D. Samples:

1. Submit four each samples of wall panel and soffit panel, 8 inch by 8 inch in size illustrating finish color, sheen, and texture.

2. Fasteners: Four of each type with statement of intended use.

3. Closures: Four metal closures and four foam closures as required.

4. Sealants: Four samples of each type with statement describing intended use.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer: Company specializing in performing the work of this section with minimum three years of experience.

C. Field Measurements: Where possible, prior to fabrication of panels, take field measurements of structure or substrates to receive panel system. Provide trimmable panel units where final measurements cannot be established prior to fabrication.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.
C. Prevent contact with materials that may cause discoloration, marring, or staining of products.

D. Finish Protection: Provide protective measures to protect metal wall panel systems from construction activity, including padding tools, boxes, stepladders, and hoist cables. Coordinate protection requirements with other trades which require access.

1.07 PROJECT CONDITIONS

A. Coordinate the Work for installation of vapor retarder and air barrier seals.

1.08 WARRANTY

A. See Section 01 77 00, Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.

C. In addition to the manufacturer’s warranty, the single source Subcontractor is to warranty the integrity and weather-tightness of the assembled exterior wall and all components thereof for a period of 5 years. Warranty will be co-signed by the manufacturer.

D. Finish Warranty: Furnish panel manufacturer’s written warranty covering failure of the factory applied exterior finish on metal panels within a 20 year warranty period.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. MP-2 and 9 Basis-of Design Manufacturers and Products:
   3. Substitutions: See Section 01 25 00, Substitution Procedures.

B. MP-10 Basis of Design Manufacturers and Products:
   2. Substitutions: See Section 01 25 00, Substitution Procedures.

C. MP-11 Aluminum plate; aluminum thickness: 0.093, Panel thickness: 1-inch. Finish: Fluoropolymer coating Color: TBD

D. MP-12 Basis of Design TBD

2.02 MATERIALS

A. Sheet Materials
   1. Stainless Steel Sheet and Plate: ASTM A240, Type 304, soft temper; brushed and non-directional orbital finished as shown.
2. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653 Formed Steel, with G90/Z275 coating; continuous coil-coated on exposed surfaces.


2.03 ACCESSORIES

A. Manufacturer's standard sheet metal flashings, closure pieces, seams and edge trim, and caps, pre-coated to match adjacent sheet metal siding or roofing. Same material, thickness, and finish as adjacent siding and roofing. Brake-formed to required profiles.

B. Gaskets and closure strips: Manufacturer's standard closed cell rubber or suitable for use with system, permanently resilient; ultraviolet and ozone resistant, cut and pre-molded to match configuration of panels.

C. Sealants: Specified in Section 07 92 00, Joint Sealants. Manufacturer's standard type suitable for use with installation of system; non-staining; color as selected.

D. Sealing Tape: 100 percent solids, butyl-based tape sealant packaged in rolls with a release paper on one side.

E. Fasteners: Manufacturer's recommended stainless steel fasteners;

F. Water-Resistant Rainscreen Barrier System: See Section 07 25 10, Weather and Air Barriers. Provide at exterior locations only.

2.04 FABRICATION

A. Fabricate metal panels MP-1, through MP-13 as detailed in the drawings.

B. Form sections true to shape, accurate in size, square, and free from distortion or defects.

C. Form pieces in longest practicable lengths.

D. Fabricate and finish panels and accessories at the factory to the greatest extent possible, by manufacturer's standard procedures and processes, as required to fulfill performance requirements.

E. Fabricate panel joints with captive gaskets or separator strips, which provide a tight seal and prevent metal to metal contact in a manner that will minimize noise from panel system movement.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that framing members and substrates are ready to receive panels. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Verify that flatness and fastening of metal roof decks complies with installation tolerances.

C. Verify that flatness and fastening of roof decks complies with installation tolerances.
3.02 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane. Space at 24 inches on center, maximum.

B. Install weather-resistant membrane and accessories on surfaces to receive metal panels as specified in Section 07 25 10, Weather and Air Barriers.

C. Stagger vertical joints of each substrate layer.

3.03 INSTALLATION

A. Comply with recommendations of SMACNA “Architectural Sheet Metal Manual.” Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units. Conceal fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Install panels on walls in accordance with manufacturer’s instructions. Make all field cuts straight, with no burs. Use tin snips, stomp shear, slitter, or double cuts. Cuts made with torches, or saws will not be accepted.

C. Protect metal in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.

D. Fasten panels to structural supports; aligned, level, and plumb.

E. Metal Trim and Flashing: (including trims, copings and miscellaneous flashings as detailed.)
   1. Verify presence of red rosin slip sheet at concrete or aluminum substrates.

F. Panel Installation:
   1. Install panels using concealed fasteners and manufacturer's recommended clips to achieve performance standards specified.

   2. Provide approved Weather-Resistant Rainscreen Barrier System at exterior wall locations.

   3. Install gaskets, joint fillers, and sealants as indicated and as required for weatherproof performance of panel systems at exterior locations.
      a. Provide manufacturer’s standard gaskets and fillers at top edge of panel. Allow for positive water drainage at all openings, with drip edges, and other standard devices.

G. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

H. Locate joints over supports. Lap panel ends minimum 2 inches.

I. Provide intermeshed, hook flanged expansion joints, filled with mastic sealant as required, where lapped or bayonet type expansion provisions cannot be used, or would not be sufficiently water or weatherproof.

J. Use concealed fasteners unless otherwise approved by Resident Engineer.

K. Seal and place gaskets to prevent weather penetration at exterior applications. Maintain neat appearance.
3.04 CONSTRUCTION

A. Tolerances

1. Maximum Offset from True Alignment between Adjacent Members Butting or In Line: 1/8 inch.

2. Maximum Variation from Plane or Location Indicated on Contract Drawings: 1/4 inch in 20 feet.

3.05 CLEANING

A. Remove site cuttings from finish surfaces.

B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.06 SCHEDULE

<table>
<thead>
<tr>
<th>PANEL</th>
<th>TYPE</th>
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<th>PROJECTS</th>
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<td>MP-2</td>
<td>PORCELIAN ENAMEL SOLID</td>
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<td>MP-3</td>
<td>PERFORATED STAINLESS STEEL</td>
<td>BRUSHED AND NON-DIRECTIONAL ORBITAL</td>
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<td>PORCELIAN ENAMEL</td>
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<td>ALUMINUM PANELS</td>
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<td>MP-12</td>
<td>PERFORATED STAINLESS STEEL PANELS WITH 1-1/4-INCH ACOUSTICAL BACKING</td>
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END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for membrane roof system key-noted (RA-1 and RA-2) on the Contract Drawings:
   1. Adhered TPO membrane roofing system.
   2. Tapered insulation to achieve slope-to-drain.
   3. Substrate board (sheathing) attached to metal roof deck.
   4. Installation of acoustical insulation, furnished under Section 05 34 23, in flutes of acoustical metal roof decking.
   5. Roof flexible walkway pads

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 05 30 00, Metal Decking
   2. Section 06 10 00, Rough Carpentry: Wood nailers, curbs, and blocking
   3. Section 07 62 00, Sheet Metal Flashing and Trim: Metal roof penetration flashings, flashings, and counterflashings
   4. Section 07 92 00, Joint Sealants
   5. Section 22 14 23, Storm Drainage Piping Specialties: Roof drains

1.02 DEFINITIONS

A. TPO: Thermoplastic polyolefin.


1.03 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by an Independent Testing Laboratory to resist uplift pressure calculated according to ASCE/SEI 7.

1. Corner Uplift Pressure: 40 lbf/sq. ft.
2. Perimeter Uplift Pressure: 30 lbf/sq. ft.

D. FM Global Listing: Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a built-up roofing system, and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A-90
2. Hail-Resistance Rating: MH

E. Energy Performance:

1. Provide roofing system with initial Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980 based on testing identical products with an initial infrared emittance (emissivity) of at least 0.9 by a qualified testing agency.
2. Provide roofing system that is listed on DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

1.04 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Society for Testing and Materials International (ASTM)
   a. ASTM C 1177: Specification for Glass-Mat, Gypsum Substrate for Use as Sheathing
   b. ASTM C 1278: Specification for Fiber-Reinforced Gypsum Panel
   c. ASTM D 6878: Specification for Thermoplastic Polyolefin Based Sheet Roofing
   d. ASTM E 108: Test Methods for Fire Tests of Roof
   e. ASTM E 108: Test Methods for Fire Tests of Roof Coverings

2. American Society of Civil Engineers (ASCE)
   a. ASCE 7: Minimum Design Loads for Buildings and Other Structures

1.05 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures

B. Product Data: For each type of product indicated.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
1. Base flashings and membrane terminations.

2. Insulation:
   a. Tapered insulation layout plan.
   b. Fastening patterns for corner, perimeter, and field-of-roof locations.

D. Samples for Verification: For the following products:
   1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
   2. Walkway pads or rolls.
   3. Metal termination bars.

E. Research/Evaluation Reports: For components of membrane roofing system, from the ICC-ES.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

B. Source Limitations: Obtain components including fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.

C. Exterior Fire-Test Exposure: ASTM E 108, Class B; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by an Independent Testing Laboratory. Materials shall be identified with appropriate markings of applicable Independent Testing Laboratory.

D. Preinstallation Roofing Conference: Conduct conference at Project site.
   1. Meet with Resident Engineer, Independent Testing Laboratory representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.

8. Review temporary protection requirements for roofing system during and after installation.

9. Review roof observation and repair procedures after roofing installation.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.08 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.09 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, and other components of roofing system.

2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 TPO MEMBRANE ROOFING


1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Carlisle SynTec Incorporated.
b. Firestone Building Products Company.
c. Johns Manville.

2. Thickness: 60 mils, nominal.

3. Substitutions: Section 01 25 00, Substitution Procedures

4. Exposed Face Color: Gray.

2.02 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system
manufacturer for intended use, and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of Environmental
Protection Agency rules.

B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet
flashing, 55 mils thick, minimum, of same color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard, water based.

D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum
bars, approximately 1 by 1/8 inch thick; with anchors.

E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with
corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane
to substrate, and acceptable to membrane roofing system manufacturer.

F. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet
flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap
sealants, termination reglets, and other accessories.

2.03 TAPERED ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO
membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for
application, of thicknesses indicated.

B. Perlite Board Insulation: ASTM C 728, rigid, mineral-aggregate thermal insulation board
composed of expanded perlite, cellulosic fibers, binders, and waterproofing agents with
top surface seal coated.

1. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope
of 1/4 inch per 12 inches unless otherwise indicated.

2. Provide preformed saddles, crickets, tapered edge strips, and other insulation
shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.04 SUBSTRATE BOARDS

A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate,
Type X, 5/8 inch thick or ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-
resistant gypsum substrate, 5/8 inch thick.

1. Products: Subject to compliance with requirements, provide one of the following:
a. Georgia-Pacific Corporation; Dens Deck.

b. USG Corporation; Securock.

c. Substitutions: Section 01 25 00, Substitution Procedures

B. Fasteners: Factory-coated corrosion-resistant steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening substrate board to roof deck.

1. Length: As required to penetrate and secure substrate board to metal roof deck but not more than 2-1/2 inches (to avoid projection past bottom of decking).

2.05 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.

2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.03 SUBSTRATE BOARD

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

1. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.
3.04  INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
   1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

F. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
   1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

3.05  ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
   2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.
H. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

3.06 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.07 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.08 FIELD QUALITY CONTROL

A. Independent Testing Laboratory: Sound Transit will engage a qualified Independent Testing Laboratory to perform tests and inspections.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.09 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Resident Engineer.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION
SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:

1. Fabricated sheet metal items, including miscellaneous flashings, counterflashings, scuppers, conductor head boxes, gutters, downspouts, and other items indicated in Schedule at end of this Section and/or as detailed on Drawings.

2. Reglets and accessories.

3. Attachment blocks for exterior mounted items, including but not limited to: canopy supports, exterior lighting, mechanical vents and penetrations, hose bibs.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 04 20 00, Unit Masonry: Unit masonry at through-wall flashings and counter-flashings specified in this Section.

2. Section 05 05 14, Fluoropolymer Coatings for Metal.: Finish for aluminum.

3. Section 05 05 13, Shop-Applied Coatings for Metal: Metal finishes.

4. Section 07 42 13, Metal Wall Panels, Metal wall systems coordination.

5. Section 07 54 23, Thermoplastic Polyolefin (TPO) Roofing: Flashing coordination.

6. Section 07 72 00, Roof Accessories: Roof-mounted units, rails and pedestals.

7. Section 07 92 00, Joint Sealants: Sealants at flashings.

8. Section 08 91 00, Louvers

1.02 REFERENCES

A. This Section incorporates by reference the following documents.

1. American Architectural Manufacturers Association (AAMA)

1.03 PERFORMANCE

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FM Global (FMG) Loss Prevention Data Sheet 1-49, to meet I-90 wind uplift.

1. Minimum gages shall be determined in accordance with FMG recommendations for each application.

1.04 SUBMITTALS

A. Procedures: See Section 01 33 00, Submittal Procedures.

B. Shop Drawings:

1. Shop drawings shall be fully coordinated and shall indicate layout, material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, counterflashings, gutters, downspouts, scuppers, and expansion joint systems, and installation details.

2. Provide fully coordinated detailed drawings, which account for construction trade interfacing, installation sequencing, adjacent materials, and attachment methods. Ensure best possible weather resistance and durability of work. Provide for protection of materials and finishes.

C. Samples: Submit two samples, 6 inch in size illustrating material and finish of typical visible trim materials. Submit for each color of trim to be used.

D. Descriptive Literature: Provide manufacturer’s descriptive literature for all materials described in Article 2.01 herein.
1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements, except as otherwise indicated.

B. Field Measurements: Where possible, take field measurements for installation of flashings and sheet metal items. Allow for overlapping or trimming where final dimensions cannot be established prior to fabrication.

C. Sequencing: Coordinate and sequence work with that of other trades to ensure a fully waterproof exterior envelope.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material on covered pallets or platforms to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage. Package materials to protect them from transportation damage.

B. Prevent contact with materials which may cause discoloration or staining.

1.07 PROJECT CONDITIONS

A. Coordinate with the work of interfacing and adjoining work for proper sequencing of installation. Ensure weather resistance and durability of work, including protection of materials and finishes.

B. Measurements: Verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces. Report all conditions which prevent proper execution of this work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sheet Materials

1. Aluminum: ASTM B 209 (ASTM B 209M); 0.032 inch thick; mill finish.

2. Pre-Finished Aluminum: ASTM B 209 (ASTM B 209M); 0.032 inch thick; plain finish shop pre coated with fluoropolymer coating of color as selected.

   a. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system; color as scheduled or as approved by Resident Engineer.

   b. See requirements of Section 05 05 14, Fluoropolymer Coatings for metal.

3. Stainless Steel: ASTM A 666 Type 316 with No. 4 Finish, soft temper, minimum thickness 26 gage where not indicated otherwise.

B. Pipe Materials

1. Round profile stainless steel downspouts shall be type 316L, schedule 10 stainless steel pipe.

C. Reglets and Accessories
1. Fasteners for Flashing and Trim: Same material and finish as flashing metal, with soft neoprene washers, as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

2. Bituminous Coating: SSPC - Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

3. Underlayment: Polyethylene, 6 mils, resistant to decay, when tested per ASTM E 154.


5. Primer: Zinc chromate type.


7. Sealants:
   a. Butyl rubber type: Curtain wall sealant by Tremco or Adcoseal BP-400, by Adco Products, Inc.
   b. Polyurethane sealant: ChemCalk 900, by Bostik Construction Products Division of Emhart, Dynatrol I by Pecor Corp., Sonolastic NP I by Sonneborn - Contech or Rubber Caulk 6000 by PRC.
   c. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.

8. Elastomeric Sealant: Type recommended by manufacturer of metal and fabricator of components being sealed, and complying with requirements of Section 07 92 00, Sealants.


10. Reglets: Surface mounted type, non-corrosive, compatible with flashing indicated.

11. Solder: ASTM B 32; 60/40 tin/lead type, with acid chloride flux. Use rosin flux over tinned surfaces.

12. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation for work, matching or compatible with material being installed, noncorrosive, size and gauge required for performance.


14. Elastic Flashing Filler: Closed-cell polyethylene or other soft closed cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.
2.02 FABRICATION

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where fabrication will allow.

C. Expansion: Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water or weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints.)

D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of the work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

E. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

F. Aluminum Extrusions: Fabricate extruded aluminum running units with joint covers for installation behind main members where possible. Fabricate mitered and welded corner units.

G. Form sections true to shape, accurate in size, square, and free from distortion or defects.

H. Form pieces in longest possible lengths.

I. Hem exposed edges on underside 1/2 inch; miter and seam corners.

J. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

K. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

L. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

M. Sill Pan Flashing: Fabricate with 1/2 inch upstanding edge at sides and back of unit, fully welded corners, and 1/2 inch turned under drip edge.

N. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

O. Gutter and Downspouts:

2. **Downspouts:** Profile as indicated on Drawings. Where round downspouts are indicated provide pipe in the material indicated. All exposed joints for stainless steel downspouts shall be welded connections. Use flanged connection with isolation joint assembly for connection of stainless steel storm drain piping to piping and components constructed of dissimilar metal.

3. **Gutters and Downspouts:** Size as indicated on Drawings.
   a. **Gutter Materials:** stainless steel.
   b. **Downspouts Material:** Stainless steel.

4. **Accessories:** Profiled to suit gutters and downspouts.
   a. **Anchorage Devices:** In accordance with SMACNA requirements.
   b. **Gutter Supports:** Brackets.
   c. **Downspout Supports:** Brackets.

5. **Seal metal joints.**

**PART 3 - EXECUTION**

3.01 **EXAMINATION**
   A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
   B. **Clearances:** Comply with NRCA “Guide for Clearance between Pipes/Walls/Curbs” for all roof penetrations; coordinate with respective trades. Penetrations shall not occur within 5 feet of drainage basins, nor restrict drainage.
   C. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 **PREPARATION**
   A. Install starter and edge strips, and cleats before starting installation.
   B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil. See Section 01 45 00, Quality Assurance/Quality Control, for thickness testing requirements.

3.03 **INSTALLATION**
   A. **General:** Comply with manufacturer's installation instructions and recommendations and with SMACNA Sheet Metal Manual. Anchor units securely, providing for thermal expansion. Conceal fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.
   B. **Underlayment:** Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of approved red rosin paper and a course of approved polyethylene underlayment.
   C. Install reglets to receive counterflashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work to be
performed in Division 3. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work to be performed in Division 4.

D. Install counter flashing in reglets, either in snap-in seal arrangement or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.

E. Nail flanges of expansion joint units to curb nailers, at a maximum spacing of 6 inches on center. Fabricate seams at joints between units with minimum 3-inch overlap, to form a continuous, waterproof system.

F. Conform to drawing details:
   2. Roof Penetration Flashing: SMACNA Architectural Sheet Metal Manual, Detail 4-14B.

G. Secure flashings in place using concealed fasteners as much as possible.

H. Apply approved plastic cement compound between metal flashings and felt flashings.

I. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

J. Solder metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

K. Secure gutters and downspouts in place using concealed fasteners.

L. Slope gutters 1/4 inch per foot minimum.

3.04 FIELD QUALITY CONTROL

A. See Section 01 45 00, Quality Assurance/Quality Control, for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.05 CLEANING

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

3.06 PROTECTION

A. Advise General Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will remain undamaged at time of completion.

3.07 SCHEDULE

A. Sheet Metal Flashing and Trim
   1. Through-Wall Flashing in Masonry:

b. Thickness: Min. 24 gage thick.

c. Finish: Mill.

d. Drawing Detail: SMACNA 4-1 (similar).

2. Reglets:


b. Thickness: Min. 24 gage thick.

c. Finish: Mill.

d. Styles: Concrete, masonry, and surface-mounted (as detailed).

3. Gutters, Downspouts and Conductor Boxes: Stainless Steel:


b. Thickness: Min. 18 gage thick.

c. Finish: Mill.

d. Styles: As indicated on Contract Documents.

4. Coping, Cap, Parapet, Sill and Ledge Flashings: Pre-Finished Aluminum.

5. Sheet Metal Roof Expansion Joint Covers, and Roof-to-Wall Joint Covers: Pre-Finished Aluminum.


8. Roofing Penetration Flashings, for Pipes, Structural Steel, and Equipment Supports: Neoprene boots or accessories provided by roofing membrane system manufacturer.

9. Gravel Stops and Drains at Gravel Stops: Stainless steel; style: SMACNA Detail 1-29A (similar) as detailed on Construction Documents.

END OF SECTION
SECTION 07 72 00
ROOF ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:
   1. Manufactured curbs, equipment rails, and pedestals.
   2. Roof hatches, manual and automatic operation, including smoke vents.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 07 54 23, Thermoplastic Polyolefin (TPO) Roofing
   2. Section 07 62 00, Sheet Metal Flashing and Trim

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.
   1. American Society for Testing and Materials International (ASTM)
   2. Underwriter Laboratories (UL)

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Manufacturer’s data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.
1.04 QUALITY ASSURANCE

A. Standards: Comply with "SMACNA Architectural Sheet Metal Manual" details for fabrication of unit, including flanges and cap flashing to coordinate with type of roofing indicated. Comply with "NRCA Roofing and Waterproofing Manual" details and "NRCA Handbook of Accepted Roofing Knowledge" for installation of unit.

B. Smoke Hatches: Provide units bearing UL label.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.06 WARRANTY

A. Warrant installed roof hatches to be free from defects in material and workmanship for time period to match roof system PRODUCTS.

1.07 MANUFACTURED UNITS

A. Curbs and Rails

1. Manufactured Curbs, Equipment Rails, and Other Roof Mounting Assemblies:

   a. AES Manufacturing Inc.
   
   b. The Pate Company
   
   c. Roof Products, Inc
   
   d. RPS Accessories
   
   e. Thaler Metal Industries, Inc.
   
   f. Substitutions: See Section 01 60 00, Product Requirements.

2. Manufactured Curbs, Equipment Rails, and Other Roof Mounting Assemblies: Factory-assembled hollow sheet metal construction with fully mitered and welded corners, integral counterflashing, internal reinforcing, and top side and edges formed to shed water.

   a. Sheet Metal: Hot-dip zinc coated steel sheet complying with ASTM A 653/A 653M, SS Grade 33; G60 coating designation; 18 gage, 0.048 inch thick.
   
   b. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing insulation; 1:1 slope; minimum cant height 4 inches.
   
   c. Manufacture curb bottom and mounting flanges for installation directly on roof deck, not on insulation; match slope and configuration of roof deck.
   
   d. Provide the layouts and configurations shown on the Contract Drawings.
3. Curbs Adjacent to Roof Openings: Provide curb on all sides of opening, with top of curb horizontal for equipment mounting.
   a. Provide preservative treated wood nailers along top of curb.
   b. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
   c. Height Above Finished Roof Surface: 8 inches, minimum.

4. Equipment Rails: Two-sided curbs in straight lengths, with top horizontal for equipment mounting.
   a. Provide preservative treated wood nailers along top of rails.
   b. Height Above Finished Roof Surface: 8 inches, minimum.

5. Pipe, Duct, and Conduit Mounting Pedestals: Vertical posts, minimum 8 inches square unless otherwise indicated.
   a. Provide sliding channel welded along top edge with adjustable height steel bracket, manufactured to fit item supported.
   b. Height Above Finished Roof Surface: 8 inches, minimum.

B. Roof Hatches, Manual and Automatic Operation

1. Manufacturers - Roof Hatches:
   a. Bilco Co
   b. Dur-Red Products
   c. Milcor Inc
   d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Roof Hatches: Factory-assembled steel frame and cover, complete with operating and release hardware.
   a. Style: Provide insulated flat metal covers unless otherwise indicated.
   b. Mounting: Provide frames and curbs suitable for mounting on flat roof deck.
   c. Size(s): As indicated on Drawings; single-leaf style.
      1) For Ladder Access: Single leaf; 30 by 36 inches.

3. Frames/Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
   a. Material: Galvanized steel, 0.0747 inch thick (14 gage).
   c. Insulation: 1 inch rigid glass fiber, located on outside face of curb.
   d. Curb Height: 12 inches from finished surface of roof, minimum.
4. 
   Metal Covers: Flush, insulated, hollow metal construction.
   a. Capable of supporting 40 pounds per square foot live load.
   b. Material: Galvanized steel; outer cover 14 gage, 0.0747 inch thick, liner 22 gage, 0.03 inch thick.
   c. Finish: Factory prime paint.
   d. Insulation: 2 inches rigid glass fiber.
   e. Gasket: Neoprene, continuous around cover perimeter.

5. 
   Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
   a. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 pounds per square foot load.
   b. Hinges: Heavy duty pintle type.
   c. Hold open arm with vinyl-coated handle for manual release.
   d. Latch: Upon closing, engage latch automatically and reset manual release.
   f. Locking: Padlock hasp on interior.

PART 2 - EXECUTION

2.01 EXAMINATION
   A. Do not begin installation until substrates have been properly prepared.
   B. If substrate preparation is the responsibility of another Installer, notify Resident Engineer of unsatisfactory preparation before proceeding.

2.02 PREPARATION
   A. Clean surfaces thoroughly prior to installation.
   B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

2.03 INSTALLATION
   A. Install in accordance with manufacturer's instructions, in manner that maintains roofing weather integrity.

2.04 REPAIR/RESTORATION
   A. Touch-up, repair or replace damaged products before Substantial Completion.
2.05 CLEANING
   A. Clean installed work to like-new condition.

2.06 PROTECTION
   A. Protect installed products until completion of project.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:

1. Spray-applied fire resistive materials CF-1 (1 Hr Rating) and CF-2 (2 Hr Rating) to structural steel members enumerated in the Performance Requirements in this Section.

2. Patching of spray-applied fire resistive materials due to testing and inspection or damaged by construction.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 05 12 00, Structural Steel Framing: Surface preparation and absence of shop prime coat under steel to receive fireproofing.

1.02 SYSTEM REQUIREMENTS

A. Hourly Ratings: Apply fireproofing to thickness required for indicated hourly ratings, in accordance with the appropriate manufacturer’s IBC ES Report or UL Designs for unrestrained members and approved by governing code authority.

1. Structural Frame: Structural frame consists of the columns, and the girders, beams, struts and spandrels having direct connections to the columns, bearing walls, slurry walls and bracing members designed to carry gravity loads: Members having no direct connection to the columns, bearing walls or slurry walls shall be considered as part of the roof/floor assemblies:

2. Floor and Roof Assemblies.

B. Performance Criteria: Provide spray-applied fire resistive materials material certified and tested to equal or exceed the following performance characteristics, except as otherwise indicated under individual product requirements:

1. Deflection: Material must not crack or delaminate from the surface to which applied when tested in accordance with ASTM E759.

2. Bond Impact: Material must not crack or delaminate from the surface to which applied when tested in accordance with ASTM E760.

3. Bond (Cohesion/Adhesion) Strength: Minimum average bond strength of 200 psf when tested in accordance with ASTM E736.

4. Compressive Strength: Minimum compressive strength of 750 psf when tested in accordance with ASTM E761.
5. Air Erosion: Maximum amount of weight loss of 0.005 grams/square foot when subjected to an air stream in accordance with ASTM E859.

6. Corrosion Resistance: No evidence of corrosion to bare, shop-coated, and galvanized steel sheets with the fireproofing material applied when tested in accordance with ASTM E937.

7. Resistance to Mold: Show resistance to mold growth for a period of 28 days for general use and 60 days for materials to be installed in plenums when tested in accordance with ASTM G 21.

8. Combustibility: Material shall have a maximum total heat release of 20 MJ/m² and a maximum 125 kw/m² peak rate of heat release 600 seconds after insertion when tested in accordance with ASTM E 1354 at a radiant heat flux of 75 kw/m² with the use of electric spark ignition, sample shall be tested in the horizontal orientation.


1.03 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents. It is a part of this Section as specified and modified. In case of a conflict between the requirements of this Section and those of a listed document, the requirements of this Section will prevail.

B. American Society for Testing and Materials International (ASTM)

1. ASTM E 84: Test Method for Surface Burning Characteristics of Building Materials


3. ASTM E 136: Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C


5. ASTM E 736: Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members


8. ASTM E 761: Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members


11. ASTM E 1529: Test Methods for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies

12. ASTM G 21: Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

C. Association of the Wall and Ceiling Industries International (AWCI)


D. Code of Federal Regulations (CFR)

1. 40 CFR 763, Subpart E (7-1-95 Edition): Asbestos-Containing Materials in Schools

E. International Code Conference (ICC):

2. ICC-ES: Evaluation Service Reports.

F. Underwriters Laboratories Inc. (UL)

2. UL 1709: Safety for Rapid Rise Fire Tests of Protection Materials for Structural Steel

1.04 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Submit manufacturer's brochure on fireproofing materials, including application instructions and procedures. Include data on patching materials and impact resistant coating materials.

C. Fireproofing Shop Drawings: Submit fireproofing shop drawings to the Resident Engineer and governing code officials for review; drawings must include the following information:

1. Code Compliance: Indicate the Code edition to which the fireproofing schedule conforms; the type of fireproofing material; number of ICC ES Report. Research/Evaluation Report acceptable to Seattle DPD, UL Design number, or equivalent; details of all non-standard configuration or assembly required to clarify compliance or obtain approval.

2. Thickness Schedule: Clearly identify thicknesses required for designated primary and secondary members and floor and roof assemblies (color code or other acceptable method).

D. Test Data: Submit evidence of (SFRM's) compliance with Seattle Building Code, and verified by an Independent Testing Laboratory indicating compliance with all specified fire and system performance criteria as indicated.

E. Certification: Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
F. Qualification Data: Refer to article Quality Assurance for requirements. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.05 QUALITY ASSURANCE

A. Applicator’s Qualifications: Certified, licensed, and preferably accredited by the National Fireproofing Contractors Association (NFCA), or otherwise approved by spray-applied fire resistive materials manufacturer as having the necessary experience, staff, and training to install manufacturer's products according to specified requirements.

B. Single Source: Obtain all sprayed-on fireproofing materials, regardless of type, from a single manufacturer.

C. Acceptance Criteria: Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."

D. Fire-Test Response Characteristics: Provide sprayed fire-resistive materials and assemblies identical to those tested for the following fire-test response characteristics in accordance with the test method indicated below by UL, or other Independent Testing Laboratory acceptable to Seattle DPD. Identify packages (bags) containing sprayed fire-resistant material with appropriate markings of applicable Independent Testing Laboratory. All assemblies are identified as “Unrestrained” for SFRM thickness determination, unless otherwise indicated on the Structural Drawings.

1. Fire-Resistive Ratings: As indicated by reference to fire-resistive designs listed in UL’s “Fire Resistance Directory”, or in the comparable publication of another testing and inspecting agency acceptable to Seattle DPD, for sprayed fire-resistant material serving as direct-applied protection, tested in accordance with ASTM E119.

2. Surface-Burning Characteristics: As indicated for each sprayed fire-resistive product required, tested in accordance with ASTM E84.

E. Allowable Tolerances: Only tolerances allowed by Underwriters’ Laboratories for samples tested will be permitted for the material as applied on the Work, except as otherwise required IBC Section 1704.11.3.

F. Minimum Thickness Determination: Comply with requirements of IBC Section 721.5.2.2.1.

G. Special Tests & Inspections IBC Section 1704.11: Refer to article entitled "Field Quality Control" of this Section for special inspection and testing which will be performed by Independent Testing Agency.

1. Test Agency Qualifications: An Independent Testing Laboratory with the experience and capability to conduct the testing indicated without delaying the Work, as documented according to ASTM E 699.

H. Pre-Application Conference: Schedule a job conference to review the work approximately two weeks prior to starting work. Conference shall be attended by Independent Testing Laboratory; the fireproofing applicator; representative of fireproofing manufacturer; Construction Manager and other representatives directly concerned with performance of the work. The following major considerations shall be reviewed at conference:
1. Review all facets of the work so as to prevent any misunderstandings of the full intent of this Specification and areas of responsibilities.

2. Review ICC ES Report or UL Designs, and approved shop drawings.

3. Trade related schedules, including the installation of mechanical and electrical equipment.

4. Review methods of inspections and responsibility for “follow-up” inspections, including patching of damaged areas.

5. Review requirements for environmental limitations, ventilation, and protection.

6. Review article entitled Sequencing and Coordination for specific project requirements.

I. Pre-Application Inspection: Refer to article entitled “Field Quality Control” of this Section for visual inspection of structural steel prior to fireproofing application.

J. Coordination:
   1. Coordinate use of primer with Section 05 12 00, Structural Steel Framing, as applicable to ensure primer is type and thickness compatible with spray-applied fire resistive materials.

1.06 DELIVERY, STORAGE & HANDLING

A. Deliver materials in unopened containers or packages bearing manufacturer's name, trade name, type, and Underwriters' Laboratories label.

B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.

C. Keep materials dry, off the ground, under cover, and away from damp surfaces. Discard materials exposed to moisture. Rotate stock of materials and use before expiration date.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply sprayed fire-resistant material when ambient or substrate temperatures are 40 degrees F or lower, unless temporary protection and heat is provided to maintain temperatures at or above this level for 24 hours before, during, and for 24 hours after product application. If necessary to job progress, the Contractor shall provide enclosures and heat to maintain temperatures.

B. Ventilation: Provide ventilation to allow for proper drying of fireproofing during and subsequent to its application. In poorly ventilated areas lacking natural ventilation, provide forced air circulation during and after application until fireproofing dries thoroughly; at a minimum ventilation rate of four complete air exchanges per hour.

C. Protection: Provide temporary enclosures to confine overspray of the application within building and to prevent defacement and damage to adjacent buildings and personnel; take precautions to prevent air pollution or broadcast of fireproofing material during application. Protect applied material from damage during subsequent construction; repair or replace material damaged.
1.08 SEQUENCING AND COORDINATION

A. General: Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application. Delay installation of mechanical and electrical ducts, piping and conduit that would interfere with applying fireproofing until fireproofing application has been completed.

B. Provide temporary enclosures for interior applications to prevent deterioration of fire-resistive material due to exposure to unfavorable environmental conditions.

C. Install clips, hanger supports, insulation stick pins, and other attachments to the fireproofing bases prior to application of fireproofing material, where their locations can be determined in advance.

D. Coordinate installation of fireproofing with other construction to minimize the need to cut or remove fireproofing. As installation of other construction proceeds, inspect fireproofing and patch all areas where fireproofing was removed or damaged.

E. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, tested, and corrections have been made to defective applications.

PART 2 - PRODUCTS

2.01 COMMERCIAL DENSITY

A. Type and Manufacturer: Carboline Co. Fireproofing Products Div. "Pyrolite 15"; Isolatex International "Cafco 300"; W.R. Grace & Company "Monokote Type MK-6/HY or MK-6’s"; or approved equal gypsum plaster based spray-applied fire resistive materials listed in accordance with UL 263 (ASTM E119) procedures and certified to meet the performance criteria specified and the following:

1. Fire Hazard Classification: 0 flame spread and 0 smoke development when tested in accordance with ASTM E84.

2. Dry Density: Minimum in-place individual dry density either 15 pounds per cubic foot when tested in accordance with ASTM E605, or minimum density as required by ICC–ES and/or UL Design for particular rating, whichever value is greater.

3. Cohesion/Adhesion (Bond Strength): 390 psf. average when tested in accordance ASTM D736.

4. Deflection: Will not crack or delaminate when tested in accordance ASTM E759.

B. Optional Product: At Contractor’s options, Isolatex International ‘Blaze-Shield II, Portland Cement base fireproofing may be used without a Substitution Request form.

C. Locations of Application: All interior locations.

2.02 RELATED MATERIALS

A. Accessories: Provide accessories to comply with manufacturer’s recommendations and to meet fire resistance design and code requirements. Such accessories include, but are not limited to, any required or optional items such as; adhesive or bonding agents, accelerator, mechanical attachments; application aids such as metal lath, scrim, or netting.
B. Patching Material: Same material as spray-applied fire resistive materials.

C. Water: Clean, potable consumption and free from such amounts of mineral or organic substances as would affect the set of the fireproofing material. Provide water with sufficient pressure and volume to meet the fireproofing application schedule.

D. Metal Lath (If Required for Fire Rating): Expanded metal lath of weight, configuration, material, and finish required to comply with fire resistance rated designs indicated and fireproofing manufacturer's recommendations. Provide clips, lathing accessories, and other anchorage devices required to attach lath to substrates.

2.03 INSTALLATION EQUIPMENT

A. General: Equipment shall be types recommended by the spray-applied fire resistive materials manufacturer and shall include pumping equipment, metering devices, booster pumps, injection pumps and accessories as required.

PART 3 - EXECUTION

3.01 EXAMINATION

A. General: Examine steel surfaces with Applicator present. Verify that surfaces and conditions are acceptable to receive fireproofing. Do not proceed with fireproofing application in areas of discrepancy until all discrepancies have been fully resolved.

B. Verify Following Conditions:

1. Verify that surfaces to receive fireproofing are free of oil, grease, loose mill scale, dirt, or other substances which may impair proper bond of fireproofing with substrate under conditions of normal use or fire exposure.

2. Bond Strength and Compatibility Over Shop Prime Coat: Where approved, verify compatibility of spray-applied fire resistive materials as meeting the following:
   a. UL Classified in accordance with UL 263, ASTM E119.
   b. Bond Tested in accordance with ASTM E736.
   c. Compatible for use with approved spray-applied fire resistive materials and certified by fireproofing manufacturer as meeting all fire and performance criteria.
   d. Application friendly.
   e. Corrosion protective barrier over steel and tested in accordance with ASTM C117, rated for 10,000 hours.

3. Verify clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.

4. Verify that substrates are not obstructed by ducts, piping, equipment, or other suspended construction which might interfere with application of fireproofing.

C. Commencement of fireproofing application indicates acceptance of surface conditions and full responsibility for failure of bond between fireproofing and substrate.
3.02 PREPARATION

A. General: Clean substrates of substances that could impair bond of fire-resistive material, including oil, grease, rolling compounds, primers, and loose mill scale. Prior to application of the fireproofing material, apply a bonding agent, approved by the fireproofing material manufacturer, to all substrates to receive fireproofing.

B. Protection: Cover other work subject to damage from fall-out or overspray of fireproofing materials during application. Drapes shall be used to prevent damage to surrounding surfaces not scheduled to receive fireproofing.

1. Actual method of protection is at Applicator’s option, and must be reviewed with the Contractor prior to starting the Work.

2. Provide temporary enclosures as required to confine spraying operations.

3.03 APPLICATION

A. Mixing & Application: Mix and apply the fireproofing in strict accordance with manufacturer’s printed instructions, quality control procedures stated in NFCA-200 – Field Quality Assurance Procedures for Application of Spray-Applied Fire Resistant Materials (SFRM), and as required to meet requirements of approved fire rated assemblies. Apply fireproofing in as many passes as necessary to cover with monolithic blanket of uniform density and texture.

B. Mechanically control material and water ratio. Do not retemper material. Complete application in an area before removing equipment and proceeding with further work.

C. Use only equipment approved by fireproofing manufacturer for conveying and dispersal of fireproofing.

D. Install metal lath if required to achieve fire resistance rating, or if required to comply with fireproofing manufacturer’s recommendation for indicated application. Secure lath to substrate in position required, using fireproofing manufacturer’s recommended anchorage devices and methods. Attach lathing accessories where indicated or required.

E. Install metal lath with fireproofing to provide closure of the fireproofing to other fire resistant assemblies where all surfaces of the beam or column are not accessible.

F. Apply fireproofing by spraying material on substrate wherever conditions permit. Complete coverage of miscellaneous areas by trowel application or other placement method recommended by fireproofing manufacturer, following spraying application in each area. Apply sprayed fireproofing to produce a spray-textured finish with no further treatment.

G. Protection during Curing: Take precautions to allow spray-applied fire resistive materials to cure without physical abuse or damage, including restrictions regarding roof traffic as stated above.

1. Provide and maintain heating and ventilation as stated above.

2. Limit deflection or impact to spray-applied fire resistive materials within manufacturer’s prescribed recommendations.

H. Thicknesses and Densities: Provide thickness and density to meet required fire resistance ratings. Comply with the rated designs for thermally “unrestrained” ratings for steel framing in accordance with “Sprayed fire-resistant materials” of SFRM, IBC Section 1704.11, and as defined in ASTM E119 for elements of building envelope included in...
Fireproofing Schedule, below. Control thickness utilizing a depth gage to meet required thickness.

3.04 PATCHING

A. Test Areas: Repair test areas and reapply areas where tests revealed deficient density or thickness. Where tests reveal thickness deficiencies, add extra course of fireproofing where feasible, or remove course and replace with new fireproofing. Where tests reveal density deficiencies, remove affected material and replace with new fireproofing.

B. Patch fireproofing which has been damaged by construction operations or damaged as a result of wash-off and replace with compatible material which maintains the project approved UL Designs and fire-resistant ratings. Costs for patching damaged fireproofing shall be borne by the trade causing such damage.

3.05 CLEAN UP AND PROTECTION

A. Cleanup: After approval of the application in each containable area, remove equipment and temporary enclosures; clean floors, walls, and other surfaces of overspray and fallout.

B. Protect fire-resistive material, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at the time of Substantial Completion.

3.06 FIELD QUALITY CONTROL

A. General: All sprayed-on fireproofing work shall be subject to special inspection and testing by an Independent Testing Laboratory in conformance with IBC Section 1704.11. Only special inspectors registered in the category of spray-applied fireproofing shall perform such inspections.

1. All inspections shall be made in accordance with approved shop drawings which clearly identify the fireproofing material and the thickness of fireproofing material required for the primary, secondary and other framing elements.

2. No fireproofing shall be covered prior to inspection.

B. Pre-Application Inspection: Independent Testing Laboratory shall conduct a visual inspection of structural steel prior to application of fireproofing material in accordance with IBC Section 1704.11.1. The purpose of this inspection is to check for foreign substances on the surfaces which could impair adhesion. This inspection shall be made with the sprayed-on fireproofing applicator, Contractor, and structural steel erector.

1. Results of inspection, including all remedial action (if any) shall be furnished to the Resident Engineer in a special written report.

2. Application of fireproofing shall not commence until all steel surfaces have been accepted by sprayed-on fireproofing applicator and material manufacturer; no additional compensation will be allowed on account of adhesion failure due to failure to remove all detrimental substances.

C. Thickness Determination: Visually check all structural frame members and floor and roof sections in each area sprayed. All generalized areas appearing to be less than required thickness, including damaged areas are to be checked for thickness and marked for recoating where required. The applicator will be directed to recoat all deficient areas.
1. Ducts, conduits, piping and similar mechanical, electrical and plumbing installations shall not be embedded within the required thickness of fireproofing material.

D. Test Method for Thickness: Conduct test method for thickness of fireproofing in accordance with IBC ASTM E605, Section 1704.11.4. The random areas selected for test measurements shall be marked on shop drawings before inspection is started. Record results of test measurements on separate data sheets.

1. Test locations on columns and beams are to be selected at the end thirds or middle thirds in a rotating order to vary the location of test areas.

2. Where thickness is less than that required, the condition shall be corrected. The location of all uncorrected areas shall be reported to the Resident Engineer.

3. Frequency of Tests: IBC Section 1704.11.3.1 for floor, roof and wall assemblies, and Section 1704.11.3.2 for structural framing.

E. Test Method for Density: Conduct test method to determine density of fireproofing in accordance with IBC ASTM E605, Section 1704.11.4. No sample shall have a density less than 5 percent below the specified density. Where the density is less than 5 percent tolerance allowed, the work shall be corrected to the satisfaction of the Resident Engineer.

1. Frequency of Tests: IBC Section 1704.11.4 – one specimen from each column, and beam for each 10,000 sq.-ft. of floor area or fraction thereof, or from each floor if the floor area is smaller than 10,000 sq.-ft.

F. Test Method for Cohesion/Adhesion: Conduct test method to determine the cohesion/adhesion of spray-applied fireproofing in accordance with IBC ASTM E736, Section 1704.11.5. No sample shall have a cohesive/adhesive force of less than 150 pounds per square foot. Where the cohesive/adhesive force is less than 150 pounds per square foot, the work shall be corrected to the satisfaction of the Resident Engineer.

1. Frequency of Tests: IBC Section 1704.11.5.1 for floor, roof and wall assemblies, and Section 1704.11.5.2 for structural framing.

G. Patching Inspections: All patching of damaged areas on beams, columns, bracing, and floor sections must be approved by the Resident Engineer.

H. Final Acceptance: Final inspection will be made when all corrections are completed. Sprayed fireproofing shall not show any deep or wide cracks, voids, spalls or any exposure of the substrate. The Independent Testing Laboratory will submit a final acceptance report and test data sheets to the Contractor and the building official on completion.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:
   1. Firestopping materials.
   2. Firestopping of all penetrations and interruptions to fire rated assemblies, whether indicated on Contract Drawings or not, and other openings indicated.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 04 42 00, Unit Masonry
   2. Section 09 21 16, Gypsum Board Assemblies

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.
   1. FM Global (FMG)
      a. FMG 4991: Approval of Firestop Contractors
   2. Underwriters Laboratories, Inc.(UL)
      a. UL (FRD) - Fire Resistance Directory

1.03 SUBMITTALS

A. Procedures: See Section 01 33 00, Submittal Procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of each penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics.
   1. Include firestopping assembly product test reports (UL Design or equivalent by an Independent Testing Laboratory acceptable to Seattle DPD) for each required firestopping design

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Certificate from the Seattle Fire Department indicating approval of materials used.

G. Installer's Qualification statements for installing mechanics as listed in Article 1.05 below.
1.04 SYSTEM DESCRIPTION

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined in accordance with ASTM E 814 or UL 1479:

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
   a. Penetrations located outside wall cavities.
   b. Penetrations located outside fire-resistance-rated shaft enclosures.

3. L-Rated Systems: Where through-penetration firestop systems are indicated in smoke barriers, provide through-penetration firestop systems with L-ratings of not more than 3.0 cfm/sq. ft at both ambient temperatures and 400 degrees F.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.

3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined in accordance with ASTM E 84.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum 3 years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this Section and:

1. Approved under FMG Standard 4991.

2. With minimum five years documented experience installing work of this type.

3. Approved by firestopping manufacturer.
C. Installing Mechanic's Qualifications: Trained by firestopping manufacturer and able to provide evidence thereof.

D. Mock-Up

1. Install one firestopping assembly representative of each fire rating design required on project.
   a. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
   b. Where firestopping is intended to fill a linear opening, install minimum of 1 linear foot.

2. Obtain approval of the Resident Engineer and the Seattle Fire Department before proceeding.
   a. If accepted, mock-up shall represent the minimum standard for the Work.
   b. If accepted, mock-up may remain as part of the Work. Remove and replace all mock-ups not accepted.

1.06 PROJECT CONDITIONS

A. Environmental Requirements

1. Comply with firestopping manufacturer’s recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Typical Firestopping Assemblies: UL Designs specified below are basis of design. Comparable assemblies by other specified manufacturers are acceptable.

1. Firestopping at Uninsulated Metallic Pipe and Conduit Penetrations, of diameter 4 inches or less: Any material meeting requirements.

2. Firestopping at Insulated Metallic Pipe Penetrations, of all diameters: Any material meeting requirements.


d. Gypsum board on metal framing wall: UL Design No. W-L-5054, F Rating 1 or 2-hour.

3. Firestopping at Non-Metallic Pipe Penetrations, of diameter 4 inches or less: Any material meeting requirements.


d. Gypsum board on metal framing wall: UL Design No. W-L-2059, F Rating 1 or 2-hour.

4. Firestopping at Cable Trays:


5. Head of Wall Firestopping at Concrete Slab:


b. Concrete masonry wall - Mechanical room: UL Design No. HW-D-0156, F Rating 2-hour.

c. Gypsum board on metal framing wall: UL Design No. HW-D-0054, F Rating 1 or 2-hour.

B. 3-Hour Firestopping Assemblies for High KVA Electrical Equipment Rooms: UL Designs specified below are basis of design. Comparable assemblies by other specified manufacturers are acceptable.

1. Firestopping at Uninsulated Metallic Pipe and Conduit Penetrations, of diameter 4 inches or less: Any material meeting requirements.


b. Concrete or masonry wall: UL Design No. C-AJ-1001

2. Firestopping at Non-Metallic Pipe Penetrations, of diameter 4 inches or less: Any material meeting requirements.


b. Concrete or masonry wall: UL Design No. C-AJ-2228.

3. Firestopping at Cable Trays:
a. Concrete or masonry walls: C-AJ-4003.

4. Head of Wall Firestopping at Concrete Slab:
   a. Concrete or masonry wall: UL Design No. HW-D-1002, (nominal 1-inch joint width will accommodate anticipated movement).

C. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant; conforming to the following:
   1. Durability and Longevity: Permanent.
   2. Color: Black, dark gray, or red.
   3. Manufacturers:
      b. 3M Fire Protection Products: www.3m.com/firestop.
      d. Substitutions: Section 01 25 00, Substitution Procedures.

D. Foam Firestopping: Single component foam compound; conforming to the following:
   1. Durability and Longevity: Permanent.
   2. Color: Dark grey.
   3. Manufacturers:
      a. 3M Fire Protection Products: www.3m.com/firestop.
      d. Substitutions: Section 01 25 00, Substitution Procedures.

E. Fiber Firestopping: Mineral fiber insulation used in conjunction with elastomeric surface sealer forming airtight bond to opening; conforming to the following:
   1. Durability and Longevity: Permanent.
   2. Manufacturers:
      d. Substitutions: Section 01 25 00, Substitution Procedures.

F. Intumescent Putty: Compound which expands on exposure to surface heat gain; conforming to the following:
   1. Potential Expansion: Minimum 1000 percent.
2. Durability and Longevity: Permanent.
3. Color: Black, dark gray, or red.
4. Manufacturers:
   b. 3M Fire Protection Products: www.3m.com/firestop.
   d. Substitutions: Section 01 25 00, Substitution Procedures.

G. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

PART 3 - EXECUTION

3.01 EXAMINATION
   A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION
   A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter, which may affect bond of firestopping material.
   B. Remove incompatible materials, which may affect bond.
   C. Install backing materials to arrest liquid material leakage.

3.03 INSTALLATION
   A. Install materials in accordance with firestopping assembly product test reports (UL Design or equivalent by other testing agency acceptable to Seattle DPD) and in accordance with manufacturer's instructions, completely closing openings.
   B. Do not cover installed firestopping until inspected by the Resident Engineer.
   C. Install labeling required by code.

3.04 CLEANING
   A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION
   A. Protect adjacent surfaces from damage by material installation.

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for sealant and backing materials for sealing of joints in construction. In general this includes, but not limited to, the following:

1. Penetrations in exterior metal wall panel systems.
2. Perimeter joints between materials listed above and door frames, aluminum windows and, louvers.
3. Horizontal expansion joints.
4. Perimeter joints between interior wall surfaces and frames of doors, and windows.
5. All locations noted on Contract Drawings as sealant or caulking.
6. Tape for isolation and gasketing as indicated.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 03 45 00, Precast Architectural Concrete
2. Section 04 20 00, Unit Masonry
3. Section 07 19 10, Water and Graffiti Repellents: Compatibility with materials of this Section.
4. Section 07 25 10, Weather and Air Barriers
5. Section 07 42 10, Metal Wall Panels
6. Section 07 54 23, Thermoplastic Polyolefin (TPO) Roofing
7. Section 07 62 00, Sheet Metal Flashing and Trim
8. Section 07 84 00, Firestopping
9. Section 08 80 00, Glazing.
10. Section 08 91 00, Louvers
11. Section 09 30 00, Tiling
12. Section 09 32 19, Mortar-Bed Paver Tiling
1.02 REFERENCES
A. This Section incorporates by reference the latest revisions of the following documents.
B. American Architectural Manufacturers Association (AAMA)
   1. AAMA 800: Voluntary Specifications and Test Methods for Sealants
C. American Society for Testing and Materials International (ASTM)
   1. ASTM C 834: Specification for Latex Sealing Compounds
   2. ASTM C 920: Specification for Elastomeric Joint Sealants
   3. ASTM C 1021: Practice for Laboratories Engaged in Testing of Building Sealants
   4. ASTM C 1085: Specification for Butyl Rubber-Based Solvent-Release Sealant
   7. ASTM C 1248: Test Method for Staining of Porous Substrate by Joint Sealants
   8. ASTM C 1281: Specification for Preformed Tape Sealants for Glazing Applications
  11. ASTM E 548: Guide for General Criteria Used for Evaluating Laboratory Competence

1.03 SUBMITTALS
A. Procedures: Section 01 33 00, Submittal Procedures.
B. General: Identify areas of use by each product submitted according with Sealant Schedule in this Section.
C. Product Data: Submit manufacturer's technical data for each joint sealer product required, including instructions for joint preparation, primer (if required), and recommended back-up material.
D. Samples for Initial Selection: Submit initial color samples in the form of manufacturer’s bead samples consisting of strips of actual products showing full range of colors available for each product.
E. Certification: Submit written certification from sealant manufacturer stating that materials forming joint substrates and joint backings (e.g. concrete, fluoropolymer coatings) have been tested for compatibility and adhesion with proposed joint sealants and are suitable for the use intended as specified; certification shall state that proposed sealant has been tested for non-staining characteristics when applied to precast concrete. Include recommendations for primers and substrate preparation needed to obtain adhesion.
1.04 QUALITY ASSURANCE

A. Installer's Qualifications: Engage experienced Installers who have completed joint sealant applications similar in material, design, and extent to that indicated for Contract.

B. Single Source Responsibility: Obtain joint sealant materials for each application from a single manufacturer.

C. Preconstruction Compatibility and Adhesion Testing: Prior to installation of joint sealants, field test their adhesion to joint substrates of each type encountered, and determine if priming and other specific joint preparation techniques are required. Perform tests under normal environmental conditions that will exist during actual installation in accordance with Field Quality Control requirements in this section. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the Work.

1.05 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. Ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 degrees F.

2. Joint substrates are wet due to rain, condensation or other causes.

3. Joint Width Conditions: Do not proceed with installation of joint sealant when joint widths are less than allowed by joint sealant manufacturer for application indicated.

4. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Color And Texture Criteria (Exterior Exposed to View Locations): Unless noted otherwise provide color of joint sealant selected from manufacturer's standard colors.

C. Color Coated (PVDF) Aluminum Framing: Provide custom color to match the Resident Engineer’s approved (PVDF) color sample.

D. Sealants (Type C) used in horizontal applications shall match adjacent color tone.

2.02 SEALANT TYPES AND MANUFACTURERS

A. Type "A" Sealant: Dow Corning "795 Building Sealant"; General Electric "Silglaze SSG4000"; Tremco "Spectrum 2"; or approved equal one-part, low-modulus silicone elastomeric sealant meeting requirements of ASTM C920, Type S, Grade NS, Class 25.

1. Application: Exposed exterior joints not subject to foot or vehicle traffic.
B. Type “B” Sealant: Self-leveling 2-part urethane meeting requirements of ASTM C920, Type M, Grade P, Class 25.
   1. Application: Interior and exterior joints subject to foot or vehicle traffic.

   1. Applications: Metal to metal open joints, either back groove or top of surface mounted flashing, exposed to weather, and for bedding thresholds and break formed flashings.

D. Type “D” Sealant: Geocel “834”; Pecora Chemical Corporation "AC-20 Acrylic Latex"; Sonneborn "Sonolac"; Tremco "Tremflex 834"; Sherwin-Williams "Pro Select 850A", or approved equal one part acrylic latex sealant complying with requirements of ASTM C834.
   1. Applications: Interior joints not subject to traffic, except in wet areas.

E. Type "E" Sealant: Dow Corning "786 Mildew Resistant Silicone"; General Electric "SCS1702"; Pecora Corporation "898 Sanitary Mildew Resistant Silicone Sealant", or approved equal one part mildew resistant silicone sealant complying with requirements of ASTM C920, Type S, Grade NS, Class 25.
   1. Applications: Interior joints in a wet areas (perimeter of countertops with sinks)

F. Type "F Series" Sealants: Non-curing, non-hardening, synthetic rubber sealer, recommended for use by manufacturer for concealed locations joint is where subject to changes in temperature, water and vibration.
   1. Type "F-1": Tape consistency, solvent-free, butyl-based sealant with a solids content of 100%; meeting the requirements of AAMA 804.1-85 (as described in AAMA 800). Packaged in rolls with release paper backing.
      a. Acceptable products include:
         1) Tremco "440 Tape".
         2) Pecora, "Extru-Seal".
         3) PTI "606 Architectural Sealant Tape".
      b. Applications: Metal to metal, and dissimilar materials, compression joints subject to shear.
   2. Type "F-2": Mastic consistency, one-part non-drying, non hardening, non-bleeding and permanently resilient butyl sealant, meeting or exceeding ASTM C 1085.
      a. Acceptable products include:
         1) Bostik 5612
         2) Pecora, “BR-96”.
         3) Tremco ‘JS-773 Sealant’.
b. Applications: Metal to metal laps, concealed compression joints.

2.03 TAPES

A. PVC Tape (Type "G"): Norton Norseal V740, or approved equal black PVC with self-adhesive backing; 1/8 inch thickness by 1/2 inch, nominal width, unless noted otherwise.
   1. Typical application: Gasket/sealant to reduce air movement, acoustical and vibration isolation and between dissimilar materials and elsewhere indicated.

2.04 COMPRESSIBLE SEAL

A. Expanding Foam Tape (Type "H"): Sandell Mfg. Co. Inn., “Polyseal”, Bosig “Wintape Expand 600”, or approved equal, self-expanding polyurethane foam impregnated with modified acrylic flame retarding polymer meeting UL 94 HF-1 (Self-Extinguishing).
   1. Typical application: For cold joints on exterior envelope components, interior side of window to WAB.

2.05 ACOUSTICAL SEALANT

A. Acoustical Sealant (Type "J"): One-part, resilient and non-setting. Spray-on sealants are not acceptable.
   1. Fire Rated Partitions - acceptable products: CP 25 Caulk by 3M Corporation, Acoustical Sealant by Specified Technologies, or approved
   2. Other applications - acceptable products: Acoustical Sealant by U.S. Gypsum, AC20®FTR Acoustical Sealant by Pecora Chemical Corporation, Acoustical Caulking CC-75 by Mason Industries, or approved

2.06 RELATED MATERIALS

A. Plastic Foam Backer Rod: ASTM C 1330. Preformed compressible, resilient, non-waxing, non-extruding foam, of size, shape and density to suit various conditions and control sealant depth. Provide open or closed cell as recommended by sealant manufacturer.

B. Backer rod type recommended for compatible with sealant by sealant manufacturer, and of type which does not cause staining or discoloration of joint based on field experience and laboratory testing.

C. Sizes as recommended by sealant manufacturer, with diameter never less than 30 percent greater than width of joint.

D. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing bond between sealant and back surface of joint. Provide self-adhesive tape wherever applicable.

E. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated.

F. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaner of type acceptable to manufacturer of sealant and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in-service performance.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealant performance. Do not proceed with joint sealer work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Cleaning of Joints: Clean joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:

B. Remove lacquers and protective films from metal surfaces. Clean metal, glass, and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealants.

C. Jointing Priming: Prime joint substrates where recommended by joint sealer manufacturer based on preconstruction compatibility and adhesion testing or prior experience. Apply primer undiluted in uniform coating over surface. Confine primers to areas of joint sealer bond; do not allow spillage or migration onto adjoining surfaces.

D. Masking Tape: Apply masking tape around joints where required to prevent contact of sealant with adjoining surfaces which otherwise would be stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 SEALANT APPLICATION

A. General: Comply with joint sealer manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Installation Standards: Comply with recommendations of ASTM C1193 for use of joint sealants as applicable to materials, applications and conditions indicated.

C. Installation of Sealant Backings:

1. Install backer rods in all butt type joints receiving sealant where depth of joint exceeds manufacturer's recommendations. Install joint filler using a blunt tool or plain faced roller. Do not puncture, stretch, or twist joint fillers.

2. Do not leave gaps between ends of joint fillers. Remove joint fillers that become wet prior to sealant application and replace with dry material.

3. Generally, install joint fillers to a depth of 1/4 inch below surface of joint. Where depth of joint is not sufficient to require joint filler, install bond breaker tape to cover full width and length of joint cavity to prevent three sided adhesion.

D. Joint Width: Width-to-depth ratio of sealant as recommended by sealant manufacturer. Do not exceed a depth of 1/2 inch when joint is 1/2 inch wide; joints exceeding 1/2 inch in width shall not exceed 1/4 inch in depth.

E. Mixing: Mix two component sealant in accordance with manufacturer's directions using premeasured units. Do not thin or adulterate sealant in any way.
F. Installation of Sealants: Apply sealant over backing to uniform thickness in continuous beads, filling all joints and voids solid; superficial pointing with skim bead will not be accepted. Use nozzle of proper size to completely fill the joints.

G. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads, free of air pockets; ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint.

1. Provide concave joint configuration, unless noted otherwise.

2. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

H. Pourable sealants shall be applied by gun or by pouring, filling the joint completely with a slight recessed finish. Additional material shall be added if low spots develop. Seal along outside slab edges of joints to prevent water from entering cavity formed by backer rod.

3.04 FIELD QUALITY CONTROL

A. General: Test sealants in accordance with ASTM C 1021 and as follows:

B. Field-Adhesion Testing: Perform Field-test of joint-sealant in accordance with test recommended in ASTM C 1193, except as modified below. Method described is similar to method described in less detail in AAMA's "Aluminum Curtain Wall Series No. 13" and in SWRI's "Sealants: The Professionals' Guide."

1. Extent of Testing: Test completed elastomeric sealant joints as follows:
   a. Perform ten tests for the first 1000 feet of joint length for each type of elastomeric sealant and joint substrate.

2. Test Method: Test joint sealants by hand-pull method described below:
   a. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches long at sides of joint and meeting cross cut at one end. Place a mark 1 inch from cross-cut end of 2-inch piece.
   b. Use fingers to grasp 2-inch piece of sealant between cross-cut end and 1-inch mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
   c. For joints with dissimilar substrates, check adhesion to each substrate separately by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.

C. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.

1. Inspect tested joints and report on the following:
   a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare
these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

b. Whether sealants filled joint cavities and are free from voids.

c. Whether sealant dimensions and configurations comply with specified requirements.

D. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

E. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.

F. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.05 Cleaning

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION
SECTION 07 95 13
EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for expansion joint assemblies for floor, wall, ceiling and soffit surfaces as detailed on Drawings or required. (EJ-9 and EJ-10).

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 03 11 00, Concrete Forming: Placement of joint assembly frames in formwork
2. Section 03 30 00, Cast-in-Place Concrete: Expansion and contraction joints in exterior concrete joints
3. Section 04 20 00, Unit Masonry: Placement of joint assembly frames in masonry

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Society for Testing and Materials International (ASTM)
   a. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices, available colors and finish.

C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.

D. Samples: Submit two samples 6 inches long each, illustrating profiles, dimensions, colors, and finishes selected.

E. Manufacturer's Installation Instructions: Indicate rough-in sizes; provide templates for cast-in or placed frames or anchors; required tolerances for item placement.

1.04 QUALITY ASSURANCE

A. Field Measurements: Verify compliance with manufacturer's requirements.
PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Expansion Joint Cover Assemblies:
   1. Architectural Art Mfg., Inc.
   2. Balco, Inc.
   3. Construction Specialties, Inc.
   4. InPro Corp (Jointmaster).
   5. Michael Rizza Co. (Rizza)
   6. MM Systems Corp.
   7. Substitutions: See Section 01 60 00, Product Requirements.

2.02 MATERIALS

C. Threaded Fasteners: Stainless steel.
D. Backing Paint: Asphaltic type.
   1. Installation: Screws.
E. EJ-9: Exterior Roof - Curb to Wall
   1. Basis of Design: Rizza "Roof Seal" with continuous waterstop membrane (gutter)
   2. Exterior seal: Neoprene extrusion quarter-round with flanges.
   3. Secondary Seal: Continuous closed cell neoprene or EPDM.
   4. Accessories: Splicing kit for in-line splices and factory transition to vertical joint.
F. EJ-10: Vertical wall joint
   1. Basis of Design: Rizza "Exterior Vertical Seal".
   2. Exterior Weather Seal: Extruded neoprene; continuous flush profile.
   3. Secondary Seal: Continuous closed cell neoprene or EPDM.

2.03 FABRICATION

A. Joint Covers: Aluminum cover plate, aluminum frame construction, retainers with resilient elastomeric filler strip, designed to permit plus or minus 50 percent joint movement with full recovery, flush mounted.
2.04 FINISHES
   A. Floors: Non-slip surfacing of aluminum oxide grit.
   B. Walls and Ceilings: Clear anodized.
   C. Resilient Filler Exposed to View: Gray.

PART 3 - EXECUTION

3.01 EXAMINATION
   A. Verify that joint preparation and affected dimensions are acceptable.

3.02 PREPARATION
   A. Provide anchoring devices for installation and embedding under Section 03 11 00, Concrete Forming.
      1. Provide templates and rough-in measurements.

3.03 INSTALLATION
   A. Install components and accessories in accordance with manufacturer's instructions.
   B. Align work plumb and level, flush with adjacent surfaces.
   C. Rigidly anchor to substrate to prevent misalignment.

3.04 INSTALLATION OF ELASTOMERIC CONCRETE
   A. Care should be taken to protect the surrounding surfaces from stains caused by the elastomeric concrete.
   B. Preparations
      1. Surfaces to receive elastomeric concrete must be clean, dry and sound. Prepare the substrate by sandblasting or grinding.
      2. Substrate must be treated with primer per manufacturer instructions.
      3. All surfaces of the joint cover system must be taped or covered to prevent contact with the elastomeric concrete. A strip of duct tape must be placed adjacent to each block out to be filled.
      4. Mix elastomeric concrete according to the instructions provided by the manufacturer.
      5. Fill the voids between the base frame and slide frame and the edges of the blockout, then smooth with trowel.

3.05 PROTECTION
   A. Do not permit traffic over unprotected floor joint surfaces until elastomeric concrete has hardened.
### SCHEDULE

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**END OF SECTION**
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:
   1. Non-fire-rated steel doors and frames.
   2. Fire-rated steel doors and frames.
   3. Thermally insulated steel doors.
   4. Accessories, including glazing and matching panels.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 04 20 00, Unit Masonry: Grouting of frames in masonry walls
   2. Section 07 19 10, Water and Graffiti Repellents: Application at areas exposed to public view
   3. Section 08 71 00, Door Hardware
   4. Section 08 80 00, Glazing: Glass for doors and borrowed lites
   5. Section 09 90 00, Painting and Coating: Field painting

1.02 REFERENCES

A. This Section incorporates by reference the latest revision of the following documents.
   1. American National Standards Institute (ANSI), /International Code Council (ICC)
      b. ANSI A250.3 - Test Procedure and Acceptance Criteria for Factory-Applied Finish Painted Steel Surfaces for Steel Doors and Frames
      c. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames
      d. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
a. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

3. Door and Hardware Institute (DHI)
   a. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute (ANSI/DHI A115 Series).

4. The National Association of Architectural Metal Manufacturers (NAAMM)
   a. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames

5. National Fire Protection Association (NFP)
   a. NFPA 80 - Standard for Fire Doors and Fire Windows

6. Underwriters Laboratories Inc. (UL)
   a. UL (BMD) - Building Materials Directory
   b. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

D. Samples: Submit two samples of metal, 2 by 2 inches in size showing factory finishes, colors, and surface texture.

E. Installation Instructions: Manufacturer's published instructions, including all special installation instructions relating to this project.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 3 years documented experience.

B. Single Source: Obtain hollow metal doors and frames from a single manufacturer.

C. Maintain at the project site a copy of all reference standards dealing with installation.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with NAAMM HMMA 840.

B. Clearly identify and mark each door and frame to correspond with same number as listed on the schedule submitted with shop drawings.
C. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

D. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided refinshed items are equal in all respects to new work and acceptable to the Architect; otherwise, remove and replace damaged items as directed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:

1. Amweld Building Products, LLC.
2. Benchmark; a division of Therma-Tru Corporation.
3. Ceco Door Products; an Assa Abloy Group company.
4. Curries Company; an Assa Abloy Group company.
5. Deansteel Manufacturing Company, Inc.
6. Fleming Door Products Ltd.; an Assa Abloy Group company.
8. Kewanee Corporation (The).
10. Security Metal Products Corp.
11. Steelcraft; an Ingersoll-Rand company.

2.02 MATERIALS

A. Doors and Frames

1. Requirements for All Doors and Frames:
   b. Door Top Closures: Flush with top of faces and edges.
   c. Door Edge Profile: Beveled on both edges.
   d. Door Texture: Smooth faces.
   e. Hardware Preparation: In accordance with DHI A115 Series, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
   f. Galvanizing for Units in Wet Areas: All components hot-dip zinc-iron alloy-coated (galvannealed), ASTM A 653, A40 coating thickness.
   g. Finish: Factory primed, for field finishing.
2. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

B. Steel Doors

1. Exterior Doors:
   a. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
   b. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.

2. Thermal-Rated (Insulated) Doors: For exterior doors enclosing conditioned space provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 when tested according to ASTM C 1363.

3. Interior Doors, Non-Fire-Rated:
   a. Grade: ANSI A250.8 Level 1, physical performance Level C, Model 1, full flush.

4. Interior Doors, Fire-Rated:
   a. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 1, full flush.
   b. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure").
      1) Provide units listed and labeled by UL.
      2) Attach fire rating label to each fire rated unit.
   c. Smoke and Draft Control Doors (Pressure Resistant Doors) (Indicated as "S" in door Schedule): In addition to required fire rating, provide door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cubic feet per minute per square foot of door opening at 0.10 inch water gage pressure at both ambient and elevated temperatures; with "S" label; if necessary, provide additional gasketing or edge sealing.
      1) Grade: ANSI A250.8 Level 3, physical performance Level B, Model 1, full flush.
      2) Door hardware to conform to door assembly design pressure loads.

5. Panels: Same construction, performance, and finish as doors.

C. Steel Frames

1. General:
a. Comply with the requirements of grade specified for corresponding door.

1) ANSI A250.8 Level 3 Doors: Minimum 14 gage frames (typical, unless noted or specified otherwise).

b. Finish: Same as for door where doors are not factory-finished.

c. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry.

d. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

e. Frames wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2. Exterior Door Frames: Face welded, seamless with joints filled.

a. Galvanizing: All components hot-dip zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.

b. Weatherstripping: Separate, see Section 08 71 00, Door Hardware.


a. Finish: Factory primed, for field finishing.


a. Fire Rating: Same as door, labeled.

D. Accessory Materials

1. Astragals for Double Doors: Specified in Section 08 71 00, Door Hardware.

a. Fire-Rated Doors: Steel, shape as required to accomplish fire rating.

2. Silencers: Resilient rubber, fitted into drilled hole; three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

3. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

E. Finish Materials

1. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

a. Siliconized primers are not compatible with finish paints specified and are not permitted.

2. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.
PART 3 - EXECUTION

3.01 EXAMINATION
   A. Verify existing conditions before starting work.
   B. Verify that opening sizes and tolerances are acceptable.

3.02 PREPARATION
   A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.
   B. Coat inside of grouted frames with bituminous coating to a thickness of 1/16 inch.

3.03 INSTALLATION
   A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.
   B. In addition, install fire rated units in accordance with NFPA 80.
   C. Coordinate frame anchor placement with wall construction.
   D. Grouting Door Frames:
      1. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout. Grout and installation are work of Section 04 20 00, Unit Masonry.
      2. Concrete Walls: Do not grout frames.
      3. Metal Stud-Framed Walls: Do not grout frames.
   E. Coordinate installation of hardware.
   F. Coordinate installation of electrical connections to electrical hardware items.
   G. Field Touch-Up: Touch-up doors and frames including the refinishing of raw surfaces resulting from job fitting, repair of job inflicted scratches and or marred surfaces.

3.04 CONSTRUCTION
   A. Erection Tolerances
      1. Clearances between Door and Frame: As specified in ANSI A250.8.
      2. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.05 ADJUSTING
   A. Adjust for smooth and balanced door movement.

3.06 SCHEDULES
   A. Refer to Door and Frame Schedule on the Contract Drawings.
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:

1. Access door and frame units, fire-rated, in wall, ceiling, and floor locations fabricated from prime-painted steel sheet and stainless steel sheet.

2. Access doors indicated in the contract documents, or otherwise required to access concealed construction requiring regular maintenance or repair.

3. Access doors and frames include both fire-rated and non-rated assemblies and doors for electrical circuit access.

4. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   a. Section 08 33 23, Overhead Coiling Doors: Panels to provide ceiling access to concealed devices and mechanisms of door.
   b. Section 08 33 26, Overhead Coiling Grilles: Panels to provide ceiling access to concealed devices and mechanisms of door.
   c. Section 09 21 16, Gypsum Board Assemblies: Openings in partitions and gypsum ceilings.
   d. Section 09 90 00, Painting and Coating: Field paint finish.
   e. Division 23: Mechanical sections for mechanical requirements through finished walls and ceilings.
   f. Division 26: Electrical sections for electrical requirements for access panels through finished walls and ceilings.

1.02 REFERENCES

A. This Section incorporates by reference the following documents:

1. American Society for Testing and Materials International (ASTM)
   a. ASTM A 36: Specification for Carbon Structural Steel
   b. ASTM A 366: Specification for Commercial Steel (CS) Sheet, Carbon, (0.15 Maximum Percent) Cold-Rolled
1.03 SYSTEM DESCRIPTION

A. Design Requirements

1. Fabricate floor access assemblies to support live load of 300 pounds per square foot with deflection not to exceed 1/150 of span.

B. Regulatory Requirements

1. Conform to applicable code for fire-rated access doors.

   a. Provide access doors of fire-rating equivalent to the fire-rated assembly in which they are to be installed. Fire rated-door assemblies shall comply with NFPA 80.

2. Provide products listed and labeled by UL as suitable for the purpose specified and indicated. Test for vertical installations: ASTM E 152. Test for horizontal installations: ASTM E 119.
3. Provide certificate of compliance from authority having jurisdiction indicating approval of fire rated doors.

1.04 SUBMITTALS

A. Procedures: See Section 01 33 00, Submittal Procedures.

B. Product Data: Provide a schedule of access doors including sizes, types, fire ratings, finishes, hardware, locations, finishes, profiles, and details of adjoining work.

C. Shop Drawings: Indicate exact position of all access door units, details of frames, anchorage, and accessory items.

D. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:
   1. Method of attaching door frames to surrounding construction.
   2. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, sprinklers, and special trim.

E. Project Record Documents: Record actual locations of all access units.

F. Closeout: Submit keys to Sound Transit.

1.05 PROJECT CONDITIONS

A. Coordinate the work with other work requiring access doors. Determine specific locations and sizes needed to gain access to concealed equipment, and indicate on schedule specified under "Submittals".

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Access Doors:
   2. The Williams Brothers Corporation of America, Ft. Royal, VA; 800-255-5515.
   4. Nystrom Products Co.: (Minneapolis MN; 612-781-7850).
   5. Substitutions: See Section 01 25 00, Substitution Procedures.

B. Floor Access Hatches: Not included in N150.
   1. Bilco: www.bilco.com, basis of design is Bilco Vault Access Door Type J-AL.
   3. Substitutions: See Section 01 25 00, Substitution Procedures.
2.02 MATERIALS

A. Steel Sheet: ASTM A 366/A 366 M commercial quality, cold-rolled steel sheet with baked-on, rust-inhibitive primer for interior doors

B. Zinc-Coated Steel Sheet: ASTM A 591/A 591 M, electrolytic zinc-coated steel sheet with Class C coating and phosphate treatment to prepare surface for painting for all exterior doors.

C. Steel Plates, Shapes, and Bars: ASTM A 36.

D. Hot-Rolled Steel Sheets: ASTM A 569, Commercial Steel (CS), Type B; free of scale, pitting, and surface defects; pickled and oiled; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568.

E. Cold-Rolled Steel Sheets: ASTM A 366, Commercial Steel (CS), or ASTM A 620, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568. Electrolytic zinc-coated steel sheet, complying with ASTM A 591, Class C coating, may be substituted at fabricator's option.

F. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

G. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316; with minimum sheet thickness indicated representing specified thickness according to ASTM A 480.

2.03 MANUFACTURED UNITS

A. Access Doors and Panels

1. All Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.

B. Access Door Units – Walls and Ceilings

1. Door and Frame Units with Exposed Trim: Formed steel.
   a. Metal for frames and flanges: 0.058 inch steel.
   b. Trim: 1-inch flange overlapping surfaces surrounding door frame

2. Trimless Flush Frame Units:
   a. Metal: 0.058 inch steel
   b. Frame Configuration: Minimum 16 gage steel flange integral with frame and overlapping face of adjoining gypsum board, with surface formed to receive joint compound
   c. Door panels: 0.070 inch (14 gage) single thickness steel sheet.
   d. Sizes:
      1) Walls: 12 x 12 inches.
      2) Ceilings: 12 x 12 inches.
3) Man entry: 22 inches wide x 34 inches high.


5) Other sizes as detailed on Drawings.

3. Hardware:


b. Lock: Flush cylinder lock with latch, two keys for each unit.

4. Fire Ratings: Match rating of the partition or floor/ceiling assembly in which the access panel is to be installed.

a. Temperature Rise Rating: 250 deg F at the end of 30 minutes.

b. Automatic Closer: Spring type.

c. Galvanized, hot dipped finish.


a. Prime coat with alkyd primer.

C. Access Units – Floors


a. Frames and anchors: Frame shall be 1/4” extruded aluminum with bend down anchor tabs around the perimeter.

b. Cover: ¼” aluminum diamond pattern.

c. Type and Size: As indicated on Drawings.

d. Hardware:

1) Hinge: Shall be specifically designed for horizontal installation and shall be through bolted to the cover with tamperproof Type 316 stainless steel lock bolts and shall be through bolted to the frame with Type 316 stainless steel bolts and locknuts.

2) Hold-open devices: Provide hold-open device with latching mechanism.

3) Lifting mechanism: Provide the required number and size of compression spring operators enclosed in telescopic tubes to provide smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing.

4) Lock: Screw driver slot or key for quarter turn cam lock.

5) Removable wrench lift handle.

e. Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.
2.04 FABRICATION

A. Manufacture each access door assembly as an integral unit ready for installation.

B. Weld, fill, and grind joints to ensure flush and square unit. Construction should be continuous, and welded. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

1. For exposed flange units, provide 1 inch (nominal) wide trim around perimeter of frame.

2. For gypsum board assemblies, furnish frames with edge trim for gypsum board or gypsum base.

3. For masonry installations, furnish frames with adjustable metal masonry anchors.

C. Recessed Panel Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

1. Furnish recessed panel doors for concealed installation in acoustic tile ceiling systems.

2. Furnish recessed panel doors and frames for concealed installation in gypsum wall board.

D. Locking Devices: Furnish as required to hold door in flush smooth plane when closed. Provide 2 keys per lock and key all locks alike. Provide access sleeves and plastic grommets installed in holes cut through finish for recessed panel doors.

2.05 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.06 STEEL FINISHES

A. Surface Preparation: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

B. Apply shop primer to uncoated surfaces of metal fabrications. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

2.07 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.
B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Polish: No. 4 finish.
   1. When polishing is complete, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that rough openings for door and frame are correctly sized and located. Coordinate with mechanical and electrical contractors.

B. Advise installers of other work about specific access door installation requirements, including sizes of openings, locations of supports, inserts, and anchoring devices. Furnish inserts and anchoring devices for access doors that must be built into other construction. Coordinate delivery with other work to avoid delay.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings. Secure rigidly in place, with plane of face panels aligned with adjacent finished surfaces.

C. Position units to provide convenient access to the concealed work requiring access.

3.03 ADJUSTING

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels or frames which are warped, bowed, or otherwise damaged.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:
   1. Overhead power-operated non-rated coiling metal doors and operating hardware
      with electric operation.
   2. Wiring from electric circuit disconnect to operator and wiring to control station.

B. Related Sections: The work of the following Sections is related to the work of this
   Section. Other Sections, not referenced below, may also be related to the proper
   performance of this work.
   1. Section 05 12 00, Structural Steel Framing: Support of grille tracks and hoods.
   2. Section 05 50 00, Metal Fabrications, Framing and supports.
   3. Section 08 31 00, Access Doors and Panels: Panels to provide ceiling access to
      concealed devices and mechanisms of doors.
   4. Section 08 71 00, Door Hardware: Cylinder cores and keys.
   5. Section 09 06 00, Schedules for Finishes.
   6. Section 09 96 00, High-Performance Coatings: Finish on hoods and guides.
   7. Section 26 05 25, Wire and Cable: Conduit from electric circuit to operator and
      from operator to Control Station.

1.02 REFERENCES

A. This Section incorporates by reference the following documents.
   1. American Society for Testing and Materials International (ASTM)
      a. ASTM A 666 - Standard Specification for Annealed or Cold-Worked
         Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.
      b. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip
   2. Interlink Testing Services (ITS)
      a. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA,
   3. National Electrical Manufacturers Association (NEMA)
a. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2003.


c. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2006.

1.03 SYSTEM DESCRIPTION

A. Regulatory Requirements

1. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.04 SUBMITTALS

A. Procedures: See Section 01 33 00, Submittal Procedures.

B. Product Data:

1. Submit general construction, component connections and details, and electrical equipment including motors.

C. Shop Drawings: Indicate details and dimensions of installation including tracks, structural supports, connection points, anchoring methods, closures, hardware locations, locations of control boxes and installation details.

D. Wiring Diagrams: Submit for coordination with the electrical Subcontractor.

E. Samples: Submit four each slat members, 10 inch in size illustrating shape, color and finish texture.

F. Manufacturer’s Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.

G. Maintenance and Operating Manuals: Furnish complete manuals describing the materials, devices and procedures to be followed in operating and maintaining all coiling service doors under this section. Include manufacturer’s brochures and parts lists describing the actual materials used in the product.

1.05 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

B. Manufacturer’s Qualifications: Furnish each assembly as a complete unit produced by a single manufacturer, including hardware, operators, controls, accessories, and installation components.

C. Anchors and Inserts: Supply inserts and anchors which must be set into other construction. Provide setting drawings, templates, and instructions. Coordinate delivery to avoid delays.
D. Wind Loading: Design and reinforce to withstand a 10 psf wind-loading pressure.

E. Project Conditions:

1. Field Measurements: Check actual locations of walls, slabs, framing, and other construction to which work of this section must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication, delivery and installation schedule with construction progress to avoid delay of work.

2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction with work of other trades to ensure that actual dimensions correspond to guaranteed dimensions. Allow for fitting and trimming.

1.06 WARRANTY

A. See Section 01 77 00, Closeout Procedures, for additional warranty requirements.

B. Furnish one (1) year written warranty from date of Substantial Completion of the Project, signed by the manufacturer and installer agreeing to repair or replace work which has failed as a result of defects in materials or workmanship. Upon notification within the warranty period, such defects shall be repaired at no cost to the owner.

C. Include coverage for reinstallation required to replace or repair defective doors.

1.07 COORDINATION

A. Coordinate the overhead door installation with the Systems Group for remote operation from Central Control. See requirements of Division 26.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Accepted Overhead Coiling Door Manufacturers:


6. Substitutions: See Section 01 25 00, Substitution Procedures.

2.02 COMPONENTS

A. Coiling Doors: Basis-of-Design “ModelSD3020-M-PC & G” by McKeon Door Company; Steel slat curtain; conform to NFPA 80.

1. Single thickness slats.
2. Nominal Slat Size: 2 inches wide x required length.

3. Finish: Field painted where noted below. See Section 09 96 00, High-Performance Coatings, for field-applied finish material. See Section 09 06 00, Schedules for Finishes, for finish color.


5. Hood Enclosure: Manufacturer's standard galvanized steel, field coated HPC-3.


7. Mounting: As indicated on Drawings.

8. Interior and Exterior lock and latch handle.


10. Hardware:
   a. Lock Cylinders: Specified in Section 08 71 00, Access Doors and Panels.
   b. Latch Handle: Interior and exterior handle.
   c. Operator Interlock: Provide interlock for operator to prevent actuation of operator when grille is latched.

11. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 pound nominal force to operate, maximum.

2.03 MATERIALS

A. Curtain Construction: Interlocking slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.

B. Steel Slats: Minimum 18 gage ASTM A 653/A 653M galvanized steel sheet.
   1. Galvanizing: Minimum G90/Z275 coating Finish: Factory prime and finish paint with manufacturer’s standard grey color for N150, and color chosen from manufacturer’s standard colors for N140.

C. Steel Guides: ASTM A 36/A 36M steel angles, size as indicated, hot-dip galvanized in accordance with ASTM A 123/A 123M.

D. Hood Enclosure: Internally reinforced to maintain rigidity and shape.
   1. Minimum 16 gage.
   2. Finish: Factory galvanized and field-coated hood.
2.04 EQUIPMENT

A. Electric Operation

1. Electric Operators:
   a. Mounting: Side-mounted or top-mounted, as required by available side clearance at openings.
   b. Motor Enclosure:
      1) Exterior doors: NEMA MG 1 Type 4; open drip proof.
      2) Interior doors: NEMA MG 1 Type 1; open drip proof.
   c. Motor Rating: 3/4 hp; continuous duty.
   d. Motor Voltage: 120 volt, single phase, 60 Hz.
   e. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   f. Controller Enclosure: NEMA 250 Type 1.
   g. Opening Speed: 8 inches per second.
   h. Brake: Adjustable friction clutch type, activated by motor controller.


3. Control Station: Provide one key-operated, (OPEN-STOP-CLOSE) momentary control for each operator on either side of each door.
   a. 24 volt circuit.
   b. Operation controls for interior coiling doors and grilles: Key-operated control stations with open, close, and stop buttons for surface mounting for interior and exterior coiling door installations.
   c. Surface-mounted.
   d. Access control system bypass.

4. Automatic Reversing Control Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.

5. Remote Monitoring and Control: Provide Remote Interface Terminal Strip inside the door control station for remote monitoring and control of coiling door or grille through dry contacts.
   a. Terminal blocks shall accept up to #14AWG wire.
   b. Wire to left side of terminal blocks. Right side for remote interface terminations by others.
   c. Two terminal blocks per monitoring or control.
d. Label blocks as shown in the table below.

e. Point functionality as defined in table below.

f. Wetting voltage nominally 24VDC.

<table>
<thead>
<tr>
<th>Remote Interface Terminal Strip</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Term Block Label</strong></td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>S1A</td>
</tr>
<tr>
<td>S1B</td>
</tr>
<tr>
<td>S2A</td>
</tr>
<tr>
<td>S2B</td>
</tr>
<tr>
<td>C1A</td>
</tr>
<tr>
<td>C1B</td>
</tr>
<tr>
<td>C2A</td>
</tr>
<tr>
<td>C2B</td>
</tr>
</tbody>
</table>

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

B. Prior to starting work, carefully inspect installed work of other trades to verify that opening sizes, tolerances and conditions are acceptable and that work of this section may properly commence. Do not begin installation until all unsatisfactory conditions are resolved.

3.02 INSTALLATION

A. Install door assembly in accordance with manufacturer's instructions.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, by installation of neoprene spacers or sheeting, or by other approved permanent separation method.

C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

F. Provide complete and functioning wiring from electrical disconnect at power panel to all door assembly electrical components. Electrical disconnect included in work of other Section.
3.03 CONSTRUCTION

A. Erection Tolerances
   1. Maintain dimensional tolerances and alignment with adjacent work.
   3. Maximum Variation From Level: 1/16 inch.
   4. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 ADJUSTING

A. Adjust door, hardware and operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean door and components.
   B. Remove labels and visible markings.

3.06 TRAINING

A. Train Sound Transit maintenance personnel on procedures and schedules related to door operations, servicing, and preventive maintenance, and procedures for resetting closing devices after activations. Allow a minimum of 4 hours of personnel training including explanation of testing and operations of fire doors.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:
1. Overhead coiling metal grilles and operating hardware, electric operation.
2. Wiring from electric circuit disconnect to operator and wiring to control station.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
1. Section 05 12 00, Structural Steel Framing: Support of grille tracks and hoods.
2. Section 05 50 00 Metal Fabrications: Framing and supports.
3. Section 08 08 00, Commissioning of Openings.
4. Section 08 31 00, Access Doors and Panels: Panels to provide ceiling access to concealed devices and mechanisms of grilles.
5. Section 08 71 00, Door Hardware: Cylinder cores and keys.
6. Section 26 05 25, Wire and Cable: Conduit from electric circuit to operator and from operator to control station.

1.02 REFERENCES

A. This Section incorporates by reference the following documents.
1. American Society for Testing and Materials International (ASTM)
   a. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.
2. National Electrical Manufacturers Association (NEMA)
   a. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2003.
   b. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated not more than 2000 Volts AC or 750 Volts DC; National Electrical Manufacturers Association; 2000 (R2005).
c. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2006.

3. Underwriters Laboratories Inc. (UL)

1.03 SYSTEM DESCRIPTION

A. Regulatory Requirements
   1. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.04 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.
B. Product Data:
   1. Submit general construction, component connections and details, and electrical equipment including motors.
C. Shop Drawings: Indicate details and dimensions of installation including tracks, structural supports, connection points, anchorage methods, closures, hardware locations, locations of control boxes and installation details.
D. Wiring Diagrams: Submit for coordination with the electrical Subcontractor.
E. Samples: Submit four each grille members, 8 x 10 inch in size illustrating shape, color and finish texture.
F. Manufacturer's Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.
G. Operations and Maintenance Data: Indicate lubrication requirements and frequency.
H. Spare Parts List: Submit recommended spare parts list, together with parts numbers and prices and photographs or catalog cuts of repair parts.

1.05 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.
B. Manufacturer's Qualifications: Furnish each assembly as a complete unit produced by a single manufacturer, including hardware, operators, controls, accessories, and installation components.
C. Anchors and Inserts: Supply inserts and anchors which must be set into other construction. Provide setting drawings, templates, and instructions. Coordinate delivery to avoid delays.
D. Project Conditions:
1. Field Measurements: Check actual locations of walls, slabs, framing, and other construction to which work of this section must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication, delivery and installation schedule with construction progress to avoid delay of work.

2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction with work of other trades to ensure that actual dimensions correspond to guaranteed dimensions. Allow for fitting and trimming.

1.06 WARRANTY

A. See Section 01 77 00, Closeout Procedures, for additional warranty requirements.

B. Provide warranty for a five year period after date of Substantial Completion Certification.

C. Include coverage for reinstallation required to replace or repair defective doors.

1.07 COORDINATION

1. Coordinate the overhead grille installation with the Systems Group for remote operation from Central Control. See requirements of Division 26.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Grille Manufacturers:


6. Substitutions: See Section 01 25 00, Substitution Procedures.

2.02 MATERIALS

A. Aluminum: ASTM B 221 (ASTM B 221M).

B. Stainless Steel: ASTM A 666, Type 304, rollable temper.

2.03 COMPONENTS

A. Grille and Components

1. Grille: Stainless Steel; horizontal bar curtain, coiling on overhead counterbalanced shaft.

   a. Finish: None.
b. Lock: Inside and outside cylinder locks.
c. Manual hand crank lift operation to open in event of power failure.
d. Electric operation for typical use.
e. Mounting: Within framed opening.

2. Curtain: Round horizontal bars connected with vertical links.
   a. Horizontal bars: 5/16 inch diameter.
   b. Bar spacing: 1 1/2 inch on center.
   c. Tube spacers: 1/2 inch diameter.
   d. Spacer spacing: 3 1/4 inch on center.
   e. Vertical links: 5/8 x 1/8 inch flat bar.
   f. Link spacing: 6 inch on center.
   g. Bar Ends: Provide with nylon runners for quiet operation.

3. Guides: Stainless steel angles, of profile to retain grille in place, mounting brackets of same metal.

4. Hood Enclosure: Stainless steel sheet metal (same material as grille); 20 gage; finish to match (none).

5. Hardware:
   a. Lock Cylinders: Specified in Section 08 71 00, Doors Hardware.
   b. Latch Handle: Interior and exterior handle.
   c. Operator Interlock: Provide interlock for operator to prevent actuation of operator when grille is latched.

6. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 pound nominal force to operate.

2.04 EQUIPMENT
A. Electric Operation
   1. Electric Operators:
      a. Mounting: Side-mounted or top-mounted, as required by side clearance at openings.
      b. Motor Enclosure:
         1) Exterior grilles: NEMA MG 1 Type 4; open drip proof.
2) Interior grilles: NEMA MG 1 Type 1; open drip proof.

c. Motor Rating: 1/2 hp; continuous duty.

d. Motor Voltage: 120 volt, single phase, 60 Hz.

e. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.

f. Controller Enclosure: NEMA 250 Type 1.

g. Opening Speed: 8 inches per second.

h. Brake: Adjustable friction clutch type, activated by motor controller.

i. Manual override in case of power failure.


3. Control Station: Provide one key-operated, three button (OPEN-STOP-CLOSE) momentary control for each operator on either side of each door.

a. 24 volt circuit.

b. Operation controls for interior coiling doors and grilles: Key-operated control stations with open, close, and stop buttons for surface mounting for interior and exterior coiling door installations.

c. Surface-mounted.

d. Access control system bypass.

4. Automatic Reversing Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.

5. Remote Monitoring and Control: Provide Remote Interface Terminal Strip inside the door control station for remote monitoring and control of coiling door or grille through dry contacts.

a. Terminal blocks shall accept up to #14AWG wire.

b. Wire to left side of terminal blocks. Right side for remote interface terminations by others.

c. Two terminal blocks per monitoring or control.

d. Label blocks as shown in the table below.

e. Point functionality as defined in table below.

f. Wetting voltage nominally 24VDC.

g. Provide remote interface as scheduled below:
### Remote Interface Terminal Strip

<table>
<thead>
<tr>
<th>Term Block Label</th>
<th>Type</th>
<th>Operation</th>
<th>Dry Contact Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1A</td>
<td>Status</td>
<td>Maintained</td>
<td>Not fully opened</td>
</tr>
<tr>
<td>S1B</td>
<td>Status</td>
<td>Maintained</td>
<td>Fully opened</td>
</tr>
<tr>
<td>S2A</td>
<td>Status</td>
<td>Maintained</td>
<td>Not fully closed</td>
</tr>
<tr>
<td>S2B</td>
<td>Status</td>
<td>Maintained</td>
<td>Fully closed</td>
</tr>
<tr>
<td>C1A</td>
<td>Control</td>
<td>1 Second Closure</td>
<td>No operation</td>
</tr>
<tr>
<td>C1B</td>
<td>Control</td>
<td>1 Second Closure</td>
<td>Open Door</td>
</tr>
<tr>
<td>C2A</td>
<td>Control</td>
<td>1 Second Closure</td>
<td>No operation</td>
</tr>
<tr>
<td>C2B</td>
<td>Control</td>
<td>1 Second Closure</td>
<td>Close Door</td>
</tr>
</tbody>
</table>

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

#### 3.02 INSTALLATION

A. Install grille unit assembly in accordance with manufacturer's instructions.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, by installation of neoprene spacers or sheeting, or by other approved permanent separation method.

C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

F. Provide complete and functioning wiring from electrical disconnect at power panel to all grille assembly electrical components. Electrical disconnect included in work of other Sections.

#### 3.03 CONSTRUCTION

A. Erection Tolerances

1. Maintain dimensional tolerances and alignment with adjacent work.


3. Maximum Variation From Level: 1/16 inch.

4. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.
3.04 ADJUSTING
A. Adjust grille, hardware and operating assemblies for smooth and noiseless operation.

3.05 CLEANING
A. Clean grille and components.
B. Remove labels and visible markings.

3.06 TRAINING
A. Train Sound Transit maintenance personnel on procedures and schedules related to door operations, servicing, and preventive maintenance, and procedures for resetting closing devices after activations. Allow a minimum of 4 hours of personnel training including explanation of testing and operations of fire doors.

3.07 COMMISSIONING
A. See Section 08 08 00, Commissioning of Openings, for commissioning requirements pertaining to the work of this Section.

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 08 56 29
HEAT-RESISTIVE WINDOW-WALL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for heat-resistive window-wall systems shown as CW-2 on the Contract Drawings.

1. Delegated engineering design to meet performance requirements.
2. Frames fabricated from cold-formed steel members.
3. Tempered glass panels specified in Section 08 80 00, Glazing.
4. Silicone rubber glazing accessories and sealants.
5. Door Hardware in N140.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Society for Testing and Materials International (ASTM)
   b. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
   c. ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
2. The National Association of Architectural Metal Manufacturers (NAAMM)
   a. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.

C. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:

1. Mullion details including reinforcement and stiffeners.
2. Joinery details.
5. Accessories.

D. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations.

E. Samples for Verification: For steel components required, prepared on Samples of size indicated below:
   1. Main Framing Member: 12-inch-long, full-sized sections, with glazing bead and factory-applied color finish.

F. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating steel glazed framing that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists, and by labels, test reports, and calculations.

B. Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Washington.

C. Shop drawings shall be stamped by the designing Professional Structural Engineer.

D. Installer Qualifications: An installer acceptable to window manufacturer for installation of units required for this Contract.
   1. Installer’s responsibilities include providing professional engineering services needed to assume engineering responsibility including preparation of data for steel glazed framing, including Shop Drawings and Designated Design Submittal based on testing and engineering analysis of manufacturer’s standard units in assemblies similar to those indicated for this Contract.

E. Source Limitations: Obtain steel glazed framing from single source from single manufacturer.

1.05 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of steel window openings by field measurements before fabrication.

1.06 WARRANTY

A. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components of steel glazed framing that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure shall meet performance requirements.
b. Structural failures including excessive deflection.

2. Warranty Period: Three years from date of Substantial Completion.

3. Warranty Period for Metal Finishes: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Structural Performance:

1. Design and size components to withstand the following load requirements without damage or permanent set:

   a. Positive Design Wind Load (inward): 15 pounds per square foot.

   b. Negative Design Wind Load (outward): 15 pounds per square foot.

2. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with the Seattle Building Code.

B. Thermal Performance:

1. Must resist temperature of 302 degrees F for one hour per NFPA.

2.02 FRAME MATERIALS

A. Cold-Formed Steel Framing Members: Provide frame and ventilator members mechanically formed from metallic-coated, low-carbon, cold-rolled steel sheet complying with ASTM A 653/A 653M. For combined weight of frame and ventilator members and front-to-back depth of frame or ventilator members:

1. Finish: Powder coat.

B. Fasteners: Provide fasteners of bronze, brass, stainless steel, or other metal that are warranted by manufacturer to be noncorrosive and compatible with trim, hardware, anchors, and other components of steel glazed framing.

1. Exposed Fasteners: If exposed fasteners are used, provide Phillips flat-head machined screws that match finish of member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Window Accessories: Provide units of stainless steel, hot-dip zinc-coated steel, bronze, brass, or iron complying with ASTM A 123/A 123M. Provide units with sufficient strength to withstand design pressure indicated.

D. Glazing Stops: Manufacturer's standard.

E. Sealant: For sealants required within fabricated glazed framing, provide Room-Temperature-Vulcanizing (RTV) silicone or other heat-resisting sealant, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.
2.03 GLAZING
A. Glazing Units: Clear, fully tempered float glass.

2.04 FABRICATION
A. General: Fabricate steel glazed framing of type and in sizes indicated to comply with HMMA 861 standards. Include a complete system for assembly of components and anchorage of window units.

B. Mullions: Formed of cold-formed steel matching window units; with anchors for support to structure and for installation of window units and having sufficient strength to withstand design pressure indicated. Provide Mullions of profile indicated and with cover plates. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections.

C. Glazing Stops: Provide glazing stops to match panel frames. Finish glazing stops to match window units if fabricated of steel; otherwise, provide manufacturer's standard finish.

2.05 METALLIC-COATED STEEL SHEET FINISHES
A. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint complying with SSPC-Paint 20 and ASTM A 780.

B. Powder-Coat Finish: Immediately after cleaning and pretreating, apply two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
2. Color and gloss: Match TBD specified in Section 09 90 00, Painting and Coating.

PART 3 - EXECUTION

3.01 EXAMINATION
A. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION
A. Comply with manufacturer's written instructions for installing glazed framing, hardware, operators, accessories, and other components.

B. Install framing level, plumb, square, true to line, without distortion or impediment to thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, to provide airtight construction.
3.03 ADJUSTING, CLEANING, AND PROTECTION

A. Clean factory-finished steel surfaces immediately after installing glazed framing. Comply with manufacturer's written recommendations for final cleaning and maintenance. Avoid damaging protective coatings and finishes.

B. Clean glass immediately after installing glazed framing. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. Remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION
1.01 SUMMARY

A. The work of this section includes the aluminum canopy frames, canopy glass and glazing, flashings and attachment plates.

1. Canopies are a delegated engineering design to include the structural design of the canopy frames, glass and the attachments to structure.

B. Related sections:

1. Section 01 45 00, Quality Assurance/Quality Control: Independent testing and inspection requirements.
2. Section 05 05 14, Fluropolymer Coating
3. Section 05 12 00, Structural Steel Framing: Steel attachment members
4. Section 05 50 00, Metal Fabrications: Steel attachment devices and supplemental supports
5. Section 07 19 10, Water and Graffiti Repellents: Application at areas exposed to public view.
6. Section 07 92 00, Joint Sealants: Perimeter sealant and back-up materials
7. Section 08 80 00, Glazing: Glazing requirements for work of this Section

1.02 REFERENCES

A. ASTM E-330: "Test for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference."
B. ASTM E-331: "Test for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference."
C. ASTM E-283: "Test for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors."

1.03 DESIGN REQUIREMENTS

A. Canopy is a delegated engineering design component. Responsibility for the structural design of the canopy frames, glass, connections and accessories is the responsibility of the canopy engineer.
B. Design loads are as determined by the project structural engineer in accordance with the applicable local codes. Coordinate the design of the canopy with the project structural engineer who will design the curbs to withstand the canopy loads.

C. Limit deflection of the canopy members to 1/180 of their length up to 20 feet and 1/240 over 20 feet, or limit deflection of the glass to 3/4 inch over one light, whichever is less.

D. Design the fasteners for a 4 to 1 safety factor based on ultimate loading.

E. Design the canopy assembly to withstand temperature variations up to 120° F without over stressing the glazing, fasteners or framing.

F. Design the canopy system so as to prevent excessive noise such as popping and creaking and wind harmonics.

G. Design bearing and edge clearances as required to accommodate expansion and contraction of the glazing materials with edge clearance of 1/4-inch minimum to the nearest metal surface.

H. Design horizontal glazing components, including the eave, to be flush glazed to allow water to move freely off the canopy.

I. Design system to prevent glass sliding without reliance on friction or placing long term dead loads into sealants.

J. Design and engineer all sealant joints for the intended use.

1.04 PERFORMANCE REQUIREMENTS

A. Provide products that have been tested in accordance with the following methods to verify their ability to meet the specified performance requirements:

1. ASTM E-330-79: Conducted at 1.0 and 1.5 times the design load for both positive and negative static pressure; no breakage, component disengagement or permanent distortion is permitted.

2. ASTM E-331-83: Conducted at 20 percent of design wind pressure but not less than 8.0 P.S.F. static pressure, with test pressure maintained for the full duration of one (1) 15-minute cycle; no uncontrolled water is to appear on the interior parts of the canopy.

3. ASTM E-283-84: Conducted at 20 percent of design wind pressure but not less than 8.0 static pressure, air infiltration is not to exceed 0.06 C.F.M. / S.F. over the entire mock-up.

1.05 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Structural calculations, sealed by a registered structural engineer licensed in the state of this project, hereinafter referred to as the ‘canopy engineer’, proving the adequacy of the framing members and glazing for all loads and with provisions for expansion and contraction.

C. Shop drawings, sealed by the canopy engineer, showing in detail all canopy members, connections to the building, interface with other materials and methods of construction for the architect’s approval prior to fabrication.
D. Glass samples: One 12-inch square sample of each type of canopy glass.

E. Finish samples: Match architect supplied color samples and submit on aluminum for review prior to application of finish. Include a minimum of 2 samples or as many as required to show expected color variation.

F. Test reports documenting satisfactory completion of ASTM tests.

G. Sealant manufacturer's certification of sealant compatibility, approval of sealant joint design, and application procedures.

H. Where structural silicone joints are required, provide report on sealant compatibility, approval of sealant joint design and application and curing procedures from the sealant manufacturer.

I. Maintenance manual for the canopy with a sequence of items, materials and methods used for proper cleaning and maintenance. Include glass make-up and source for future replacements.

1.06 QUALITY ASSURANCE

A. Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Washington.

B. The manufacturer must have not less than ten (10) years of successful fabrication and installation of work similar to this project with a minimum of three (3) projects of similar size and scope that have been performing successfully for 10 years.

C. Installer is to be the manufacturer or an installer with a minimum of five (5) years experience successfully installing work of this product on projects of similar size and scope.

D. Before start of canopy work, hold a pre-installation meeting for the architect and all related subcontractors to coordinate installation, roof protection, fall protection, and work of adjacent trades.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond to aluminum when exposed to sunlight or weather.

1.08 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls, slabs, framing, and other construction to which work of this section must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication, delivery and installation schedule with construction progress to avoid delay of work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction with work of other trades to ensure that actual dimensions correspond to guaranteed dimensions. Allow for fitting and trimming.
B. Environmental Requirements

1. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. Submit all warranties in conformance with the General and Supplementary Conditions.

B. Manufacturer's material warranty: Five (5) years on all canopy components agreeing to repair or replace any part of the canopy that exhibits defects in workmanship or performance.

C. Installer's warranty: Five (5) years on watertight and structural performance agreeing to repair or replace any part of the canopy installation that exhibits defects in workmanship or performance.

D. Silicone manufacturer's warranty: Ten years (10) years on weather seals and structural silicone.

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Aluminum Framed Canopy: Basis of design product manufacturer

1. DeaMor Skylights. Other

B. Other Manufacturers are acceptable subject to meeting performance requirements and compliance with requirements of this Section.

C. Substitutions: See Section 01 25 00, Substitution Procedures.

2.02 MATERIALS

A. Framing members, perimeter angles and caps are to be extruded aluminum, alloy 6063 or 6061, temper T-5 or T-6, as recommended by manufacturer and required for design loading and required finishes. Extruded aluminum framing sections are to have a minimum thickness of 0.100 inch.

B. Sheet and plate aluminum is to be 5052 alloy for flashing, trim, closures and accessories, minimum .040 inch thick as required to maintain flatness. Provide structural aluminum plates as required by engineer.

C. Fasteners for glazing are to be 1/4 inch non-magnetic stainless steel hex head screws, with neoprene sealer washers, at maximum of 10 inches on center, covered by an extruded cap designed to snap over the pressure plate.

D. Exterior fasteners are to be non-magnetic, 300 series, stainless steel, engineered as required.

E. Interior fasteners, not exposed to moisture, are to be zinc-plated steel.
2.03 GLASS AND GLAZING MATERIALS

A. Glass types are specified in Section 08 80 00 and the following descriptions establish minimum standards. Overhead glazing must be sized to conform to loading and local code requirements.

B. Glazing gaskets are to be minimum 1/8 inch extruded silicone or Santoprene®, as compatible with adjacent sealants.
   1. Mechanically interlock gaskets into the canopy glazing bars and caps so that the gaskets provide a setting surface and waterproof seal against both surfaces of the glass.
   2. Tape or butyl gaskets are not to be used in the glazing system.

C. Glass is to be blocked and retained in the system against sliding and uplift loads.
   1. Provide extruded glazing wedges, mechanically locked into the glazing bars that fully support the glass edges with a silicone block to prevent slipping and lateral movement of the glass.
   2. Retain glass with extruded caps screwed to rafters and continuous extruded horizontal members at the ridge.
   3. Flashings are not to be used for glass retention.

2.04 FABRICATION

A. Fabricate materials in the manufacturer's shop of the appropriate alloys for the specified finish.

B. Provide weep holes in all eave members so that the condensation gutters will drain to the exterior above the eave apron.

C. Fabricate the glass supporting members with hairline joints and aligned to within 1/64 inch. Mock-up the canopy frames as required to determine dimensional accuracy and alignment.

D. Pre-tab and shop weld or solder the flashings prior to finishing.

2.05 FINISH

A. After fabrication is complete, prepare aluminum as required for specified finish.

B. Paint Finish: Apply a standard 2-coat fluoropolymer paint finish as selected by Architect. Application is to conform to the requirements of AAMA 2605.
   1. Pretreat all components with a phosphate conversion coating.
   2. Apply primer as required by the manufacturer.
   3. Apply a minimum 1.0 mil finish coat.
   4. Paint color: TBD
2.06 DISSIMILAR METAL PROTECTION
A. Shop apply 3-M "Scotchrap 50", 10 mil, black vinyl corrosion resistant tape to separate dissimilar metals. Locate so as to be concealed after installation.

2.07 SLIP JOINTS
A. Line slip joints with a high-density material suitable for metal surfaces in friction such as Teflon or 3-M Scotch Ultra-High Molecular Weight (UHMW) polyethylene tape, with suitable adhesive one side. Provide thickness as required to allow free movement and prevent noise due to thermal expansion.

PART 3 - EXECUTION

3.01 EXAMINATION
A. Inspect the installed substrates and adjacent construction to verify that it is as engineered and approved, and that it is satisfactory for the proper installation of the canopy. Do not proceed with installation until any discrepancies have been corrected.
B. Verify dimensions, alignments and layout is correct for the approved design.

3.02 PREPARATION
A. Protect the area around the canopy as required to prevent damage to adjacent construction.
B. Secure staging and provide protection as required to prevent scratching or gouging of the adjacent materials.

3.03 INSTALLATION
A. Install the frames and flashings in accordance with the approved shop drawings.
B. Install the canopies level, plumb and properly aligned with uniform joints and reveals. Remove and replace any components that may be defective or are damaged during installation.
C. Seal the canopy system with approved silicone sealants, using them only as engineered for structural glass retention or exterior waterproofing at horizontal butt joints.
D. Leave the canopies free of all protective material, identification labels and excess sealant.
E. Clean the canopies within one week before final acceptance, in accordance with manufacturer's recommended methods.

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:

1. Hardware as indicated and specified herein for hollow steel and aluminum doors, including appropriate fasteners and miscellaneous materials required to complete the work.

2. Hardware for fire-rated doors.

3. Electrically operated and controlled hardware.

4. Lock cylinders for doors for which hardware is specified in other sections.

5. Thresholds.

6. Weatherstripping, seals and door gaskets.

7. Complete hardware schedule preparation. The drawings and specifications are indications of the design intent for the project. Full provision of an itemized hardware schedule shall be the responsibility of the contractor.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. The drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Division 00 and 01 requirements apply to the work of this section.

2. Section 08 11 13, Hollow Metal Doors and Frames.

3. Section 08 33 23, Overhead Coiling Doors: Cylinder cores and keys.

4. Section 08 33 26, Overhead Coiling Grilles: Cylinder cores and keys.

5. Section 08 56 29, Heat Resistive Window Wall Systems.

1.02 REFERENCES

A. This Section incorporates by reference the latest revision of the following documents.

1. ANSI A 156.18 – Materials and Finishes; Latest edition.


4. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 2004.

5. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; Door and Hardware Institute; 1996.


1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures

B. Schedules and Product Data

1. Schedules to be in vertical format, listing each door opening, and organized into “hardware sets” indicating complete designations of every item required for each door opening to function as intended. Hardware schedule shall be submitted within two (2) weeks from date the purchase order is received by the finish hardware supplier. Furnish four (4) copies of revised schedules after approval for field and file use. Note any special mounting instructions or requirements with the hardware schedule. Schedules to include the following information:

   a. Location of each hardware set cross-referenced to indications on drawings, both on floor plans and in door and frame schedule.

   b. Handing and degree of swing of each door.

   c. Door and frame sizes and materials.

   d. Keying information.

   e. Type, style, function, size, and finish of each hardware item.

   f. Elevation drawings and operational descriptions for all electronic openings.

   g. Name and manufacturer of each hardware item.

   h. Fastenings and other pertinent information.

   i. Explanation of all abbreviations, symbols and codes contained in schedule

   j. Mounting locations for hardware when varies from standard.

2. Submit catalog cuts and/or product data sheets for all scheduled finish hardware.

3. Submit separate detailed keying schedule for approval indicating clearly how the owner’s final instructions on keying of locks has been fulfilled.
C. Samples
1. Upon request, samples of each type of hardware in finish indicated shall be submitted. Samples are to remain undamaged and in working condition through submittal and review process. Items will be returned to the supplier or incorporated into the work within limitations of keying coordination requirements.

D. Templates
1. Furnish a complete list and suitable templates, together with finish hardware schedule to contractor, for distribution to necessary trades supplying materials to be prepped for finish hardware.

E. Electronic Hardware Systems
1. Provide complete wiring diagrams prepared by an authorized factory employee for each opening requiring electronic hardware, except openings where only magnetic hold-open devices are specified. Provide a copy with each hardware schedule submitted after approval.

2. Provide complete operational descriptions of electronic components listed by opening in the hardware submittals. Operational descriptions to detail how each electrical component functions within the opening incorporating all conditions of ingress and egress. Provide a copy with each hardware schedule submitted for approval.

3. Provide elevation drawings of electronic hardware and systems identifying locations of the system components with respect to their placement in the door opening. Provide a copy with each hardware schedule submitted for approval.

4. Prior to installation of electronic hardware, arrange conference between supplier, installers and related trades to review materials, procedures and coordinating related work.

5. The electrical products contained within this specification represent a complete engineered system. If alternate electrical products are submitted, it is the responsibility of the distributor to bear the cost of providing a complete and working system including re-engineering of electrical diagrams and system layout, as well as power supplies, power transfers and all required electrical components. Coordinate with electrical engineer and electrician to ensure that line voltage and low voltage wiring is coordinated to provide a complete and working system.

6. For each item of electrified hardware specified, provide standardized molex plug connectors to accommodate up to twelve (12) wires. Molex plug connectors shall plug directly into through-door wiring harnesses, frame wiring harnesses, electric locking devices and power supplies.

F. Operations and Maintenance Manuals
1. Upon completion of construction and building turnover, furnish two (2) complete maintenance manuals to the owner. Manuals to include the following items:
   a. Approved hardware schedule, catalog cuts and keying schedule.
   b. Hardware installation and adjustment instructions.
   c. Manufacturer’s written warranty information.
d. Wiring diagrams, elevation drawings and operational descriptions for all electronic openings.

1.04 QUALITY ASSURANCE

A. Substitutions

1. All substitution requests must be submitted before bidding and within the procedures and time frame as outlined in Division 1, General Requirements. Approval of products is at the discretion of the architect and his hardware consultant.

B. Supplier Qualifications

1. A recognized architectural door hardware supplier who has maintained an office and has been furnishing hardware in the project’s vicinity for a period of at least two (2) years.

2. Hardware supplier shall have office and warehouse facilities to accommodate this project.

3. Hardware supplier shall have in his employment at least one (1) Architectural Hardware Consultant (AHC) who is available at reasonable times during business hours for consultation about the project’s hardware and requirements to the owner, architect and contractor.

4. Hardware supplier must be an authorized factory distributor of all products specified herein.

C. FIRE-RATED OPENINGS

1. Provide door hardware for fire-rated openings that comply with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed by Underwriter’s Laboratories (UL) or Warnock Hersey (WH) for use on types and sizes of doors indicated.

2. Project requires door assemblies and components that are compliant with positive pressure and S-label requirements. Specifications must be cross-referenced and coordinated with door manufacturers to ensure that total opening engineering is compatible with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies.
   a. Hardware required for fire doors shall be listed with Underwriters Laboratories for ratings specified.
   b. Certification(s) of compliance shall be made available upon request by the Authority Having Jurisdiction.

1.05 DELIVERY, STORAGE AND HANDLING

A. Marking and Packaging

1. Properly package and mark items according to the approved hardware schedule, complete with necessary screws and accessories, instructions and installation templates for spotting mortising tools. Contractor shall check deliveries against accepted list and provide receipt for them, after which he is responsible for storage and care. Any shortage or damaged good shall be made without cost to the owner.
2. Packaging of door hardware is the responsibility of the supplier. As hardware supplier receives material from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set and door numbers to match the approved hardware schedule. Two or more identical sets may be packed in same container.

B. Delivery

1. The supplier shall deliver all hardware to the project site; direct factory shipments are not allowed unless agreed upon beforehand. Hardware supplier shall coordinate delivery times and schedules with the contractor. Inventory door hardware jointly with representatives of hardware supplier and hardware installer/contractor until each is satisfied that count is correct.

2. No keys, other than construction master keys and/or temporary keys are to be packed in boxes with the locks.

3. At time of hardware delivery, door openings supplier in conjunction with the contractor shall check in all hardware and set up a hardware storage room.

C. Storage

1. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of work will not be delayed by hardware losses both before and after installation.

1.06 WARRANTY

A. See Section 01 77 00, Closeout Procedures, for additional warranty requirements.

B. All items, except as noted below, shall be warranted in writing by the manufacturer against failure due to defective materials and workmanship for a minimum period of one (1) year commencing on the date of final completion and acceptance. In the event of product failure, promptly repair or replace item with no additional cost to the owner.

1. Mortise locksets: Five (5) years
2. Exit Devices: Five (5) years
3. Door closers: Ten (10) years
4. Securitron (and approved equals) electrified hardware: Unlimited Lifetime

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Only manufacturers as listed below shall be accepted. Obtain each type of finish hardware (hinges, latch and locksets, exit devices, door closers, etc.) from a single manufacturer.

2.02 MATERIALS

A. Screws and Fasteners
1. All required screws shall be supplied as necessary for securing finish hardware in the appropriate manner. Thru-bolts shall be supplied for exit devices and door closer where required by code and the appropriate blocking or reinforcing is not present in the door to preclude their use.

B. Hanging Devices

1. Hinges
   a. Hinges shall conform to ANSI A156.1 and have the number of knuckles as specified, oil-impregnated bearings as specified with NRP (non-removable pin) feature, at all exterior reverse bevel doors. Unless otherwise scheduled, supply one (1) hinge for every 30” of door height, or fraction thereof. Hinges shall be a minimum of 4 1/2” high and 4 1/2” wide; heavy weight hinges (.180) shall be supplied at all doors where specified.

   1) Specified Manufacturer: McKinney
   2) Approved Substitutes: Bommer, Hager, Stanley

2. Continuous Stainless Steel Hinges
   a. All hinges to be non-handed and of slim barrel design. Hinges to be type 316 stainless steel and shall have a concealed teflon-coated stainless steel pin with twin self-lubricated nylon bearings at each knuckle. Hinges shall be UL list up to and including 3 hours and shall be available with power transfer cutouts when necessary.

   1) Specified Manufacturers: Markar
   2) Approved Manufacturers: McKinney, Select

C. Flush Bolts and Accessories

1. All manual and automatic flush bolts to be furnished as specified.
   a. Specified Manufacturer: Rockwood
   b. Approved Substitutes: McKinney, Trimco

D. Cylinders and Keying

1. Cylinders
   a. All cylinders shall be high security tested, drill & pick proof, extreme attack configured, patent protected in U.S. and Canada, and include a unique double row of pins.

      1) Specified Manufacturer: BiLock
      2) Approved Substitutes: None

2. Keying
a. All locks and cylinders shall be provided with construction cylinders/cores, for use during the construction phase. All permanent cores shall be keyed to the existing BiLock Master Key system, per the approved key schedule. Provide the following quantity of keys:

1) Two (2) change keys per lock

2) Six (6) master keys per master level

3) Five (5) construction/temporary keys

3. Cylinder Installation

a. The general contractor shall install all construction cylinders/cores at the time of hardware installation.

b. The owner, or their representative, shall remove all construction cylinders/cores and install all permanent cylinders/cores.

4. Key Box

a. Model: KNOX 3200 X Recessed Mounting Kit (RMK)

b. Provide quantity as shown on plan.

E. Locking Devices

1. Mortise Locksets

a. All locksets shall be ANSI 156.13 Series 1000, Grade 1 Certified. All functions shall be manufactured in a single sized case formed from 12 gauge steel minimum. The lockset shall have a field-adjustable, beveled armored front, with a .125” minimum thickness and shall be reversible without opening the lock body. The lockset shall be 2 3/4” backset with a one-piece 3/4” anti-friction stainless steel latchbolt. The deadbolt shall be a full 1” throw made of stainless steel and have 2 hardened steel roller inserts. All strikes shall be non-handed with a curved lip. To insure proper alignment, all trim, shall be thru-bolted and fully interchangeable between rose and escutcheon designs and shall be the product of one manufacturer.

1) Specified Manufacturer: Corbin Russwin

2) Approved Substitutes: Sargent, Schlage

2. Electrified Locksets

a. Mechanical features of locksets shall conform to standards as specified above. Locksets shall be fail-secure unless otherwise specified. Where specified electrified locksets shall be provided with a switch to monitor inside or outside lever handle or signal remote location.

1) Specified Manufacturers: Corbin Russwin

2) Approved Manufacturers: Sargent, Schlage
3. Lockset Strikes
   a. Strikes shall be non-handed and available with curved lip, full lip or ASA type strikes as required. Provide strikes with lip-length required to accommodate jamb and/or trim detail and projection.

F. Exit Devices
   1. Conventional Devices – Push Rail
      a. All exit devices shall be ANSI A156.3, Grade 1 Certified and shall be listed by Underwriters Laboratories and bear the UL label for life safety in full compliance with NFPA 80 and NFPA 101. Mounting rails shall be formed from a solid single piece of stainless steel, brass or bronze no less than 0.072” thick. Push rails shall be constructed of 0.062” thick material. Painted or anodized aluminum shall not be considered heavy duty and is not acceptable. Lever trim shall be available in finishes and designs to match that of the specified locksets.
         1) Specified Manufacturer: Corbin Russwin ED4000/ED5000 Series
         2) Approved Substitutes: Precision, Sargent

G. Door Closers
   1. Surface-Mounted Closers – Heavy Duty
      a. All door closers shall be ANSI 156.4, Grade 1 Certified. All closers shall have aluminum alloy bodies, forged steel arms, and separate valves for adjusting backcheck, closing and latching cycles and adjustable spring to provide up to 50% increase in spring power. Closers shall be furnished with parallel arms mounting on all doors opening into corridors or other public spaces and shall be mounted to permit 180 degrees door swing where wall conditions permit. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
         1) Specified Manufacturer: Corbin Russwin DC6000 Series
         2) Approved Substitutes: Norton, Sargent

H. Door Trim and Protective Plates
   1. Kick plates shall be .050 gauges and two (2) inches less full width of door, or as specified. Push plates, pull plates, door pulls and miscellaneous door trim shall be as shown in the hardware schedule.
      a. Specified Manufacturer: Rockwood
      b. Approved Substitutes: McKinney, Trimco

I. Door Stops and Holders
   1. Wall-mounted Door Stops
      a. Where a door is indicated on the plans to strike flush against a wall, wall bumpers shall be provided. Provide convex or concave design as indicated.
1) Specified Manufacturers: Rockwood
2) Approved Substitutes: McKinney, Trimco

2. Overhead Stops/holders
   a. Where specified, overhead stops/holders as shown in the hardware sets are to be provided. Track, slide, arm and jamb bracket shall be constructed of extruded bronze and shock absorber spring shall be of heavy tempered steel. Overhead stops shall be of non-handed design.

    1) Specified Manufacturers: Rixson
    2) Approved Substitutes: ABH, Sargent

J. Gasketing and Thresholds

1. Provide continuous weatherseal on exterior doors and smoke, light, or sound seals on interior doors where indicated or scheduled. Provide intumescent seals as required to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies. Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

2. Provide threshold units not less than 4” wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames. All threshold units shall comply with the Americans with Disabilities Act (ADA).

   a. Specified Manufacturers: Pemko
   b. Approved Substitutes: Reese, Zero

K. Door Silencers

1. Furnish rubber door silencers all hollow metal frames; two (2) per pair and three (3) per single door frame.

L. Power Supplies

1. Power supplies shall furnish regulated 24VDC and shall be UL class 2 listed. LED’s shall monitor zone status (voltage/no voltage) and slide switches shall be provided to connect or disconnect the load from power; 1, 4 or 8 separate output circuit breakers shall be provided to divide the load. Power supplies shall have the internal capability of charging optional 24VDC sealed lead acid batteries in addition to operating the DC load. Power supplies shall be supplied complete requiring only 120VAC to the fused input and shall be supplied in an enclosure. Power supplies shall be provided with emergency release terminals that allow the release of all devices upon activation of the fire alarm system. Multiple hardware sets may list power supplies but the total quantity can be decreased by installing larger power supplies to power multiple doors. Operating amperage and voltage must be within limits recommended by the hardware manufacturer.

   a. Power supplies to be provided by the Access Control Contractor
2.03 HARDWARE FINISHES

A. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 or traditional U.S. finishes shown by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer’s standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. Where specified hardware shall have an antimicrobial coating which permanently suppresses the growth of bacteria, algae, fungus, mold and mildew applied. The finish shall control the spread and growth of bacteria, mold and mildew and shall be FDA listed for use in medical and food preparation equipment.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Contractor shall ensure that the building is secured and free from weather elements prior to installing interior door hardware. Examine hardware before installation to ensure it is free of defects.

3.02 INSTALLATION

A. Mount hardware units at heights indicated in the following applicable publications, except as specifically indicated or required to comply with the governing regulations.

1. “Recommended Locations for Builders Hardware for Standard Steel Doors and Frames” by the Door and Hardware Institute (DHI.)

2. NWWDA Industry Standard I.S.1.7, “Hardware Locations for Wood Flush Doors.”

B. All hardware shall be applied and installed in accordance with best trade practice by an experienced hardware installer. Care shall be exercised not to mar or damage adjacent work.

C. Install each hardware item in compliance with the manufacturer’s instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

D. Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.03 FIELD QUALITY CONTROL

A. The Contractor shall comply with AIA A201 1997 section 3.3.1 which reads as follows: “The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the contract Documents give other specific instructions concerning these matters.”
B. The hardware supplier shall do a final inspection prior to building completion to ensure that all hardware was correctly installed and is in proper working order.

3.04 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

B. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore to proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Instruct owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes and usage of any electronic devices.

3.05 PROTECTION

A. Contractor shall protect all hardware, as it is stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

3.06 HARDWARE SCHEDULE

A. The following Hardware Schedule is provided for whatever assistance it may afford the Contractor; who shall not consider it to be entirely inclusive. Should any particular door or item be omitted in any scheduled hardware heading, provide door or item with hardware same as required for similar purposes. Hardware supplier is responsible for handling and sizing all products as listed in the hardware heading. Quantities listed are for each pair of doors, or for each single door.

B. Manufacturer’s Abbreviations:

1. AR  Adams-Rite
2. BL  BiLock
3. CR  Corbin Russwin
4. DE  Detex
5. GE  General Electric (SENTROL)
6. KS  Kant-Slam
7. KD  Kedex
8. MA  Markar
9. MC  McKinney
10. PE  Pemko
11. RO  Rockwood
12. RX  Rixson
13. SDC  SDC
14. SN  Securitron
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:
   1. Glass: Standard, safety, and in fire-rated assemblies as follows:
      a. Typical Safety Glass at Interior or Exterior Glazing - GL-1
      b. Safety Glass with Graffiti-Resistant Coating - GL-2
      c. Laminated Translucent Glass - GL-3
   2. Glazing compounds and accessories.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 05 50 00, Metal Fabrications
   2. Section 07 19 10, Water and Graffiti Repellants: Applications on glazing
   3. Section 07 92 00, Joint Sealants: Joint Sealants: Sealant and backer rod materials at glazing
   4. Section 08 56 29 Heat Resistive Window wall Systems:
   5. Section 08 83 00, Vandal-Resistant Mirrors.

1.02 REFERENCES

A. This Section incorporates by reference the following documents.

   1. American National Standards Institute (ANSI)


3. Glass Association of North America (GANA)


b. GANA (SM) - FGMA Sealant Manual; 1990.

1.03 SYSTEM DESCRIPTION

A. Performance Requirements

1. Provide glass and glazing materials for continuity of building enclosure vapor retarder and air barrier. Maintain continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant. Coordinate with requirements of Section 07 92 00, Joint Sealants.

   a. In conjunction with vapor retarder and joint sealer materials described in other sections.

   b. To maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

2. Select type and thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with Seattle Building Code. Determine type and thickness in accordance with ASTM E 1300. Limit deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.

   a. Use the procedure specified in ASTM E 1300 to determine glass type and thickness.

   b. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.

   c. Thicknesses listed are minimum requirement.

1.04 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, and special handling or installation requirements.
C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Samples: Submit two samples 12 x 12 inch in size of glass units, showing coloration and design.

E. Certificates: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE


B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

1.06 PROJECT CONDITIONS

A. Environmental Requirements

1. Do not install glazing when ambient temperature is less than 50 degrees F.

2. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

A. See Section 01 77 00, Closeout Procedures, for additional warranty requirements.

B. Provide a ten year warranty to include coverage for sealed glass units from insulating glazing seal failure, interpane dusting or misting, and replacement of same.

C. Provide a ten year warranty to include coverage for delamination of laminated glass and replacement of same.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Requirements

1. Glass and glazing materials shall be supplied and installed in accordance with the schedule set forth herein and in the drawings.

2. Glass shall meet the performance requirements specified.

3. Flat Glass Manufacturers:


e. Substitutions: Refer to Section 01 25 00, Substitution Procedures.
4. Typical Safety Glass at Interior or Exterior Glazing - Type **GL-1**: Clear 1/4-inch Fully-Tempered Float Glass:
   a. Comply with ASTM C 1048, Type I, transparent flat, Class 1 clear, quality Q3 (glazing select).

5. Safety Glass with Graffiti-Resistant Coating – Type **GL-2**: Clear 1/4-inch, fully-tempered float glass with graffiti-resistant coating as specified in Section 07 19 10, Water and Graffiti Repellents.
   a. Provide this type of glazing in all locations required by code.
      1) Glazed lites in doors except fire doors.
      2) Glazed sidelights to doors.
      3) Other locations as required by Code or indicated on Drawings.

6. Laminated Translucent Glass – Type **GL-3**:
   a. Laminated with 0.060 inch thick plastic interlayer between two panes 1/4-inch clear glass; comply with ASTM C 1172.
   b. Comply with ASTM C 1048, Condition A uncoated, Type I, transparent flat, Class 1, Quality q2 glazing select.
   c. 65% light transmittance, translucent white interlayer.

B. Glazing Compounds
1. Manufacturers:
   d. Tremco, Inc.
   e. Substitutions:  Refer to Section 01 25 00, Substitution Procedures.

2. Butyl Sealant:  Single component; Shore A hardness of 10 to 20; black color; non-skinning.

3. Silicone Sealant:  Single component; chemical curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C 920, Type S, Grade NS, Class 25, Uses M, A, and G; cured Shore A hardness of 15 to 25; color as selected.

C. Glazing Accessories
1. Setting Blocks:  Neoprene, 80 to 90 Shore A durometer hardness, ASTM C 864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerances stipulated by the GANA (GM) - GANA Glazing Manual.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

A. For any glazing systems that utilize standard framing modules and Sound Transit standard glass sizes, obtain field measurements for each opening to receive glass to confirm that acceptable tolerances for bite on and clearance from the frame can be achieved. Notify Resident Engineer of all framing that doesn’t conform to tolerances. For framing with non-standard modules, obtain field dimensions of each opening to receive glass, and cut each lite to provide optimal bite on and clearance from frame.

B. Clean contact surfaces with solvent and wipe dry.

C. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

D. Prime surfaces scheduled to receive sealant.

E. Install sealants in accordance with ASTM C 1193 and FGMA Sealant Manual.

F. Install sealant in accordance with manufacturer’s instructions.

3.03 INSTALLATION

A. Exterior/Interior Dry Method (Gasket Glazing)

1. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

2. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

3. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

B. Exterior Dry Method (Tape and Gasket Spline Glazing)
1. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.

2. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

3. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

4. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.

5. Trim protruding tape edge.

C. Exterior Wet/Dry Method (Preformed Tape and Sealant)

1. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.

2. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.

3. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

4. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.

5. Install removable stops, with spacer strips inserted between glazing and applied stops, 1/4 inch below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.

3.04 FIELD QUALITY CONTROL

A. Manufacturer’s Field Services

1. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

2. Monitor and report installation procedures and unacceptable conditions.

3.05 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.06 GLAZING SCHEDULE

A. Glazing and Glazed Assemblies: Type and thicknesses required to comply with code and with specified performance requirements. Use interior or exterior glazing methods as applicable. Provide at locations indicated on Drawings and as scheduled below:
<table>
<thead>
<tr>
<th>MARK</th>
<th>TYPE</th>
<th>DESCRIPTION</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type GL-1</td>
<td>Typical Interior Safety Glass</td>
<td>Clear 1/4-inch Fully-Tempered Float Glass</td>
<td>Interior glazing subject to impact.</td>
</tr>
<tr>
<td>Type GL-2</td>
<td>Safety Glass with Graffiti-Resistant Coating</td>
<td>Clear 1/4-inch, fully-tempered float glass with graffiti-resistant coating</td>
<td>Interior glazing in frames and non-rated doors subject to impact and graffiti vandalism.</td>
</tr>
<tr>
<td>Type GL-3</td>
<td>NA to N150 Laminated Translucent Glass</td>
<td>Laminated with 0.060 inch thick frosted plastic interlayer between two panes 1/4-inch clear glass</td>
<td>Canopies and Clerestory Window glazing at canopies.</td>
</tr>
<tr>
<td>Type GL-4</td>
<td>NA to N140 &amp; N150 Laminated, Tempered safety glazing with graffiti-resistant coating</td>
<td>Clear 3/8-inch, laminated, tempered safety glass with graffiti-resistant coating</td>
<td>Elevator Shaft Glazing and in fire-rated doors subject to impact and graffiti vandalism.</td>
</tr>
<tr>
<td>Type GL-5</td>
<td>Not Used</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Type GL-6</td>
<td>NA to N140 &amp; N150 Smoke Curtain Glass Assembly</td>
<td>1/2 inch thick, fully-tempered panes in manufactured smoke baffle assembly</td>
<td>Ceiling locations indicated on Drawings.</td>
</tr>
</tbody>
</table>

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for plastic polycarbonate vandal-resistant mirrors for installation in toilets and utility rooms.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 08 80 00, Glazing: Toilet and Utility Room Accessories

2. Section 10 28 10, Toilet and Utility Room Accessories: Metal-framed glass mirrors for installation in non-public toilets and spaces.

1.02 REFERENCES

A. This Section incorporates by reference the following documents.

1. American National Standards Institute (ANSI)

2. Glass Association of North America (GANA)
   b. GANA (TIPS) - Mirrors Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors; National Association of Mirror Manufacturers; 2004.

1.03 SYSTEM DESCRIPTION

B. Performance Requirements

1. Limit mirrored glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.

1.04 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data on Mirror Types: Provide structural, physical and environmental characteristics, size limitations, and special handling or installation requirements.
C. Samples: Submit four each samples, 4 x 4 inch in size, illustrating mirror material and coloration.

D. Manufacturer’s Certificate: Certify that mirrors, meets or exceeds specified requirements.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Sound Transit’s name and registered with the manufacturer.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual for glazing installation methods.

B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with GANA recommendations.

C. Refer to Section 10 28 10, Toilet and Utility Room Accessories: Verify that frame finishes provided for mirrors match finish of other accessories specified in this section.

1.06 WARRANTY

A. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Mirrors:

   4. Substitutions: See Section 01 25 00, Substitution Procedures.

2.02 MATERIALS

A. Vandal-Resistant Polycarbonate Mirror: ANSI Z97.1; plastic compound, clear; mirrored coating; silicone abrasion resistant coating for scratch resistance; stainless steel frames all-around.

   1. Size: 24 inch wide x 36 inch high, nominal.
   2. Thickness: 0.236 inch.
   4. Other sizes noted on Contract Drawings (not to exceed nominal size).

2.03 ACCESSORIES

A. Glazing

2. Mirror Adhesive: Chemically compatible with mirror coating and wall substrate.

**PART 3 - EXECUTION**

3.01 EXAMINATION

A. Verify that openings for mirrored glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive mirrors.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer. Prime surfaces scheduled to receive sealant.

C. Perform installation in accordance with ASTM C 1193 for solvent release sealants. Install sealant in accordance with manufacturer’s instructions.

3.03 INSTALLATION

A. Install mirrors in accordance with GANA recommendations.

B. Set mirrors plumb and level, free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

D. Installation in Mirrors in Frames:
   1. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.
   2. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
   3. Rest mirrors on setting blocks and push against tape for full contact at perimeter of pane or unit.
   4. Place glazing tape on free perimeter of mirrors in same manner described above.
   5. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

E. Application of Mirrors with J-Channel Frames: Provide continuous channel support at bottom and top of mirrors. Anchor channels and clips rigidly to wall construction.

3.04 CLEANING

A. Remove labels after Work is complete.

B. Clean mirrors and adjacent surfaces.
3.05 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION
SECTION 08 91 00
LOUVERS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:
1. Fixed extruded louvers, frames, screens and accessories.
2. Blank-off panels for wall louvers.
3. Wall vents for mechanical and fire protection systems as indicated on Contract Drawings.

B. Related Sections:
1. Section 04 20 00, Unit Masonry
2. Section 05 05 14, Fluoropolymer Coatings: Louver Finish
3. Section 05 40 00, Cold-Formed Metal Framing.
4. Section 05 50 00, Metal Fabrications: Fabricated supports for louvers.
5. Section 07 62 00, Sheet Metal Flashing and Trim.
6. Section 07 92 00, Joint Sealants.
7. Division 23, HVAC Ducts and Casings: Ductwork attachment to louvers.

1.02 REFERENCES

A. This Section incorporates by reference the following documents.
1. American Architectural Manufacturers Association (AAMA)
2. Air Movement and Control Association International, Inc. (AMCA)
   a. AMCA 511 - Certified Ratings Program for Air Control Devices; 1999 (Rev 2004).
3. American Society for Testing and Materials International (ASTM)
1.03 SYSTEM DESCRIPTION

A. System Performance Requirements

1. Structural Performance: Design, engineer, fabricate, and install exterior metal wall louvers to withstand the effects of loads and stresses from wind and normal thermal movement, without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter; and permanent damage to fastener and anchors:

a. Wind Load: Uniform pressures (velocity pressures) indicated on drawings, acting inwards or outwards.

b. Normal thermal movement is defined as that resulting from the following maximum change (range) in ambient temperature. Base design calculations on actual surface temperatures of metals due to both solar heat gain and night time sky heat loss.

1) Temperature Change (range): 100 degrees F. (55 degrees C)

c. Air Performance, Water Penetration, and Air Leakage Ratings: Provide louvers complying with performance requirements indicated as demonstrated by testing manufacturers stock units, of height and width indicated, according to Air Movement and Control Association (AMCA) Standard 500.

d. Airborne Sound Transmission Loss: Provide acoustical louvers complying with airborne sound transmission los ratings indicated, as demonstrated by testing manufacturer's stock units according to ASTM E 90.

1.04 SUBMITTALS

A. Procedures: See Section 01 33 00, Submittal Procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.

1. Clearly illustrate all elements, including attachment and bracing members, methods employed to assure performance integrity of the exterior enclosure system, and the component's relationship to surrounding work, including dimensional tolerances and bench mark locations to be met.

2. Shop drawings shall be fully coordinated with work of the following sections:

a. Section 04 20 00, Unit Masonry

b. Section 05 40 00, Cold-Formed Metal Framing.

c. Section 07 62 00, Sheet Metal Flashing and Trim.
3. In order to review the coordination of all components of the exterior enclosure system, shop drawings for the above listed sections shall be submitted to the Resident Engineer simultaneously as part of a fully coordinated submittal package. Any submittal for one or more of the above listed sections which is not part of a fully coordinated submittal package will be considered incomplete and will be returned to the Contractor without review.

D. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.

E. Test Reports: Independent Testing Laboratory reports showing compliance with specified performance criteria.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Maintenance Data: Include lubrication schedules, and adjustment requirements.

1.05 QUALITY ASSURANCE

A. Single Source Responsibility: Provide all louvers and vents from a single source.

B. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

C. Field Testing: Mock-up (see Article below) shall be field tested in accordance with AAMA 501.2 "Hose stream test." Contractor shall perform test in presence of the Resident Engineer.

1. If initial tests reveal leaks, contractor shall make corrections and re-test until test is successful (no leaks) at no additional costs to Sound Transit. Corrections shall be incorporated into subsequent work.

1.06 PROJECT CONDITIONS

A. Coordinate work of this section with installation of other sections mentioned above.

B. Coordinate work of this section with installation of mechanical ductwork and electrical services to motorized devices.

C. Field Measurements: Check actual louver openings by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the Work. Where field measurements cannot be made without delaying the Work, guarantee opening dimensions and proceed with fabrication of louvers and vents without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to guaranteed dimensions.

1.07 WARRANTY

A. Provide twenty year manufacturer warranty against distortion, metal degradation, and failure of connections.

1. Finish: Include coverage against degradation of exterior finish.
PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Manufacturers and Products: The design and type of louvers is based on products by manufacturers indicated below. Subject to compliance with requirements, provide the named product or an approved equal. See Contract Drawings for sizes and location of louver Types.


2. Comparable products by following manufacturers acceptable:
   a. Construction Specialties, Inc.; San Marcos, CA.
   b. Airolite Company; Marieta, OH.
   c. Ruskin Co.; Grandview, MO.

3. Substitutions: See Section 01 25 00, Submittal Procedures.

2.02 MATERIALS

A. Extruded Aluminum: ASTM B 221 (ASTM B 221M), 6063 alloy, T-5 or T-52 temper.

B. Fasteners: Of same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals which are corrosive or incompatible with materials joined.

1. Use types, gages and lengths to suit installation conditions.

2. Use Philips flat head machine screws for exposed fasteners, unless noted otherwise.

C. Anchors and Inserts: Of type, size, and material required for type of loading and installation indicated. Use nonferrous metal anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use expansion bolt devices for drilled-in-place anchors.

D. Bird Screens: Full size with aluminum wire mesh.

E. Fluoropolymer Coating: Comply with requirements of Section 09 96 00, High-Performance Coatings: Minimum 70 percent Kynar 500/Hylar 5000 resin, three coat baked-on finish system, complying with AAMA 2604.

F. Louvers

1. General: Factory-fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified under AMCA 511.

   a. Wind Load Resistance: Design to resist positive and negative wind load as required by code without damage or permanent deformation.

   b. Drainable Blades: Continuous rain stop at front of blade aligned with vertical gutter recessed into both jambs of frame.

G. Fixed Extruded Aluminum Wall Louvers
1. Horizontal Drainable Fixed Blade Louvers: Extruded aluminum frames, recessed mullions and louver blades; designed to collect and drain water to exterior at sill by means of dual gutters in front edges of blades and of channels in jambs and mullions; complying with the following requirements:

   a. Louver Depth: 4 inches, unless otherwise indicated.
   b. Frame Thickness: 0.081 inch, unless otherwise indicated.
   c. Louver Blade Thickness: 0.081 inch, unless otherwise indicated.
   d. Louver Blade Angle: 42.5 degrees, unless otherwise indicated.
   e. Performance Requirements: As follows, determined by testing units 48 inches wide by 48 inches high in accordance with AMCA Standard 500:

      1) Free Area: Not less than 8.98 square feet.
      2) Static Pressure Loss: Not more than 0.15 inch water gauge at an airflow velocity of 1000 feet per minute free area intake velocity.
      3) Water Penetration Limit: Free area intake velocity at beginning point of water penetration when 48 x 48 inch unit tested for 15 minutes shall be not less than 1151 feet per minute.
      4) Free Areas, Static Pressure Loss and Water Penetration Limits to be per tested units with specified screens installed.
   f. AMCA Seal: Mark units with AMCA certified ratings seal.

H. Louver Screens

1. General: Provide each exterior louver with screens complying with the following requirements:

   a. Screens for Fixed Louvers: Provide screens at all louvers at interior face of blades, unless otherwise indicated or detailed on Contract Drawings.
   b. Bird Screen Locations:

      1) Provide bird screening at all exhaust louvers at Station Smoke Exhaust Fans.
      2) Provide bird screening at all intake/exhaust louvers at Tunnel Vent Fans (TVFs) at Bypass Vent Shafts.

2. Secure screens to louver frames with stainless steel machine screws, spaced at each corner and at 12 inch on center between.

3. Louver Screen Frames: Fabricate screen frames with mitered corners to louver sizes indicated and to comply with the following requirements:

   a. Metal: Same kind and form of metal as indicated for louver frames to which screens are attached.

      1) Reinforce extruded aluminum screen frames at corners with clips.
b. Finish: Same finish as louver frames to which louver screens are attached.

c. Type: Rewireable frames with driven spline or insert for securing screen mesh.

4. Bird Screening: Interwoven aluminum wire mesh; 1/2 inch open weave square mesh formed with 0.062 inch diameter aluminum wire; set in extruded aluminum frame; removable.

I. Blank-Off Panels

1. General: Furnish blank-off panels behind non-functioning portions of louvers. Fabricate blank-off panels from materials and to sizes indicated and to comply with the following requirements:

   a. Finish: Match finish applied to louver with respect to coating type, except for color, which shall be as follows:

      1) Black.

   b. Attach blank-off panels to back of louver frames with clips and seal for a watertight installation. Omit louver screens where blank-off panels are required.

2. Non-insulated Blank-off Panels: Metal sheet complying with the following requirements:

   a. Aluminum sheet for aluminum louvers, thickness as follows:

      1) 0.032 inch, unless otherwise indicated.

J. Fasteners and Anchors: Stainless steel.

K. Head and Sill Flashings: See Section 07 62 00, Sheet Metal Flashing and Trim.

L. Sealant: type, as specified in Section 07 92 00, Joint Sealants.

2.03 FABRICATION

A. General: Fabricate louvers and vents to comply with requirements indicated for design, dimensions, materials, joinery, and performance.

B. Preassemble louvers in shop to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of size indicated with allowances made for fabrication and installation tolerances of louvers, adjoining construction, and perimeter sealant joints.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacing indicated but not further apart than recommended by manufacturer, or 72 inches, on center, whichever is less. At horizontal
joints between louver units, provide horizontal mullions except where continuous vertical assemblies are indicated.

G. Provide sill extensions and loose sills made of same material as louvers, where required for drainage to exterior and to prevent water penetrating to interior.

H. Join frame members to one another and to fixed louver blades as follows, unless otherwise indicated, or size of louver assembly makes bolted connections between frame members necessary:

1. With fillet welds, concealed from view, or mechanical fasteners, or a combination of these methods, as standard with louver manufacturer.

2.04 FINISHES

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish louvers after assembly.

C. Aluminum Finishes:
   1. Finish designations prefixed by "AA" to conform to the system established by the Aluminum Association for designating aluminum finishes.
   2. Fluoropolymer Coating:
      a. Comply with requirements of Section 05 05 14 Fluoropolymer Coatings
      b. Provide 3 coat PVDF system as approved by Resident Engineer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated.

C. Coordinate drawings, diagrams, templates, instructions, and directions for installation of anchorages which are to be embedded in concrete or masonry construction. Coordinate delivery and schedule of installation of such anchorages to avoid construction delay.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level, plumb, and in proper alignment with adjacent work.

C. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
D. Secure louver frames in openings with concealed fasteners. Provide EPDM or Neoprene washers fitted to screws where required to protect metal surfaces and to make a weather-tight connection.

E. Form closely fitted joints with exposed connections accurately located and secured.

F. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated. Install concealed gaskets, flashings, joint fillers and insulation as louver installation progresses where required to make louver joints weather-tight. Install perimeter sealant and backing rod in accordance with Section 07 92 00, Joint Sealants.

G. Provide waterproof connection between ductwork, louver screen and louver, and provide positive water drainage to exterior of building.

H. Repair finishes damaged by cutting, welding, soldering, and grinding operations. Restore finishes to that no evidence of corrective work remains. Return items which cannot be refinished in field to shop, and make required alterations and refinish entire unit, or provide new units.

3.03 ADJUSTING

A. Adjust operable louvers for freedom of movement of control mechanism. Lubricate operating joints.

B. Protect louvers and vents from damage of any kind during construction period including use of temporary protective coverings where needed and approved by louver manufacturer.

C. Restore louvers and vents damaged during installation and construction period so that no evidence remains of correction work. If results of restoration are unsuccessful, as judged by Resident Engineer, remove damaged units and replace with new units.

D. Test operation of adjustable wall louver and adjust as needed to produce fully functioning units which comply with requirements.

3.04 CLEANING

A. Clean and touch up minor abrasions in finishes with air dried coating that matches color and gloss of, and is compatible with the factory-applied finish coating.

B. Strip protective finish coverings.

C. Clean surfaces and components with mild soap or detergent not harmful to finishes. Rinse thoroughly and dry surface.

D. Before final inspection; clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

E. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Resident Engineer, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried PVDF coating that matches color and gloss of, and is compatible with, factory finish coating. See Section 09 96 00 High-Performance Coatings, for requirements.
3.05 SCHEDULE


END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for providing finishes and colors for the station structural steel, equipment, architectural systems and components, paving materials, interior wall finishes, and other items that are coated or have architectural finishes. The materials are specified in other Sections of these Specifications.

1.02 REFERENCES

A. When a particular manufacturer's number of description is referenced, it is indicated for the sole purpose of providing an example of the required pattern or color.

1.03 SUBMITTALS

A. General: Refer to Section 01 33 00, Submittal Procedures, for submittal requirements and procedures.

PART 2 - PRODUCTS

2.01 FINISHES

A. General

1. In the following schedules, the materials or objects to receive the finish shall be as described in other Sections.

2. All colors indicated shall be confirmed by the Resident Engineer in compliance with Sound Transit approved colors.

3. Where building component Colors are listed as a similar color—all similar colors shall match a single control sample.

PART 3 - EXECUTION

3.01 ROOM FINISH SCHEDULE

A. Schedule attached following this Section.
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| **Roof Level** | | | | | | | | | | | |
| N07-07PH01 | TUNNEL VENTILATION PLENUM | RA-2 | -- | * | * | * | * | * | -- | |
| N07-07PH10 | TUNNEL VENTILATION PLENUM | RA-2 | -- | * | * | * | * | * | -- | |
| **Common** | | | | | | | | | | | |
| N07-07ES01 | ESCALATOR-1 | * | * | * | * | * | * | * | -- | SEE NOTE 6 |
| N07-07ES02 | ESCALATOR-2 | * | * | * | * | * | * | * | -- | SEE NOTE 6 |
| N07-07ES03 | ESCALATOR-3 | * | * | * | * | * | * | * | -- | SEE NOTE 6 |
| N07-07ES04 | ESCALATOR-4 | * | * | * | * | * | * | * | -- | SEE NOTE 6 |
| N07-07ES05 | ESCALATOR-5 | * | * | * | * | MP-4 | * | MP-4 | SEE NOTE 6 |
| N07-07ES06 | ESCALATOR-6 | * | * | * | * | * | * | MP-4 | SEE NOTE 6 |
| N07-07ES07 | ESCALATOR-7 | * | * | * | * | * | * | MP-4 | SEE NOTE 6 |
| N07-07ES08 | ESCALATOR-8 | * | * | * | * | * | * | MP-4 | SEE NOTE 6 |
| N07-07STE01 | STAIR-1 | * | -- | * | * | * | * | * | -- | |
| N07-07STE02 | STAIR-2 | * | -- | * | * | * | * | * | -- | |
| N07-07STE03 | STAIR-3 | * | -- | * | * | * | * | * | -- | |
| N07-07STE04 | STAIR-4 | * | -- | * | * | * | * | * | -- | |
| N07-07ST05 | STAIR-5 | PS-1 | -- | -- | -- | MP-1 | MP-4 | MP-4 | |
| N07-07ST06 | STAIR-6 | PS-1 | -- | -- | -- | MP-4 | MP-1 | MP-4 | |

**Notes:**
1. Floor finish is CIP-S1 UNO
2. Use base RB-1 for gyp board walls UNO
3. Wall finish is PNT-3 UNO
4. Not used
5. See section 14 21 00 for finishes in elevators
6. See section 14 31 00 for finishes on escalators
7. See finish plans for floor finish types and locations

* = See notes
= No finish

**End of Section**
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:
   1. Metal stud wall framing.
   2. Metal channel ceiling framing.
   3. Shaft wall system.
   4. Fire-rated wall assemblies.
   5. Framing and Gypsum Board for mechanical shafts and soffits.
   7. Joint treatment and accessories.
   8. Bidder design and engineering of framing systems

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 05 40 00, Cold-Formed Metal Framing: Exterior wind-load-bearing metal stud framing.
   2. Section 06 10 00, Rough Carpentry: Wood blocking product and execution requirements
   4. Section 07 21 00, Thermal Insulation: Insulation.
   5. Section 07 84 00, Firestopping
   6. Section 08 31 00, Access Doors and Panels
   7. Section 09 30 00, Tiling.
   8. Section 09 90 00, Painting and Coating: Finish level requirements at tiling.
   9. Divisions 21, 22, 23 and 26 sections on Plumbing, Electrical, Fire Suppression and HVAC.

1.02 REFERENCES

A. This Section incorporates by reference of the following documents.
1. American Society for Testing and Materials International (ASTM)
   e. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2004.
   i. ASTM E 413 - Classification for Rating Sound Insulation; 2004.

2. Gypsum Association (GA)
   b. GA-226 - Application of Gypsum Board to Form Curved Surfaces; Gypsum Association; 1996.

3. Underwriters Laboratories Inc. (UL)

1.03 SYSTEM DESCRIPTION

   A. Assembly Performance Requirements

   1. Acoustic Attenuation for Interior Partitions Indicated as Acoustic: For assemblies indicated to have STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were classified by an Independent Testing Laboratory 45-49 in accordance with ASTM E 413, based on tests conducted in accordance with ASTM E 90.
2. Shaft Wall: Configure and install components as required to achieve the following performance levels:

   a. Structural Performance Requirements: Engineer, fabricate, and install gypsum board shaft-wall assemblies to withstand the following lateral design loads (air pressures) without falling and while maintaining an airtight and smoke-tight seal. Apply design loads transiently and cyclically under in-service conditions for maximum heights of partitions indicated. Evidence of failure includes deflections exceeding those indicated below, bending stresses causing studs to break or to distort, and end-reaction shear causing runners to bend or to shear and studs to become crippled.

   b. Air Pressure Within Shaft: Intermittent loads of 10 pounds per square foot with maximum mid-span deflection of L/360.

   c. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E 413, based on tests conducted in accordance with ASTM E 90.

   d. Structural performance, in accordance with Seattle Building Code.

1.04 SUBMITTALS

   A. Procedures: Section 01 33 00, Submittal Procedures.

   B. Shop Drawings: Indicate special details associated with fireproofing, acoustic seals, and other unique details. Show size, gauge, and spacing of studs used to comply with specified requirements for steel framing, and show all control joints as indicated or required in accordance with ASTM C840.

   C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

   D. Engineering: Provide manufacturer's data or engineering calculations on spans, deflection, attachment methods, and bracing, and indicate compliance with code.

   E. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

   F. Test Reports: For all stud framing products that do not comply with ASTM C 645 or C 754, provide independent laboratory reports showing maximum stud heights at required spacing and deflections.

1.05 QUALITY ASSURANCE

   A. Fire Test Response Characteristics: Where fire-rated gypsum board assemblies are indicated, provide materials and construction identical to those of assemblies tested for fire resistance in accordance with ASTM E 119 by an Independent Testing Laboratory agency acceptable to the authorities having jurisdiction.

   B. Fire Resistance Ratings: As indicated by reference to GA file numbers in GA-600 "Fire Resistance Design Manual" or to design designations in UL "Fire Resistance Directory" or in the listing of another Independent Testing Laboratory acceptable to authorities having jurisdiction.

   C. Single Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
D. Single Source Responsibility for Finishing Materials: Obtain finishing materials from the same manufacturer that supplies gypsum board and other panel products.

E. Field Samples: On actual gypsum board assemblies, prepare field samples of at least 100 square feet in surface area for the following applications. Simulate finished lighting conditions for review of in-place unit of work.

1. Wall surfaces indicated to receive non-textured paint finishes.
2. Ceiling surfaces indicated to receive non-textured paint finishes
3. Modify field samples or apply additional samples as required to obtain Resident Engineer’s acceptance at no additional cost.

F. Perform all work of this Section in accordance with ASTM C 840.

G. Applicator Qualifications: Company specializing in performing gypsum board application and finishing, with minimum three years of documented experience.

H. Coordination: Coordinate work with that of other trades, including but not limited to plumbing, HVAC, Venting, and fire sprinklers, to ensure complete and proper installation of all trades. Include coordination with and provision for design-build trades in base bid pricing.

I. Regulatory Requirements

1. Conform to applicable code for fire-rated assemblies as follows:
   a. Fire-Rated Partitions: Listed assembly by UL or GA with required hour ratings as indicated on Drawings.
   b. Head of Fire-Rated Partitions: Listed assembly by UL or GA with required hour ratings as indicated on Drawings.
   c. Fire-Rated Ceiling and Soffits: Listed assembly by UL or GA with required hour ratings as indicated on Drawings.
   d. Fire-Rated Shaft Wall Requirements: Listed assembly by UL or GA with required hour ratings as indicated on Drawings.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

C. Handle gypsum board to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.07 PROJECT CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer’s recommendations.
B. **Room Temperatures:** For non-adhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours prior to application and continuously after until set. Do not exceed 95 deg F when using temporary heat sources.

C. **Ventilation:** Ventilate building spaces, to the extent required, for drying joint treatment materials. Avoid drafts during hot dry weather to prevent finishing materials from drying too rapidly.

**PART 2 - PRODUCTS**

2.01 **MANUFACTURERS**

A. **Gypsum Board:**


B. **Substitutions:** Not permitted.

2.02 **MATERIALS**

A. **Metal Framing**

1. **General:** Provide steel framing members complying with the following requirements:

   a. **Performance Requirements:** Select steel studs and all other members in accordance with the Manufacturer's standard load tables and following design pressures and deflections:

      1) At stairs and other vertical shafts: 1/360 at 10 pounds per square foot.

      2) At all partitions: 1/360 at 10 pounds per square foot.

      3) At suspended and furred ceilings: 1/240 per 10 pounds per square foot.

   b. **Protective Coating:** G40 hot-dip galvanized coating in accordance with ASTM A 525.

2. **Cavity Shaft-Wall Assemblies:** Provide assemblies constructed of proprietary gypsum liner panels inserted between steel tracks at each end of studs; with specially shaped steel studs engaged in tracks and fitted between gypsum liner panels; and with gypsum board on finished side or sides applied to studs in the number of layers, thicknesses and arrangement indicated. Provide C-H studs, J-tracks, and other components as required.

3. **Non-Loadbearing Framing System Components:** ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 for the conditions indicated.
a. Exception: The minimum metal thickness and section properties requirements of ASTM C 645 are waived provided steel of 40,000 pounds per square inch minimum yield strength is used, the metal is continuously dimpled, the effective thickness is at least twice the base metal thickness, and maximum stud heights are determined by testing in accordance with ASTM E 72 using assemblies specified by ASTM C 754.

b. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return) and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:

1) Thickness: As required to comply with Performance Requirements. Minimum thickness allowable 25 gauge
   a) Depth: 3-5/8 inches, unless otherwise indicated.

c. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, depth and minimum thickness of base (uncoated) metal as follows:

1) Depth: 7/8 inch.
2) Thickness: 0.0179 inch, unless otherwise indicated.

d. Furring Brackets: Serrated-arm type, adjustable, fabricated from corrosion-resistant steel sheet complying with ASTM C 645, minimum thickness of base (uncoated) metal of 0.0329 inch, designed for screw attachment to steel studs and steel rigid furring channels used for furring.

e. Z-Furring Members: Manufacturer’s standard Z-shaped furring members with slotted or non-slotted web, fabricated from steel sheet complying with ASTM A 525 or ASTM A 568; with a minimum base metal (uncoated) thickness of 25 GA at interior non load bearing locations, face flange of 1-1/4 inch, wall-attachment flange of 7/8 inch, and of depth required to fit insulation thickness indicated.

f. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated


a. Strapping: Provide 16 gage x 2 inches width strapping at locations indicated on Drawings.

b. Backing: Behind all cabinetry and shelving, provide 2 feet x 4 feet wide x 16 gage sheet metal backing inside of walls screwed directly on steel studs before gypsum wallboard is installed. (This is to allow Contractor and Sound Transit (in future) to adjust location of shelving and cabinetry with backing and wallboard already in place.)

5. Typical Framing Components:

a. Studs: "C" shaped with flat or formed webs.
b. Runners: U shaped, sized to match studs.

c. Ceiling Channels: C shaped.

d. Furring: Hat-shaped sections, minimum depth of 7/8 inch.

6. Shaft Wall Studs and Accessories: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 and specified performance requirements.

7. Shaft Wall Studs and Accessories: and specified performance requirements ASTM C 645, of profile, size, and base metal thickness required to produce assemblies complying with Part 1 “Assembly Performance Requirements” Article; with sectional properties computed to conform with AISI “Specification for the Design of Cold-Formed Steel Structural Members”

8. Framing for Suspended and Furred Wallboard Ceilings: Type and size as specified in ASTM C 754 for spacing required.

9. Partition Head to Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short.

10. Backing: Provide 20 gauge sheet metal backing as required for installation of wall mounted equipment and specialties. Ensure flat gypsum installation as required by ANSI A108-A4.8

B. Gypsum Board

1. Manufacturers:


2. Fiberglass Face Gypsum Wall Board: ASTM C 79/C 79M; moisture resistant type; sizes to minimize joints in place; water repellent fiberglass faces; ends square cut.

   a. Applications: Tiling substrate in dry areas, unless otherwise indicated.
   b. At Assemblies Indicated with Fire-Rating: Use fire-rated type required by indicated tested assembly.
   c. Core Type: Regular.
   d. Thickness: 5/8 inch.
   e. Basis-of-Design Product: “Dens-Glass” Fireguard Sheathing by Georgia-Pacific Gypsum Corporation
   f. Edges: Square, for vertical application.

3. Gypsum Shaftwall or Coreboard: ASTM C 1396/C 1396M; Type X core; sizes to minimize joints in place; 1 inch thick; square, tongue and groove, or double beveled edges, ends square cut.

2.03 ACCESSORIES

A. Acoustic Insulation: As specified in Section 07 21 00, Thermal and Acoustical Insulation.

B. Acoustic Sealant: Non-hardening, non-skinning, non-sag, non-staining, paintable latex sealant, for use in conjunction with gypsum board, and complying with ASTM C 834 and the following:

C. Products: Subject to compliance with requirements, provide one of the following:
   1. AC-20 FTR Acoustical and Insulation Sealant, Pecora Corp.
   2. SHEETROCK Acoustical Sealant, United States Gyp Co.

D. Corner Beads, Edge Trim, and Control Joints: Galvanized steel, or plastic, complying with ASTM C 1047. Sheet steel zinc-coated by hot-dip process.
   1. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:
      a. Provide metal cornerbead on outside corners, unless otherwise indicated on Drawings.
      b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim unless otherwise indicated.
      c. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
      d. One-piece control joint formed with V-shaped slot, with removable strip covering slot opening.

E. Aluminum Accessories: Where indicated, provide manufacturer’s standard extruded aluminum accessories of profile indicated or referenced by manufacturer’s product designations, complying with the following requirements:
   1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of finish indicated and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for alloy and temper 6063-T5.
   2. Class II Clear-Anodized Finish: AA-C12C22A3 1 (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: etched, medium matte; Anodic

F. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions.
   1. Joint Tape, Provide paper reinforcing tape, unless otherwise indicated.
   2. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
      a. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
b. For pre-filling gypsum board joints, use formulation recommended by gypsum board manufacturer for this purpose.

c. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by the gypsum board manufacturer for this purpose.

d. For topping compound, use sandable formulation.

3. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.


c. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.

d. Topping compound formulated for fill (second) and finish (third) coats.

G. Textured Finish Material: Calcium Carbonate based, water activated, and sprayed texture.


H. Screws: ASTM C 1002; self-drilling type unless otherwise noted. Provide corrosion resistant coated steel drill screws as in accordance with manufacturer recommendations at all exterior and wet interior locations.

I. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum panels.

J. Grout: ASTM C 475, setting-type joint compound recommended for fully grouting hollow metal door frames.

K. Fastening Adhesive for Metal: Special adhesive recommended for laminating gypsum panels to steel framing.

L. Anchorage to Substrate: Corrosion resistant tie wire, nails, screws, fasteners, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

M. Cast-In-Place and Post-installed Anchors in Concrete: Chemical, Expansion, or Cast in place anchors, fabricated from corrosion-resistant materials, with holes or loops for attaching hanger wires, and with capability to sustain, without failure, a load equal to 5 times that imposed by ceiling construction, as determined from testing in accordance with ASTM E 488 conducted by an Independent Testing Laboratory.

N. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing in accordance with ASTM E 1190 conducted by an Independent Testing Laboratory.
O. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper. 0.1620-inch (8 gage) diameter.

P. Hanger Rods: Mild steel and zinc-coated or protected with rust-inhibitive paint.

Q. Flat Hangers: Mild steel and zinc-coated or protected with rust-inhibitive paint.

R. Angle-Type Hangers: Angles with legs not less than 7/8 inch wide, formed from 0.0635-inch-thick galvanized steel sheet complying with ASTM A 446 Coating Designation 090, with bolted connections and 5/16-inch-diameter bolts.

S. Sound Attenuation Blankets: Unfaced mineral-fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing):
   1. Mineral-Fiber Type: Fibers manufactured from glass or slag.

T. Elastomeric Spray-Applied Membrane:
   1. CP 672 Fire Spray by Hilti Construction Chemicals
   2. Metacaulk 1200 and Biostop 750 by Rectorseal

2.04 FABRICATION

A. Gypsum Board Assemblies
   1. Provide completed assemblies complying with ASTM C 840 and GA-216.
      a. See PART 3 for finishing requirements.
   2. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
      a. Air Pressure within Shaft: Sustained loads of 10 pounds per square foot with maximum mid-span deflection of L/360.
   3. Shaft Walls: Provide completed assemblies with the following characteristics:
      a. Air Pressure Within Shaft: Intermittent loads of 10 pounds per square foot with maximum mid-span deflection of L/360.
   4. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
      a. Fire Rated Partitions, Ceilings, Soffits, Shaft Walls and Wall Head Conditions: UL listed or GA listed assemblies as detailed or indicated on Drawings on Sheet A581.
      b. ICC IBC Item Numbers: Comply with applicable requirements of ICC IBC for the particular assembly.
      c. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.
      d. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL Fire Resistance Directory.
2.05 FINISHES

A. Gypsum Board

1. For Level 4 gypsum board finish, embed tape in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration. Use the following joint compound combination:
   a. Embedding and First Coat: Setting-type joint compound.
   b. Fill (Second) Coat: Setting-type joint compound.
   c. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.

2. Where Level 5 gypsum board finish is indicated, apply joint compound combination specified for Level 4 plus a thin, uniform skim coat of joint compound over entire surface. Use joint compound specified for the finish (third coat) or a product specially formulated for this purpose and acceptable to gypsum board manufacturer. Produce surfaces free of tool marks and ridges ready for decoration of type indicated.

3. Where Level 3 gypsum board finish is indicated, apply joint compounds specified for first and second coat in addition to embedding coat.

4. Where Level 2 gypsum board finish is indicated, apply joint specified for first coat in addition to embedding coat.

5. Where Level 1 gypsum board finish is indicated, apply joint compound specified for embedding coat.

6. Finish exterior gypsum soffit board using setting-type joint compounds to pre-fill joints and embed tape, mud for first, fill (second) and finish (third) coats, with the last coat being a sandable product. Smooth each coat before joint compound hardens to minimize need for sanding. Sand between coats and after finish coat.
   a. Painting exterior gypsum soffit board after finish coat has dried is specified in Section 09 90 00, Painting and Coating.

7. Base for Acoustical Tile: Where gypsum board is indicated as a base for adhesively applied acoustic tile, install tape and a two-coat compound treatment, without sanding.

8. Finish glass-mat water-resistant gypsum backing board forming substrate for ceramic tile in dry areas to comply with ASTM C 840 and board manufacturer’s directions for treatment of joints behind tile.

9. Finish cementitious backing board forming substrate for ceramic tile in wet areas to comply with unit manufacturer’s directions. See Section 09 30 00, Tiling, for requirements.

10. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
    a. Feather coats of joint compound so that camber is maximum 1/32 inch.
11. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing with Installer present for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

1. Furnish concrete inserts and other devices indicated to other trades for installation well in advance of time needed for coordination with other construction:

B. Before sprayed-on fireproofing is applied to decking or structural steel, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fireproofing. Where offset anchor plates are required, provide continuous units fastened to building structure not more than 24 inches on center.

C. After sprayed-on fireproofing has been applied, remove only as much fireproofing as needed to complete installation of gypsum board assemblies without reducing thickness of fireproofing below that required to obtain fire-resistant rating indicated. Protect remaining fireproofing from damage.

3.03 INSTALLATION

A. Shaft Wall

1. General: Install gypsum board shaft-wall assemblies to comply with performance and other requirements indicated as well as with manufacturer's installation instructions and the following:

   a. ASTM C 754 for installing steel framing.

2. Do not bridge building expansion joints with shaft-wall assemblies; frame both sides of joints with furring and other support as indicated.

3. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.
a. Support elevator hoistway door frames independently of shaft-wall framing assemblies, or reinforce assemblies according to assembly manufacturer's instructions.

b. Where handrails are indicated for direct attachment to gypsum board shaft-wall assemblies, provide not less than a 0.0341-inch-thick by 4-inch-wide galvanized steel reinforcement strip, accurately positioned and secured behind not less than 1 gypsum board face layer of 1/2-inch or 5/8-inch thickness.

4. Coordinate gypsum board shaft-wall construction with sprayed-on fireproofing applied to structural elements so both remain complete and undamaged. Patch or replace sprayed-on fireproofing removed or damaged during the installation of shaft-wall assemblies to comply with requirements specified in Division 07 Section "Sprayed-On Fireproofing."

5. Integrate stair hanger rods with gypsum board shaft-wall assemblies where indicated (and where possible) by locating cavity of assemblies where required to enclose rods.

6. At penetrations in shaft wall, maintain fire-resistance rating of entire shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

7. Isolate shaft-wall assemblies from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details indicated on Drawings.

8. Seal gypsum board shaft-walls at perimeter of each section that abuts other work and at joints and penetrations within each section. Install acoustical sealant to withstand dislocation by air pressure differential between shaft and external spaces; comply with manufacturer’s instructions and ASTM C 919.

9. In elevator shafts where gypsum board shaft-wall assemblies cannot be positioned within 2 inches of the shaft face of structural beams, floor edges, and similar projections into shaft, install 1/2-inch- or 5/8-inch-thick gypsum board cants covering tops of projections as follows:

   a. Slope cant panels not less than 75 degrees with the horizontal. Set base-edge of panels in gypsum board adhesive and secure top edges to shaft walls at 24 inches on center with screws fastened to shaft-wall framing.

   b. Where needed to support gypsum board cants, install steel studs spaced 24 inches) on center; extend studs from top of projection to shaft-wall framing behind cant.

10. Shaft Wall Framing: Comply with manufacturer's installation instructions,

   a. Install studs at spacing required to meet performance requirements.

B. Metal Framing

1. Metal Framing General: Comply with ASTM C 754 and manufacturer's instructions, ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
a. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co.

b. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings.

1) Where building structure abuts ceiling perimeter or penetrates ceiling.
2) Where partition framing and wall furring abut structure except at floor.
   a) Provide slip- or cushioned-type joints as detailed to attain lateral support and avoid axial loading.
3) Install elastomeric spray-applied sealant and mineral wool deck flute packing as required at deflection track in accordance with manufacturer's instructions.

c. Do not bridge building expansion and control joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

d. Provide anchorage bracing and support designed to meet structural seismic requirements of the Seattle Building Code.

2. Suspended Ceilings and Soffits:

a. Suspend ceiling hangers from building structural members and as follows:

1) Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.

2) Where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and requirements of current addition of Seattle Building Code.

3) Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a
manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

4) Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

5) Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

6) Do not attach hangers to steel deck tabs.

7) Do not attach hangers to steel roof deck. Attach hangers to structural members.

8) Do not connect or suspend steel framing from ducts, pipes or conduit.

b. Sway-brace suspended steel framing with hangers used for support.

c. Install suspended steel framing components in sizes and at spacing indicated but not less than that required by the referenced steel framing installation standard.

1) Wire Hangers: 4 feet on center.

2) Carrying Channels (Main Runners)): 1-1/2 inch, 4 feet on center.

3) Rigid Furring Channels (Furring Members): 16 inches on center.

d. Installation Tolerances: Install steel framing components for suspended ceilings so that cross-furring members or grid suspension members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.

e. Wire-tie or clip furring members to main runners and to other structural supports as indicated.

f. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

g. Install bracing as required at exterior locations to resist wind uplift.

3. Framing for Walls and Partitions: Space studs at 24 inches on center.

a. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.

b. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.
c. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Cut studs 1/2 inch short of full height. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1) For STC-rated and fire-resistive-rated partitions requiring partitions to extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.

d. Terminate partition framing at suspended ceilings where indicated.

e. Install steel studs and furring in sizes and at spacing indicated but not less than that required by the referenced steel framing installation standard to comply with maximum deflection and minimum loading requirements specified:

1) Space studs as required to comply with Performance Criteria (Article 2.3)

2) Maximum spacing not to exceed 16 inches o.c.

f. Install steel studs so that flanges point in the same direction and so that leading edges or ends of each gypsum board can be attached to open (unsupported) edges of stud flanges first.

g. Frame door openings to comply with details indicated, with GA-219, and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1) Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

h. Frame openings other than door openings to comply with details indicated or, if none indicated, in same manner as required for door openings. Install framing below sills of openings to match framing required above door heads.

4. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

5. Standard Wall Furring: Install at masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.

a. Orientation: Horizontal.

6. Blocking: Install blocking for support of plumbing fixtures and toilet partitions. Comply with Section 06 10 00, Rough Carpentry.
1. Comply with ASTM C 840 and GA-216. Install to minimize butt end joints, especially in highly visible locations.

2. Single-Layer Non-Rated: Install gypsum board parallel to framing, with ends and edges occurring over firm bearing.


4. Gypsum Soffit Board: Install perpendicular to framing, with staggered end joints over framing members or other solid backing.

5. Cementitious Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions. See Section 09 30 00, Tiling, for detailed requirements.

6. Installation on Metal Framing: Use screws for attachment of all gypsum board.

7. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

8. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.

9. Install ceiling board panels across framing to minimize the number of abutting end joints and avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member. Do not install water resistant gypsum backing board at ceiling locations.

10. Install wall/partition board panels to minimize the number of abutting end joints or avoid them entirely. Stagger abutting end joints not less than one framing member in alternate courses of board. At stairwells and other high walls, install panels horizontally with end abutting joints over studs and staggered.

11. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

12. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position adjoining panels so that tapered edges abut tapered edges, and field-cut edges abut field-cut edges and ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions. Avoid joints at corners of framed openings where possible.

13. Attach gypsum panels to steel studs so that the leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

14. Attach gypsum panels to framing provided at openings and cutouts.

15. Grout hollow metal frames for doors, transoms, borrowed lights and other openings solidly and continuously.

16. Form control joints and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
17. Cover both faces, of steel stud partition framing with gypsum panels in concealed spaces (above ceilings), except in chase walls that are braced internally.
   a. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 square feet in area.
   b. Fit gypsum panels around ducts, pipes, and conduits.

18. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations

D. Trim and Accessories

1. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   a. Not more than 30 feet apart on walls and ceilings over 50 feet long.
   b. At exterior soffits, not more than 30 feet apart in both directions.

2. Corner Beads: Install at external corners, using longest practical lengths.

3. Edge Trim: Install at locations where gypsum board abuts dissimilar materials. Install edge trim where edge of gypsum panels would otherwise be exposed or semi-exposed. Provide edge trim type with face flange formed to receive joint compound except where other types are indicated.
   a. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
   b. Install L-bead where edge trims can only be installed after gypsum panels are installed

3.04 APPLICATION

A. Gypsum Board

1. Single-Layer Application: Install gypsum wallboard panels as follows:
   a. On ceilings, apply gypsum panels prior to wall partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
   b. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.
   c. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

2. Wall Tile Substrates: For substrates indicated to receive thin-set ceramic tile and similar rigid applied wall finishes, comply with the following:
   a. Install cementitious backer units to comply with ANSI AI 08.11.
b. Install cementitious backer units at showers, tubs, and where indicated to comply with ANSI A

c. Install gypsum wallboard panels with tapered edges taped and finished to produce a flat surface except at showers, tubs, and other locations indicated to receive cementitious backer units.

3. **Double-Layer Application:** Install gypsum backing board for base layers and gypsum wallboard for face layers.

   a. On ceilings, apply base layer prior to applying base layer on walls/partitions; apply face layers in same sequence. Offset face-layer joints at least 10 inches from parallel base-layer joints. Apply base layers at right angles to framing members unless otherwise indicated.

   b. On partitions/walls, apply base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face layer joints offset at least one stud or furring member with base layer joints. Stagger joints on opposite sides of partitions.

   c. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

4. **Single-Layer Fastening Methods:** Apply gypsum panels to supports as follows:

   a. Fasten with screws.

5. **Double-Layer Fastening Methods:** Apply base layer of gypsum panels and face layer to base layer as follows:

   a. Fasten both base layers and face layers separately to supports with screws.

   b. Fasten base layers with screws and face layer with adhesive and supplementary fasteners.

**B. Joint Treatment**

1. **General:** Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration and levels of gypsum board finish indicated.

2. Pre-fill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.

3. Apply joint tape over gypsum board joints except those with trim accessories having concealed face flanges not requiring taping to prevent cracks from developing in joint treatment at flange edges.

4. Apply joint tape over gypsum board joints and to trim accessories with concealed face flanges as recommended by trim accessory manufacturer and as required to prevent cracks from developing in joint compound at flange edges.
3.05 FIELD QUALITY CONTROL

A. Tolerances

1. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

B. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Resident Engineer will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.

1. Notify Resident Engineer 7 days in advance of date and time when Work, or part of Work, will be ready for above-ceiling observation.

2. Before notifying Resident Engineer, complete the following in areas to receive gypsum board ceilings:
   a. Installation of 80 percent of lighting fixtures, powered for operation.
   b. Installation, insulation, and leak and pressure testing of water piping systems.
   c. Installation of air-duct systems.
   d. Installation of air devices.
   e. Installation of mechanical system control-air tubing.
   f. Installation of ceiling support framing.

3.06 CLEANING

A. Promptly remove any residual joint compound from adjacent surfaces.

3.07 PROTECTION

A. Promptly remove any residual joint compound from adjacent surfaces.

B. Provide final protection and maintain conditions, in a manner suitable to Installer that ensures gypsum board assemblies remain without damage or deterioration at time of Completion.

3.08 SCHEDULE

A. Finish Levels

1. Finish gypsum board in scheduled areas in accordance with levels defined in ASTM C 840 and as scheduled below.

2. Refer to Section 09 90 10, Finish and Color Schedule, for paint finishes and textures.

3. **Level 1:** Above finished ceilings concealed from view, for ceiling plenum areas, and where indicated, unless a higher level of finish is required for fire-resistive-rated assemblies and/or sound-rated assemblies.
4. **Level 2:** Utility areas and where water-resistant gypsum backing board panels form substrates for tiling, and where indicated.

5. **Level 3:** At locations indicated on Finish and Color Schedule, Section 09 06 00, Schedule for Finishes.

6. **Level 4:** Walls and ceilings scheduled to receive flat paint finish.

7. **Level 5:** Walls and ceilings scheduled to receive semi-gloss or gloss paint finish.

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 09 23 13
ACOUSTICAL GYPSUM PLASTERING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Multiple coat spray applied acoustical gypsum plaster finish over solid substrate for interior applications.

B. Related Sections:
   1. Section 04 20 00, Concrete Masonry Units
   2. Section 09 21 16, Gypsum Board Assemblies

1.02 REFERENCES

A. ASTM International:
   1. ASTM C423 - Test Method for Sound Absorption and Sound Absorption Coefficient by the Reverberation Room Method.
   5. ASTM E605 - Test Method for Density

B. Northwest Wall and Ceiling Bureau (NWCB): Recommendations and Specifications, Tel (206) 524-4243.

1.03 PERFORMANCE REQUIREMENTS

A. Acoustical: Tested on solid backing to ASTM C423 by certified testing laboratory: Conduct testing on solid backing with no air gap.
<table>
<thead>
<tr>
<th>Frequency (HZ)</th>
<th>125</th>
<th>250</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
<th>NRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absorption Coefficient: 1/2 inch (Solid Substrate)</td>
<td>0.11</td>
<td>0.30</td>
<td>0.36</td>
<td>0.46</td>
<td>0.73</td>
<td>0.99</td>
<td>0.50</td>
</tr>
<tr>
<td>Absorption Coefficient: 1 inch (Solid Substrate)</td>
<td>0.15</td>
<td>0.39</td>
<td>0.61</td>
<td>0.75</td>
<td>0.85</td>
<td>1.00</td>
<td>0.65</td>
</tr>
<tr>
<td>Absorption Coefficient: 1-1/2 inch</td>
<td>0.32</td>
<td>0.63</td>
<td>0.93</td>
<td>0.91</td>
<td>0.63</td>
<td>0.12</td>
<td>0.80</td>
</tr>
<tr>
<td>Noise Reduction Coefficient (NRC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Not less than 0.55 at approximately 3/4 inch thickness.</td>
</tr>
<tr>
<td>Absorption Coefficient at 250 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Not less than 0.35 within plus or minus 0.03 range.</td>
</tr>
</tbody>
</table>

1.04 SUBMITTALS
A. Submit under provisions of Section 01 33 00
B. Product Data: Product characteristics, limitations, and maintenance.
C. Product Samples:
   1. 12 inch square samples of manufacturer’s standard acoustical plaster material and finish.
   2. Include sample of specified finish and color. Show texture variations
   3. Submit additional sample as directed by Resident Engineer
   4. Stamp each sample with manufacturer identifying label, certifying that sample texture is representative that certified by acoustical testing reports.
D. Color Samples: Include manufacturer’s standard color range.
E. Test Data: Certified test results conducted by independent testing laboratory. Indicate bond strength, compressive strength, light reflectance, combustibility, toxicity, compressive strength, and acoustical performance for specified finish.
F. Manufacturer’s Certification: Installer as accepted by manufacturer as licensed, trained, and qualified to perform work of this Section.
G. Manufacturer’s Instructions: Include installation instructions, special procedures, and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE
A. Perform work using manufacturer’s equipment and materials.

1.06 QUALIFICATIONS
A. Installer:
   1. Specialist in work of this Section with minimum 3 years documented experience in continuous commercial quality work of comparable type and scope.
2. Trained, licensed, and certified by manufacturer as qualified to perform work of this Section prior to Bid Date, or accepted by Architect

B. Manufacturer:
   1. Specialist in work of this Section with minimum 3 years documented experience manufacturing and distributing spray-applied acoustical ceiling materials.
   2. Maintain technical field representative, locally available.

1.07 Mock-Up

A. Provide under provisions of Section 01 45 00.
B. Provide 100 square foot mock-up at location as directed by Resident Engineer illustrating finish and treatment.
C. Protect accepted mock-up as standard of quality for work of this Section.
D. Mock-up may be incorporated into the Work of this Contract.

1.08 Pre-Installation Conference

A. Arrange, in accordance with Section 01 31 19.
B. Attendance: Contractor, installer, Owner, Architect, manufacturer’s representative, and those requested to attend.
C. Meeting Time: Minimum 1 week prior to beginning work of this Section and work of related Sections affecting work of this Section.
D. Location: Project Site.
E. Verify substrate and finish requirements and conditions for performing work of this Section.

1.09 Delivery Storage and Handling

A. Conform to provisions of Section 01 60 00 and manufacturer’s instructions.
B. Deliver in manufacturer’s protective packaging clearly labeled as to manufacturer, product, and test data.
C. Store off ground in manner to keep dry. Cover and protect from moisture and soiling.
D. Protect liquid adhesive from freezing.

1.10 Project Conditions

A. Ventilation: Provide continuous mechanical or natural ventilation as instructed by manufacturer for curing acoustical ceiling following application. Do not use propane or other vapor producing heaters.
B. Temperature: Do not apply insulation material when temperature is below 44 degrees F (ambient), or substrate is below 40 degrees F.
1.11 COORDINATION

A. Conform to Section 01 31 13 for coordination with work of other Sections. Coordinate work with other work, to minimize possibility of damage to insulation resulting from performance of subsequent work.

B. Section 09 29 00 for gypsum board as substrate to work of this Section.

C. Section 04 20 00 for concrete masonry units as substrate to work of this Section.

1.12 WARRANTY

A. Conform to Warranty provisions specified Section 01 77 00.

B. Manufacturer: Standard 10 year materials Warranty against cracking, flaking, dusting, peeling, and other deterioration to condition as intended for effective sound acoustical performance.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Pyrok, Inc, Acoustement 40 (AP-1) and Acoustement 20 (AP-2)

1. Manufacturer: Tel (914) 277-5135, Fax (914) 276-3990, Email pyrokman@aol.com (Andrew Sarcinella, Sales Mgr, Somers, NY).

2. Web Site: http://www.pyrokinc.com

3. Local Representative: Tel (206) 568-3900, Fax (206) 726-1122 (Michael Sheehan, Fryer Noble).


B. Substitution Requests: Conform to provisions of Section 01 25 00.

2.02 MATERIALS

A. Spray Applied Acoustical Material: Free of asbestos, mineral fiber, polystyrene and cellulose

1. AP-1: Mixture of Portland cement and exfoliated vermiculite.

2. AP-2: Mixture of Gypsum plaster and exfoliated vermiculite.

B. Density per ASTM E605:

1. 41 pounds per cubic foot. (Acoustement 40)

2. 22 pounds per cubic foot. (Acoustement 20)

C. Compressive Strength per ASTM E761:

1. 300 PSI. (Acoustement 40)

2. 30 psi. (Acoustement 20)

D. Bond Strength per ASTM E736:
1. 5000 psf. (Acoustement 40)
2. 670 psf (Acoustement 20)

E. Combustibility per ASTM E136: Non-Combustible.

F. Surface Burning Characteristics: Tested ASTM E84/UL 723, Class A.
   1. Flame Spread Index: 0.
   2. Smoke Developed: 0.

G. Sound Absorption (ASTM C423):
   1. 1 inch thick: 0.65 NRC (Acoustement Gypsum Plaster 20)
   2. 1 inch thick: 0.60 NRC (Acoustement Cement Plaster 40)
   3. 1/2 inch thick: 0.50 NRC (Acoustement Cement Plaster 40)
   4. 1/2 inch thick: 0.50 NRC (Acoustement Gypsum Plaster Plaster 20)
   5. 1 1/2 inch thick: 0.80 NRC (Acoustement Gypsum Plaster Plaster 20)

2.03 ACCESSORIES
   A. Binder: Manufacturer’s standard spray applied binding adhesive.
   B. Primers and Bonding Agents: As instructed by manufacturer to suite specific installation.

2.04 EQUIPMENT
   A. Spray Equipment: As instructed by manufacturer.
   B. Temporary Enclosures: As instructed by manufacturer and as required to prevent spray drift beyond application areas.

2.05 FINISHES
   A. Color: As selected for manufacturer's standard range.

PART 3 - - EXECUTION

3.01 EXAMINATION
   A. Examine substrate and verify conditions ready to receive work of this Section before beginning.
   B. Verify substrate:
      1. Free of bond breakers and foreign matter which may result in loss of adhesive bond.
      2. Free of migratory stains and other coloration that may affect color of acoustical ceiling maternal.
3. Flat and true to plane, acceptable to meet flatness tolerances specified this Section.

3.02 PREPARATION

A. Do not proceed until said substrate and conditions are acceptable, in accordance with manufacturer=s instructions.

B. Prepare substrate by filling voids, cracks, and offsets, remove projections that result in telegraphing through finish.

C. Prime substrate with primer or bonding agent as instructed by manufacturer.

D. Mask adjoining surfaces in order to minimize damage from overspray.

E. Provide minimum 4 air exchanges per hour with necessary ventilation and air circulation to dry acoustical plaster without causing excessive drying.

F. Provide tarps, temporary enclosures, and masking as necessary to cover and protect adjacent materials from droppings, spray, and over-spray.

G. Perform patching and repairing due to cutting and damage of installation during construction.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and provisions of Contract Documents.

B. Apply acoustical ceiling plaster using rotary-stator plastering pump or other spray equipment as instructed by manufacturer.

C. Apply in minimum two coats, minimum one scratch coat and one finish coat.

D. Apply in maximum application of 1/4 inch per coat.

E. Provide steel trowel, bull float, darby, steel float, back trowel, and other such means and methods as necessary to achieve specified finish and tolerances, as determined from accepted mock-up.

F. Apply minimum 1 1/2 inch thick and as necessary to achieve specified NRC.

G. Apply in texture and color matching Architect accepted mock-up.

3.04 TOLERANCES

A. Flatness: Maximum 1/8 inch in 10 foot, non-accumulating.

B. Plane: 1/8 inch overall deviation.

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Representative:

1. Attend Pre-Installation Meeting.

2. Make pre-installation inspection and intermittent field inspections.
3. Perform final inspection.

4. Promptly notify Architect of conditions and installation not conforming to manufacturer’s instructions.

3.06 ADJUSTING

A. Patch damaged acoustical plaster areas surfaces as work is completed in each area.

B. Overspray damaged areas matching finish of completed work.

C. Patch severely damaged areas using procedures as instructed by manufacturer.

3.07 CLEANING

A. Remove overspray and fall-out materials immediately upon completion of the work in each area.

B. Clean residue from surfaces to remove evidence of soiling.

C. Leave installation area clean and free from debris and residue resulting from work of this Section.

END OF SECTION
SECTION 09 30 00

TILING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:

1. ST-furnished, Contractor-installed engraved granite “way-finding” pavers Owner Furnished Material (OFM).

2. ST-furnished, Contractor-installed platform edge detectable warning tile strips (OFM).

3. Porcelain Tile for floor applications as scheduled.

4. Porcelain Tile for wall applications as scheduled.

5. Cementitious backer board as tile substrate at exterior or wet areas.

6. Setting materials and procedures.

7. Ceramic trim.

8. Non-ceramic trim.


B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 01 64 00, Owner-Furnished Materials and Equipment: OFM to be installed by Contractor.

2. Section 07 19 00, Water and Graffiti Repellents: Application at areas exposed to public view.

3. Section 07 92 00, Joint Sealants: Sealant used as tile joint.

4. Section 09 21 16, Gypsum Board Assemblies: Gypsum tiling substrate products and applications.

5. Section 09 06 00, Schedules for Finishes: Tile product selections and tile colors.


7. Section 32 14 13, Precast Concrete Unit Paving: Concrete paver type PC-1 and PC-2 ribbed detectable warning strips as used on interior platforms at Elevator entrances.
1.02 REFERENCES

A. This Section incorporates by reference the following documents.

1. American National Standards Institute (ANSI)


1.03 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured in accordance with ASTM C 499) plus joint width indicated.

B. Facial Dimension: Actual tile size (minor facial dimension as measured in accordance with ASTM C 499).

1.04 SUBMITTALS

A. See Section 01 33 00, Submittal Procedures, for submittal procedures.

B. Product Data: Provide manufacturers’ data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout. Show locations of each type of tile, concrete paver, granite paver, and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

D. Sample Boards: Mount full-size tile of each type and pattern and apply with specified grout on two plywood panels, minimum 18 x 18 inches in size illustrating pattern, color variations, and grout joint size variations.
E. Manufacturer's Certificate: Certify that all products meet or exceed specified requirements.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

G. Samples for Verification:
   1. Full-size units of each type and composition of tile and for each color and finish indicated.
   2. Full-size units of each type of trim and accessory.

H. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

I. Product Certificates: For each type of product, signed by product manufacturer.

J. Qualification Data: For Installer.

K. Material Test Reports: For each tile-setting and -grouting product.

1.05 QUALITY ASSURANCE

A. Maintain one copy of TCA Handbook and ANSI A108 Series/A118 Series on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum 5 years of documented experience.

C. Installer Qualifications: Company specializing in performing tile installation, with minimum of 5 years of documented experience.

D. Source Limitations for Tile: Obtain all tile of each scheduled type and color or finish from one source or producer.
   1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

E. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

F. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:
   1. Joint sealants.

G. Pre-installation Conference: Conduct conference at Contract site to comply with requirements in Section 01 31 19, Project Meetings.

1.06 MOCK-UP

A. See Section 01 45 00, Quality Assurance/Quality Control for general requirements for mock-up.

B. Construct tile mock-up where indicated on the drawings, incorporating all components in colors and finishes specified for the location.
C. Minimum size of mock-up is indicated on the drawings.
D. Approved mock-up may remain as part of the Work.

1.07 READINESS REVIEW MEETING
A. The Resident Engineer will convene a readiness review meeting one week before starting work of this Section and after all submittals have been reviewed and approved.

1.08 DELIVERY, STORAGE, AND HANDLING
A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.
B. Sound Transit-supplied (OFM) detectable warning surface tile and sandblast engraved granite pavers will be stored at the following Sound Transit storage facility where they may be picked up by the Contractor upon request to the Resident Engineer. Contractor to pre-seal these materials at this facility prior to his pick-up, as specified in Article 2.02D herein.
   3409 C Street, # 6 and # 7
   Auburn, Washington
C. Store all tile, granite pavers and cementitious materials on elevated platforms, under cover, and in a dry location.
D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
E. Store liquid latexes and emulsion adhesives in unopened containers and protected from freezing.
F. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.09 PROJECT CONDITIONS
A. Environmental Requirements
   1. Do not install adhesives in an unventilated environment.
   2. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.
   3. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.10 EXTRA MATERIALS
A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 2 percent of amount installed, for each type, composition, color, pattern, and size indicated.
PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 Articles where titles below introduce lists, the following requirements apply for product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.

2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.02 MATERIALS

A. General

1. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

   a. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Definitions Article 1.03.


3. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

   a. As selected by Resident Engineer from manufacturer's full range.

4. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

5. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless otherwise indicated.

   a. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

6. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

B. Performance Requirements, Static Coefficient of Friction:

1. For tile installed on walkway surfaces, stairways and stair landings, provide products with the following values as determined by testing identical products in accordance with ASTM C 1028:
a. Level Surfaces: Minimum 0.6.

C. Tile

1. Approved Manufacturers:


   g. Substitutions: See Section 01 25 00, Substitution Procedures.

2. Unglazed Porcelain Ceramic Floor Tiling (PT): Flat floor tile as follows:

   a. **PT-1**: 12” x 12” x 5/16 Porcelain Floor Tile: Crossville Ceramics ColorBlox “Graphite”.

   b. Composition: Porcelain.

   c. Surface: Slip-resistant, with abrasive admixture.

   d. Module Size: 12 inch by 12 inch.

   e. Nominal Thickness: 5/16 inch.

   f. Face: Plain with cushion edges.

   g. Color: As specified in Section 09 90 10, Finish and Color Schedule.

3. Glazed Ceramic Wall Tiling (WT): Basis-of Design flat tile products as follows:

   a. **WT-1**: 4” x 8” x 5/16 “ and 4” x 12” x 3/8” Glazed Ceramic Wall Tile, Semi Gloss; DalTile “Modern Dimensions”. For N150 Station.

   b. **WT-2**: 12” x 18” x _TBD__” Glazed Ceramic Wall Tile, Semi-Gloss; Mfg.: xxx; For N140 Station.

   c. **WT-3**: 4” x 4” x 3/8” Glazed Ceramic Wall Tile, Semi-Gloss; Mfg.: TBD For N140 Station.

   d. Composition: Ceramic

   e. Surface: Smooth, without abrasive admixture.

   f. Face: Plain with cushion edges.

   g. Color: As specified in Section 09 06 00, Schedules for Finishes
4. Ceramic Trim Units: Matching characteristics of adjoining flat wall tile and coordinated with sizes and coursing of adjoining flat wall tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
   a. Wainscot Cap: Bullnose, module size 4 by 8 inch and 4 by 12 inch.
   b. External Corners for Thin-Set Mortar Installations: Surface bullnose, module size 4 by 8 inch and 4 by 12 inch.
   c. Internal Corners: Cove, module size 4 by 8 inch and 4 by 12 inch.
   d. Color: As described in this Section and/or as scheduled in Section 09 06 00.

D. Detectable Warning Surface Tile (PT) and Sandblast-Engraved Granite Pavers (PB)
1. Platform Edge Detectable Warning Tile:
   a. PT-2: 12” x 12” x 3/8” (nominal) porcelain tiles with orthogonal truncated domes. (OFM installed by Contractor).

2. Sandblast Engraved Granite Pavers types PB-1, PB-2 and PB-3:
   a. PB-1: 8” x 16” x 3/8” (nominal) sandblast engraved granite pavers. (OFM installed by Contractor).
   b. PB-2: 12” x 12” x 3/8” (nominal) sandblast engraved granite pavers. (OFM installed by Contractor).
   c. PB-3: 12” x 12” x 3/8” (nominal) sandblast engraved granite pavers. (OFM installed by Contractor).

1) See Sound Transit Directive Drawing AD 242 for “knot” configuration.
2) Four pavers required to make up the engraved “knot” and these may vary depending on how the braid terminates at the knot.

3. Pre-installation sealing: Contractor shall pre-seal surface of all OFM detectable warning surface tiles and sandblast-engraved granite pavers with paraffin prior to delivery to jobsite. See Article 1.08B herein.

4. Post-installation sealing: Provide additional grout sealant and tile sealant as specified in Section 09 30 00, 2.02, H after setting tile pavers.

E. Crack-Suppression/Isolation and Waterproofing Membranes for Thin-Set and Medium-Set Tile Installations

1. General: Manufacturer's standard product that complies with ANSI A118.10, selected from the following or approved equal. All materials in this Article to be provided and installed where indicated or detailed, even if paver/tile is OFM.
   a. Chlorinated-Polyethylene-Sheet Product: Non-plasticized, chlorinated polyethylene faced on both sides with high-strength, nonwoven polyester fabric, for adhering to latex-portland cement mortar; 60 inches wide by 0.030-inch nominal thickness.
1) Approved Product: “Nobleseal CIS” by The Noble Company


b. Polyethylene-Sheet Product: Woven polyethylene sheet with an anchoring fleece on both sides, 39 inches wide by 0.008-inch nominal thickness.


F. Setting Mortar and Grouting Materials

1. Scope: All materials in this Article to be provided and installed at all tiling, even if paver/tile is OFM.

2. Approved Manufacturers:
   a. Bostik Company.
   b. Custom Building Products.
   c. DAP, Inc.
   d. Laticrete International Inc.
   e. Mapei Corporation.
   f. Substitutions: See Section 01 25 00, Substitution Procedures.

3. Latex-Portland Cement Mortar (Thin Bed Set): ANSI A118.4, consisting of the following:
   a. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.
      1) For wall applications, provide non-sagging mortar that complies with Article F-4.6.1 in addition to the other requirements in ANSI A118.4.
      2) Minimum 400 pounds per square inch 28 day shear strength to porcelain and other impervious tiles.
   b. Approved Products and Manufacturers:
      1) “Kerabond” with “Universal Keralastic” by Mapei Corporation.
      3) “317 Floor and Wall Thin Set Mortar” with “3701 Latex Mortar Admix” by Laticrete International, Inc.
      4) “Hydroment Tile-Mate Premium” with “447 Flex-a-Lastic” by Bostic Co.
5) Other products as approved by Resident Engineer.

4. Latex-Portland Cement Mortar (Medium-Thick Bed Set): ANSI A118.4, consisting of the following:

   a. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.
      1) For floor applications, see requirements in ANSI A118.4.
      2) Minimum 400 pounds per square inch 28 day shear strength to porcelain and other impervious tiles.

   b. Approved Products and Manufacturers:
      1) “Hydroment Medium Bed Mortar” by Bostic Co.
      2) “226 Thick Bed Mortar Mix” with “3701 Latex Mortar Addmix” by Laticrete International, Inc.
      3) Other products as approved by Resident Engineer.

5. Latex-Portland Cement Mortar (Thick Bed Set):

   a. See Section 32 14 13, Article 2.02A for requirements.

6. Polymer-Modified Tile Grout: ANSI A118.7, consisting of the following:

   a. Polymer Type: Ethylene vinyl acetate, in dry, redispersible form, prepackaged with other dry ingredients.
      1) Unsanded grout mixture for joints 1/8 inch and narrower.

G. Flexible Setting Materials

1. Scope: All materials in this Article to be provided and installed where indicated, even if paver/tile is OFM. Use Flexible Setting Materials at all interior wall tile applications ten vertical feet or more above finish floor or other walking surfaces.


3. Basis-of-Design Flexible Setting Material to be Mapei Co.; “Grani/Rapid Flexible Mortar System” or approved equal, and shall meet all of the following requirements:

   a. Two component system, fast-setting, deformable cementitious adhesive.

   b. Product shall be fast-setting, have very low shrinkage, be resistant to impact, vibration, temperature changes, thermal shock, and dilute chemical agents.

H. Elastomeric Sealants

1. All materials in this Article to be provided and installed at all tiling applications, even if paver or tile is OFM.
2. Sealant, General: Provide manufacturer’s standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Section 07 92 00, Joint Sealants.

3. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

4. Wall: One-Part, Mildew-Resistant Silicone Sealant; ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
   a. Approved Products:
      1) Dow Corning Corporation; Dow Corning 786.
      2) GE Silicones; Sanitary 1700.
      3) Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
      4) Tremco, Inc.; Tremsil 600 White.
      5) Substitutions: See Section 01 25 00, Substitution Procedures.

5. Floor: Multipart, Pourable Urethane Sealant for Use T; ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.
   a. Approved Products:
      1) Bostik; Chem-Calk 550.
      3) Pecora Corporation; NR-200 Urexpan.
      4) Tremco, Inc.; THC-900.
      5) Substitutions: See Section 01 25 00, Substitution Procedures.

I. Miscellaneous Materials

1. Scope: All materials in this Article to be provided and installed by Contractor at all tiling, even if paver/tile is OFM.

2. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

3. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
   a. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F in accordance with ASTM D 87.
b. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

4. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

5. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.

a. Available Products:

1) Bostik; CeramaSeal Grout Sealer.

2) Custom Building Products; Grout and Tile Sealer.:

3) MAPEI Corporation; KER 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile.

4) Substitutions: See Section 01 25 00, Substitution Procedures.

J. Trim

1. Scope: All materials in this Article to be provided and installed, even if paver/tile is OFM.

2. Ceramic Trim: Matching bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.

a. Manufacturer: Same as for tile.

3. Non-Ceramic Trim: Brushed stainless steel, style and dimensions to suit application, for setting using tile mortar or adhesive.

a. Applications: Use in the following locations:

1) Open edges of wall tile.

2) Open edges of floor tile.

3) Open edges of floor tile at escalator thresholds.

4) Wall corners, outside and inside.

5) Transition between floor finishes of different heights.

6) Thresholds at door openings.

7) Movement and control joints, floor and wall.

8) Floor to wall joints.

9) Borders and other trim as indicated on drawings.

b. Manufacturer:

2) Substitutions: See Section 01 25 00, Substitution Procedures.

K. Adhesive

1. Manufacturers:
   d. Substitutions: See Section 01 25 00, Substitution Procedures.

2. Organic Adhesive: ANSI A136.1, thinset bond type; use Type I in areas subject to prolonged moisture exposure.


L. Mortar

1. Manufacturers:
   d. Substitutions: See Section 01 25 00, Substitution Procedures.


3. Mortar Bond Coat Materials:
   b. Latex-Portland Cement type: ANSI A118.4.
   c. Epoxy: ANSI A118.3.

M. Grout

1. Manufacturers:
   d. Substitutions: See Section 01 25 00, Substitution Procedures.

2. Standard Grout: Polymer modified cement grout, sanded or unsanded, as specified in ANSI A118.7.
   a. Color: As scheduled or selected from manufacturer’s standard assortment by Resident Engineer.

N. Cementitious Backer Board Substrate for Tiling
1. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced.
3. Provide at all exterior tiling and tiling at wet wall locations near plumbing fixtures as defined by Seattle Building Code.

O. Accessory Materials
1. Uncoupling and waterproofing membrane at horizontal applications: 1/8 inch thick polyurethane matting with three-dimensional grid structure with dovetail shaped cavities and fleece webbing laminated to the underside to provide a mechanical bond to the substrate adhesive.
   a. Basis-of-Design Product: Schleuter Systems "DITRA" or approved
2. Crack suppression and waterproofing membrane with anchoring fleece; Basis-of-Design Product: Schleuter Systems "KERDI", or "KERDI-FLEX" or approved; as applicable to floor or wall conditions as indicated or detailed on Drawings
3. Reinforcing Mesh: 2 x 2 inch size weave of 16/16 wire size; welded fabric, galvanized, at locations as required by TCA Handbook or as detailed on Drawings.
4. Thresholds and edge strips: Extruded aluminum.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
B. Verify that wall surfaces are smooth and flat within the tolerances of ANSI 118-A-4.8 specified for that type of work, are dust-free, and are ready to receive tile.
   1. Framing members shall be straight, plumb or level, of uniform dimension, and aligned to provide square corners. Maximum variation from required plane shall be 1/4 inch in 10 feet (6 mm in 3 m) for floor joists, wall studs, and ceiling joists.
   2. Studs shall be furred out flush with face of receptors and heavy gauge anchor plates. Install required blocking or headers to support all plumbing fixtures, soap dishes, grab bars, towel racks, and other accessories.
C. Verify that sub-floor surfaces are dust-free and free of substances which would impair bonding of setting materials to sub-floor surfaces.
D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
   1. Moisture emission rate: Not greater than 3 pounds per 1000 square feet per 24 hours when tested using calcium chloride moisture test kit for 72 hours.
E. Verify that required floor-mounted fixtures and utilities are in correct locations.

3.02 PREPARATION

A. Protect surrounding work from damage.
B. Vacuum clean surfaces and damp clean.
C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.03 INSTALLATION

A. General

1. Install tile, trim, thresholds and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCA Handbook recommendations.

2. Lay tile to pattern indicated on Drawings. Do not interrupt tile pattern through openings.

3. Place thresholds at locations indicated.

4. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor and wall joints.

5. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size as allowed by the TCA Handbook. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

6. Form internal angles square and external angles bullnosed.

7. Install ceramic accessories rigidly in prepared openings.

8. Install non-ceramic trim in accordance with manufacturer's instructions.

9. Sound tile after setting. Replace hollow sounding units.

10. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

11. Allow tile to set for a minimum of 48 hours prior to grouting.


13. Apply Sealant Type 1 to junction of tile and dissimilar materials and junction of dissimilar planes and as detailed on Drawings. See Section 07 92 00, Joint Sealants.

B. Tile Installation Sequence: Installation of the Sound Transit-supplied detectable warning surface tiles shall follow installation of the platform edge steel angle and shall precede the installation of the platform field pavers.

C. Installation of Sound Transit-Supplied Detectable Warning Surface Tiles

1. Pre-seal and then pick up at Sound Transit storage facility.

2. Prior to installation of the tiles, the keyway to receive the tiles shall be clean and dry. All traces of debris, dirt, dust, or other foreign substances shall be removed.
3. Set the elevation of the tiles adjacent to the platform edge so that the top of the outer edge is flush with the top of the platform edge steel angle. The truncated domes shall project above this elevation.

4. Set the joints between tiles to align with the layout of the 2-foot by 2-foot platform paving module.

D. Installation of Sound Transit-Supplied Tactile Path Pavers

1. Pre-seal and then pick up at Sound Transit storage facility.

2. Set the elevation of the pavers to align the rebated engraved edges of the tiles flush with the elevation of the adjacent field pavers.

3. Set the joints between the tiles to align with the layout of the 2-foot by 2-foot platform paving module.

E. Substrates

1. Levelness and finish of concrete substrates shall be approved by Resident Engineer prior to installation of floor tiles, pavers or warning strips.

2. Install gypsum or cementitious tile backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge. See Section 09 21 16.

3. Install gypsum or cementitious tile backer board in strict accordance with manufacturer's instructions, using galvanized roofing nails or corrosion-resistant bugle head drywall screws. Bed fiberglass self-adhesive tape at all joints and corners with material used to set tiles.

   a. Per ANSI 4.8.4.1.1: Framing members shall be straight, plumb or level, of uniform dimension, and aligned to provide square corners. Maximum variation from required plane shall be 1/4 inch in 10 feet (6 millimeters in 3 meters) for floor joists, wall studs, and ceiling joists. (This addresses the issue with the plumbness of the substrate walls, if you need that reference.)

   b. Per ANSI 4.8.4.4.1 Studs shall be furred out flush with face of receptors and heavy gauge anchor plates. Install required blocking or headers to support all plumbing fixtures, soap dishes, grab bars, towel racks, and other accessories. (This addresses the issue of the bowing of the walls at the strapping plates. To comply with this Article, they should have furred or shimmed the studs to be flush with the face of the plates.)

F. Flexible Setting Material

1. Provide and install where indicated, even if paver/tile is OFM. Install approved Flexible Setting Material at all interior wall tile applications ten vertical feet or more above finish floor or other walking surfaces.

2. Install approved Flexible Setting Material for Sound Transit-supplied Platform Edge Detectable Warning Tile and Tactile Path Tiles.

G. Crack-Suppression and Waterproofing Membranes

1. Install approved Crack-Suppression and Waterproofing membranes so as to comply with manufacturer's written instructions and recommendations.
H. Floors – Thin-Set Methods

1. Over interior concrete substrates, install in accordance with TCA Handbook Method F113, dry-set or latex-portland cement bond coat, with standard grout, unless otherwise indicated.
   
a. Use uncoupling membrane under all tiles unless other underlayment is indicated.

b. Where waterproofing membrane is indicated, install in accordance with TCA Handbook Method F122, with latex-portland cement grout.

c. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F131.

I. Floors – Mortar Bed Methods

1. Over exterior concrete substrates, install in accordance with TCA F101, bonded, with standard grout.

2. Over interior concrete substrates, install in accordance with TCA Handbook Method F111, with cleavage membrane, unless otherwise indicated.
   
a. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCA Handbook Method F121.

b. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F132, bonded.

c. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with TCA Handbook Method F114, with cleavage membrane.

3. Cleavage Membrane: Lap edges and ends.


5. Mortar Bed Thickness: 5/8 inch, unless otherwise indicated.

J. Setting Wall Tile

1. On exterior walls install in accordance with TCA Handbook Method W244, thin-set over cementitious backer units, as detailed on Construction Documents.

2. Flexible Setting Material for Wall Tile: Provide and install where specified or indicated.

3. Crack-Suppression and Waterproofing Membranes for Wall Tile: Provide and install where specified or indicated.

4. Over cementitious backer units on studs, install in accordance with TCA Handbook Method W244.

5. Over coated glass mat backer board on studs, install in accordance with TCA Handbook Method W245.
6. Over gypsum wallboard on wood or metal studs install in accordance with TCA Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat, unless otherwise indicated.
   a. Where mortar bed is indicated, install in accordance with TCA Handbook Method W222, one coat method.
   b. Where waterproofing membrane is indicated other than at showers and bathtub walls, install in accordance with TCA Handbook Method W222, one coat method.


8. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

9. Joint Widths: Install tile on walls with the following joint widths:
   b. Sealant Joints at junction of tile and dissimilar materials and junction of dissimilar planes: ¼ inch, typical.

3.04 CLEANING
A. On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   1. Remove latex-portland cement grout residue from tile as soon as possible.
   2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
   3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

3.05 PROTECTION
A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
B. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.
C. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.
3.06 SCHEDULE

A. Typical Floor Tile Installation

1. Typical Tile Installation: Interior floor installation over crack-suppression membrane over concrete; thin-set or medium-set mortar; TCA F122 and ANSI A108.5.
   a. Tile Type: Ceramic mosaic tile
   c. Grout: Polymer-modified unsanded grout.

B. Installation of Sound Transit-Supplied Detectable Warning Surface Tile (DWT) and Sandblast-Engraved Granite Pavers (PB)

1. Tile Installation: Interior floor installation on crack-suppression membrane over concrete; thin-set or medium-set mortar; TCA F122 and ANSI A108.5.
   a. Mortar: Flexible mortar setting bed material in accordance with Article 2.02G herein.
   b. Grout: Polymer-modified un-sanded grout.

C. Wall Tile Installation

1. Tile Installation: Interior wall installation over cementitious backer units; thin-set mortar or flexible setting material; TCA W244 and ANSI A108.5.
   a. Tile Type: Unglazed porcelain ceramic mosaic tile.
   b. Thin-Set Mortar: Latex-Portland cement mortar or approved flexible setting material as described above.
   c. Grout: Polymer-modified unsanded grout.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes installation in mortar bed of Owner provided precast concrete pavers (PC-1, PC-2).

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

   1. Section 07 92 00, Joint Sealants.
   2. Section 09 06 00, Schedules for Finishes.
   3. Section 09 30 00, Tiling.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

   1. American Society for Testing and Materials International (ASTM)
      a. ASTM A 185 Specification for Steel Welded Wire, Fabric, Plain for Concrete Reinforcement
      b. ASTM C 33 Concrete Aggregates
      c. ASTM C144 Aggregate for Masonry Mortar
      d. ASTM C 150 Portland Cement
      e. ASTM C 979 Pigments for Integrally colored concrete
   2. American Standards Institute (ANSI)
      a. ANSI A108.1B Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar
      b. ANSI A108.10 Installation of Grout in Tilework
      c. ANSI A118.4 Latex Portland Cement Mortar

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.
B. Layout Drawings: Submit layout drawings showing typical installation of pavers, including layout dimensions, field cutting, coordination of lid pavers with underslab vaults and handholds; and other pertinent information.

C. Submit product data for the following products:
   1. Latex additives for use in mortar bed, bond coat, and grout.
   2. Color pigments.

D. Submit additional samples for approval.
   1. Grout: Submit samples of grout.

E. Mortar Bed and Grout Mixes: Submit mix designs for mortar bed and grout, including gradation of sand and amount of color pigments required (grout).

F. Qualification data for firms and persons specified in Article 1.04, herein, to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of architects and owners, plus other information specified.

G. Contract Closeout Submittal: Submit the following at time of Project Closeout in accordance with the provisions in Section 01 77 00, Closeout Procedures, and Section 01 78 23, Operation and Maintenance Data.
   1. Grout color and mix proportion.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has successfully completed unit paver installations similar in material, design, and extent to that indicated for the Contract.

B. Single Source Responsibility: Obtain each color, type and variety of unit pavers, joint materials and setting materials from a single source with resources to provide products and materials of consistent quality in appearance and physical properties without delaying progress of the work.

D. Tolerance:
   1. Installation Tolerance: Vertical - Do not exceed 1/8 inch in 10 feet in all directions from level or slopes indicated when tested with a 10-foot straightedge.
   2. Installation Tolerances: Horizontal – Units shall be installed with the centerline of joints on a 2-foot 0-inch module in both direction along the length and width of the station platforms. Cumulative variances from the 2-foot 0-inch module shall not exceed 1 inch in 190 feet measured in all directions from the centerline of the platform.

E. Acceptability or Appearance: The following list of finish defects shall be considered as unacceptable and shall be requested to be replaced.
   1. Non-uniformity of surface texture.
2. Foreign material embedded in the face.

3. Shrinkage cracks.

4. Ragged or irregular edges. Minor defects incidental to the usual method of manufacturer or slight chipping resulting from handling and delivery may be acceptable to the Resident Engineer provided such defects are minor in scope and do not affect the overall quality and appearance of the work.

F. Field Constructed Mock-Up: Prior to installation of unit pavers, erect mock-ups for each form and pattern of unit pavers required to verify selections made under sample submittals, to match with finish material board sample, and to establish the appearance and workmanship standards required for the project. Grout joints with same type and color of grout to be used in the Work. Mock-up areas shall be a minimum of 100 square feet. Build mock-ups to comply with the following requirements, using materials and same base construction.

1. Locate mock-ups on-site in location and size indicated.

2. Notify Resident Engineer one week in advance of the dates and times when mock-ups will be erected.

3. Demonstrate quality of workmanship that will be produced in final unit of work.

4. Obtain acceptance of mock-ups before start of final unit of work.

5. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed unit of work.
   a. When directed, demolish and remove mock-ups from Project site.
   b. Accepted mock-ups in undisturbed condition at time of substantial completion may become part of completed unit of work.

1.05 DELIVERY, STORAGE AND HANDLING

A. General: Comply with requirements specified in Section 01 60 00, Product Requirements.

B. Deliver precast pavers on wood pallets, covered with non-staining waterproof membrane; allow air to circulate around precast units.

C. Handle precast units to prevent chipping, breakage, soiling or other damage. Do not use pinch or wrecking bars without protecting edges of precast units with wood or other rigid materials. Lift with wide-belt type slings wherever possible; do not use wire ropes or ropes containing tar or other substances that might cause staining. If required, use wood rollers and provide cushion at end or wood slides.

D. Protect mortar materials and precast units work accessories from weather, moisture, and contamination with foreign materials. Protect liquid components from freezing.

1.06 PROJECT CONDITIONS

A. Review installation procedures, and coordinate with other work, and others whose work will be affected by the precast units work.
B. Cold Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

C. Weather Limitations: Protect unit paver work against freezing when atmospheric temperature is 40 degrees F and falling. Heat materials and provide temporary protection of completed portions of unit paver work. Comply with International Masonry All Weather Council, Guide Specification for Cold Weather Masonry Construction, Section 04200, Article 3.

D. Hot Weather Requirements: Protect unit paver work when temperature and humidity conditions produce excessive evaporation of setting beds and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 degrees F and above.

PART 2 - PRODUCTS

2.01 OWNER PROVIDED PRECAST CONCRETE PAVERS (PC-1,PC-2) - FOR INSTALLATION

CONTRACTOR’S INFORMATION

A. Type and Manufacturer: Wausau Tile “Terra-Pavers” – Type 3 Cotillion FDX, Abbotsford Concrete Products Ltd. “HydralPressed Paving slabs”, or approved equal machine made paver meeting the following requirement:

1. Type PC-1: Ribbed top surface tactile paver, Elevator Thresholds.
2. Type PC-2: Ribbed top surface tactile paver, Platform Train Loading.
3. Sizes:
   a. 11-13/16 inches by 11-13/16 inches by 2 inches thick.
4. Color: Dark grey to match either of the following:
   a. Wausau Terra Pavers, Type 3, FDX 3008
   b. Mutual Materials Hydra-Pressed Paving Slabs, "Texada Charcoal".
5. Finish: Provide manufacturer’s standard light sandblast finish.
6. Edges: Manufacturer’s standard chamfer on top edges (four sides).

B. Method of Fabrication: Fabricated on the Fielding Press or similar method utilizing the wet mix process.

C. Physical Properties:

1. Compressive Strength: Minimum 7,000 psi at 28 days when tested in accordance with ASTM C140.
2. Water Absorption: Maximum of five percent when tested in accordance with ASTM C140.
3. Freeze/Thaw: Pavers shall meet the freeze/thaw tests in accordance with Section 8 of ASTM C67. Specimens when tested shall have no breakage and not greater than one percent loss in dry weight of any individual unit when subjected to 50 cycles of freezing and thawing.
2.02 SETTING MATERIALS (MORTAR SET PAVERS)

A. Portland Cement: ASTM C150, Type I or II

B. Sand: Clean, fine sand conforming to ASTM C144.
   1. Sand for mortar bed: Uniformly graded from coarse to fine with 100 percent passing the No. 4 sieve and not more than ten percent passing the No. 100 sieve.
   2. Sand for grout: Uniformly graded from coarse to fine with not more than 5 percent passing the No. 100 sieve and 100 percent passing the No. 16 sieve.

C. Latex Additive for Mortar Setting Bed: Mapei, Inc. “Planicrete 50”, Laticrete International, Inc. “3701 Latex Additive”, or approved equal latex material which is recommended for use in mortar beds for exterior applications.


F. Color Pigments (Grout): As specified for precast concrete pavers, color to match field paver selected by Resident Engineer.

G. Reinforcing Mesh: ASTM A185, 2 inches by 2 inches by 16/16 gage, galvanized welded wire mesh.

H. Water: Clean and free of deleterious materials that would impair strength or bond.

2.03 MIXES (MORTAR SET)

A. Setting Bed: Proportions shall consist of 1 part Portland Cement to three parts sand by volume. Measure sand in damp, loose condition. Mix cement and sand with 50 percent latex additive and 50 percent water in accordance with manufacturer’s directions.

B. Bond Coat: Mix 1:1 portland cement/sand gauged with latex additive in accordance with manufacturer’s directions. Mortar shall conform to ANSI A118.4.

C. Grout: Proportions shall consist of one part Portland Cement, three parts sand by volume, and color pigment. Measure sand in damp, loose condition. Mix cement, sand, and pigments with 100 percent latex additive. Grout complies with ANSI A118.6.

D. Sealant: Sealant and back-up material for expansion joints shall be as specified in Section 07 92 00; Joint Sealants, sealant shall be type “B”.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine areas where installation of precast concrete pavers will occur with Installer present. Verify that substrates and conditions are satisfactory for installation and comply with manufacturer’s requirements and those specified in this Section. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved. Commencement of work constitutes acceptance of conditions.
3.02 PREPARATION
A. Vacuum subbase to remove dirt, dust, debris, and loose particles.
B. Remove substance from concrete substrates that could impair bond of mortar, including wiring and sealing compounds, form oil and laitance.

3.03 INSTALLATION, GENERAL
A. Do not use precast units with chips, cracks, voids, stains, or other defects that might be visible in the finished work. Before setting precast units, examine units for conformance with specified fabrication tolerances and appearance standards; units not meeting requirements shall be requested to be replaced.
B. Use power driven masonry saws for cutting of pavers; provide clean, sharp unchipped edges; cut to provide pattern indicated and to fit adjoining work neatly; accurately form corners. All cut pavers that abut other pavers shall have the top edges cut to maintain the 1/4-inch chamfer edges. Use full units without cutting wherever possible.
C. Maintain surface plane for finish pavers not exceeding a tolerance of 1/8 inch in 10 feet when tested with a 10-foot straightedge.

3.04 PAVER INSTALLATION IN MORTAR BED
A. General: Install precast concrete pavers by conventional thick set Portland Cement mortar method in accordance with ANSI A108.1B and TCA Method F121.
   1. Air temperature and relative humidity shall be within the latex additive manufacturer’s established limits when setting precast units.
   2. Clean precast units of all surface contaminants prior to setting. Special attention shall be given to backside to remove all bond breaker that may be present as a result of manufacturing process.
   3. If recommended by the mortar manufacturer, wet precast units prior to back buttering so the rate of absorption is within manufacturer’s limits.
B. Apply mortar setting bed to uniform thickness to produce a true surface, level in plane or uniformly sloped for drainage as indicated on Contract Drawings; apply setting bed to a minimum thickness of 1-1/4 inches. Center reinforcement within mortar bed.
C. When mortar bed has cured, apply latex Portland Cement mortar bond coat with a notched trowel leaving uniform ribs or ridges of mortar, unless otherwise recommended by latex additive manufacturer, use a notched trowel which will result in 1/4 inch wide by 3/8-inch high ribs of mortar. Do not apply more mortar that can be covered within 20 minutes or before surface has developed a skin. In all cases, mortar shall be wet and tacky when setting pavers.
   1. Back butter each paver unit just prior to setting with same mortar bond coat; unless otherwise recommended by latex additive manufacturer, use a notched trowel, which will result in 1/4-inch high ribs of mortar.
   2. Tamp and beat each paver unit to ensure 100 percent full bedding and a true surface, free of air voids. Set and level each unit immediately.
   3. Set pavers in pattern as indicated on Contract Drawings with uniform joints of not more than 1/4 inch wide to maintain the 2'-0" module and registration of lid pavers with hard-holes.
D. Joints shall be straight, true and uniform. Remove joint fillers or spacers before mortar has set. Adjust all pavers that are out of line before initial set takes place. Completed work shall be free from hollow sounding areas and loose, cracked, or defective pavers.

E. Grouting: Comply with ANSI A108.10. Allow latex thin-set mortar to cure for a minimum of 3 days prior to grouting. Thoroughly clean joints prior to grouting. Force grout into joints, taking care not to smear grout on adjoining paver units.

1. After initial set of grout, finish joints by tooling to produce a flush polished joint, free from drying cracks

2. Before grout sets, clean off excess and fill all skips and gaps. Finish grout shall be uniform in color, smooth and without voids, pinholes or low spots.

3. After grouting exterior locations, cover pavers to protect from moisture until latex additives have set to the point where it is no longer water sensitive.

F. Expansion Joint: Locate expansion joints as indicated on Contract Drawings; expansion joints shall extend through setting bed; joints shall be uniform 3/8 inch wide.

1. Premolded joint filler shall be of height required to extend through setting bed to within 1/2 inch from top of paver. Provide removable wood strips on top of premolded filler to provide space for joint filler and sealant.

2. Expansion joints shall be in accordance with TCA Method EJ171. Sealant materials and application shall be part of the work under this Section; refer to Section 07 92 00, Joint Sealants, for materials and application requirements.

3.05 CLEANING

A. Remove mortar and grout during progress of work prior to hardening. Leave finished installation clean and free of cracked, chipped, broken, unbonded or otherwise defective pavers.

1. Remove and replace all defective pavers as directed, or pavers that do not match adjoining pavers as intended.

2. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment to eliminate evidence of replacement.

3. Repoint defective and unsatisfactory joints as required to provide a neat, uniform appearance.

4. Seal with clear water repellent for interior and exterior floor tiles and unit pavers as specified in Section 07 19 10, Water and Graffiti Repellents.

3.06 PROTECTION

A. Provide final protection and maintain condition in a manner acceptable to Resident Engineer, which ensures paver work being without damage or deterioration at time of Final Acceptance.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for expanded metal, and corrugated perforated metal panel ceilings,

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Divisions 21, 23, and 26 Sections

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Architectural Manufacturer’s Association (AAMA)

   a. ASTM A 240: Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
   b. ASTM A 580: Specification for Stainless Steel Wire
   c. ASTM A 591: Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Weight (Mass) Applications
   d. ASTM A 641: Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
   e. ASTM A 653: Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
   f. ASTM A 666: Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
   g. ASTM A 1008: Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
   h. ASTM B 164: Specification for Nickel-Copper Alloy Rod, Bar, and Wire
   i. ASTM B 209: Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
j. ASTM B 633: Specification for Electrodeposited Coatings of Zinc on Iron and Steel

k. ASTM C 553: Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications

l. ASTM C 635: Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

m. ASTM C 636: Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels

n. ASTM E 84: Test Method for Surface Burning Characteristics of Building Materials

o. ASTM E 488: Test Methods for Strength of Anchors in Concrete and Masonry Elements


3. Ceilings & Interior Systems Construction Association


4. National Association of Architectural Metal Manufacturers (NAAMM)


5. Structural Engineering Institute/American Society of Civil Engineers

a. SEI/ASCE 7: Minimum Design Loads for Buildings and Other Structures;

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: For each type of product indicated.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below:

1. Metal Panels: Set of full-size samples of each type, finish, color, pattern, and texture. Show pan edge profile.

2. Exposed Suspension System Members, Moldings and Trim: Set of 12-inch-long Samples of each type, finish, and color.

3. Sound Absorber: Match size of Sample metal pan.
D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension members.
2. Method of attaching hangers to building structure.
3. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices such as light fixtures, sprinklers, and air-distribution components whose installation is specified in other Divisions 21, 23, and 26 of these Contract Specifications.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Ceiling perimeter and penetrations through the ceiling; and trim and moldings.

1.04 QUALITY ASSURANCE

A. Source Limitations:

1. Acoustical Ceiling Pans: Obtain each type from single source from single manufacturer.
2. Suspension Systems: Obtain each type from single source from single manufacturer.

B. Source Limitations for Perforated Metal Panel Ceilings: Obtain each combination of perforated metal panels and exposed suspension systems from one source with resources to provide products of consistent quality in appearance, physical properties, and performance.

C. Surface-Burning Characteristics: Complying with ASTM E 84 for Class A materials.

D. Seismic Standard: Provide perforated metal panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:


1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver perforated metal panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Handle perforated metal panels, suspension system components, and accessories carefully to avoid damaging units and finishes in any way.
1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install perforated metal panel ceilings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Contract when occupied for its intended use.

1.07 COORDINATION

A. Coordinate layout and installation of perforated metal panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.08 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Metal panels: Full-size units equal to two percent of quantity installed.

2. Suspension System Components: Quantity of each grid and exposed molding and trim equal to two percent of quantity installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Armstrong World Industries, Inc.

2. Ceilings Plus.

3. Chicago Metallic Corporation.


6. Steel Ceilings Inc.

7. USG Interiors, Inc.

2.02 ACOUSTICAL METAL CEILING PANS - GENERAL

A. Sheet Metal Characteristics: For metal components exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, roughness, stains, or discolorations.

1. Aluminum Sheet: Roll-formed aluminum sheet, complying with ASTM B 209; alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
B. Sound-Absorbent Fabric Layer: Provide fabric layer, sized to fit concealed surface of pan, and consisting of black, nonwoven, nonflammable, sound-absorbent material with surface-burning characteristics for flame-spread index of 25 or less and smoke-developed index of 50 or less, as determined by testing in accordance with ASTM E 84.

1. Bond fabric layer to panels in the factory with manufacturer's standard nonflammable adhesive.

2.03 EXPANDED METAL PANEL CEILING

A. Expanded Metal Panels MC-3: Expanded steel sheet metal with formed sheet metal edge perimeter:

1. Expanded metal pattern: 3/4-inch No.9 regular
2. Metal thickness: 0.134 inch (10 gage).
3. Minimum 0.024 inch thick steel sheet 3/4 inch deep U-edge; tack welded on all sides.

B. Suspension Grid: 15/16-inch wide double-web tee system; meeting ASTM C 635, Heavy Duty classification.

1. Finish: "360-degree finish" to match color and gloss of ceiling panels.

2.04 CORRUGATED CUSTOM PERFORATED METAL PANEL CEILING

A. Corrugated panels MC-4: Custom aluminum sheet with round perforation.

1. Corrugated panel size and configuration: Ribs 6-inches high, 3 inches wide, 12 inches on center.
2. Panel pattern: Ribs are solid; trough is to be perforated to Match MP-13 hole size and spacing.
3. Metal thickness: TBD
4. Size: TBD
5. Finish: Fluoropolymer coating.
   a. Color: Match PNT-9

2.05 PERFORATED METAL CEILING PANEL

A. Perforated metal panel MC-6: Flat stainless steel panel; Basis of design: Ceilings Plus Illusions.

2. Metal thickness: TBD
3. Size: 4ft x 10 ft.
4. Finish: Orbital

2.06 METAL SUSPENSION SYSTEMS

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Suspension Systems: Provide systems complete with carriers, runners, splice sections, connector clips, alignment clips, leveling clips, hangers, molding, trim, retention clips, load-resisting struts, and other suspension components required to support ceiling units and other ceiling-supported construction.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

   1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing in accordance with ASTM E 488, conducted by an Independent Testing Laboratory.

       a. Type: Postinstalled expansion anchors.

       b. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchors.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

   1. Stainless-Steel Wire: ASTM A 580/A 580M, Type 316, nonmagnetic.

   2. Size: Select wire diameter so its stress at three times the hanger design load indicated in ASTM C 635, Table 1, Direct Hung will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.

E. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

F. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

G. Exposed Metal Edge Moldings and Trim: Provide exposed members as indicated or as required to comply with seismic requirements of Seattle Building Code, to conceal edges of and penetrations through ceiling, to conceal edges of pans and runners, for fixture trim and adapters, for fasciae at changes in ceiling height, and for other conditions; of metal and finish matching perforated metal panel ceiling units, unless otherwise indicated.

H. Suspension System for Torsion-Spring Metal Pans: Provide runners with factory-cut slots fabricated to accept torsion-spring attachment.

2.07 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.08 STEEL FINISH

A. Powder Coat: TGIC Polyester meeting performance requirements for gloss and color retention of AAMA 2604.


B. Preparation:

1. Metal Preparation and Pre-Treatment: Remove organic and inorganic surface soil, grease, oils, and other foreign materials in multi-stage process.

2. Prepare surfaces using a chemical cleaning and pre-treatment process as recommended by powder coating manufacturer.

C. Application:

1. Apply coating by electrostatic spray process and bake at temperature and duration as recommended by powder coating manufacturer to ensure maximum adhesion.

2. Coating shall be smooth and free of holidays, orange peel, sags, pinholes, blisters, or other signs of poor workmanship.

3. Apply each coating in color to achieve a dry film thickness of 1.5 mils, minimum for first coat primer, and 1.5 to 2.5 mils, minimum for finish coat, not including clear coat as indicated, adjust to match Resident Engineer’s approved sample for color uniformity and hide.

4. Edges and corners shall receive a dry film thickness equivalent to that of flat surfaces.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which perforated metal panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of perforated metal panel ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Measure each ceiling area and establish layout of perforated metal panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width pans at borders, and comply with layout shown on Contract Drawings (reflected ceiling plans) and Coordination Drawings.
3.03 INSTALLATION

A. Install perforated metal panel ceilings to comply with ASTM C 636 and seismic requirements indicated, in accordance with manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.

6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

7. Do not attach hangers to steel roof deck. Attach hangers to structural members.

8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of perforated metal panels.

1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
F. Cut perforated metal panel units for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.

G. Install perforated metal panels in coordination with suspension system and exposed moldings and trim.

1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated.
2. Fit adjoining units to form flush, tight joints.
3. Install directionally patterned or textured metal pans in directions indicated.

H. Install hold-down clips where indicated.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Sound Transit will engage an Independent Testing Laboratory to perform tests and inspections.

B. Tests and Inspections: Testing and inspecting of completed installations of acoustical panel ceiling hangers and anchors and fasteners shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.

1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.

a. Within each test area, the Independent Testing Laboratory will select one of every postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.

b. When testing discovers fasteners and anchors that do not comply with requirements, the Independent Testing Laboratory will test those anchors not previously tested until twenty pass consecutively and then will resume initial testing frequency.

C. Acoustical panel ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.

3.05 CLEANING

A. Clean exposed surfaces of perforated metal panel ceilings, including trim and edge moldings after removing strippable, temporary protective covering, if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY
A. This section includes specifications for resilient wall base.

1.02 REFERENCES
A. This Section incorporates by reference the latest revisions of the following documents.

1. American Society for Testing and Materials International (ASTM)

2. National Fire Protection Association (NFPA)

1.03 SUBMITTALS
A. See Section 01 33 00, Submittal Procedures, for submittal procedures.
B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
C. Selection Samples: Submit one manufacturer's complete set of color samples for Project Engineer's initial selection.
D. Verification Samples: Submit four samples, at least 12 by 12 inches in size illustrating color and pattern for each resilient flooring product specified.
E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.04 DELIVERY, STORAGE, AND PROTECTION
A. Deliver base and accessories to Project site in original manufacturer's unopened cartons and containers, each bearing names of product and manufacturer, and shipping and handling instructions.
B. Protect roll materials from damage by storing on end.

1.05 PROJECT CONDITIONS
A. Environmental Requirements
1. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

2. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Extra Materials

1. See Section 01 60 00, Product Requirements, for additional provisions.

2. Provide 100 lineal feet of base materials of each type and color specified.

B. Base (RB-1)

1. Resilient Base: ASTM F 1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove, and as follows:
   a. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
   b. Height: 4-inch.
   c. Style: Cove.
   d. Thickness: 0.125 inch thick.
   e. Finish: Satin.
   f. Length: Roll.
   g. Color: Solid color to match Johnsonite
   h. Accessories: Premolded external corners and end stops. (Do not wrap base around corners.)
   i. Manufacturers:
      4) Substitutions: Not permitted.

2.02 INSTALLATION MATERIALS

A. Primers: Non-staining type as recommended by manufacturer.

B. Adhesives: Water resistant types made by "Henry GreenLine", or recommended by the manufacturer for the conditions of the installation; adhesives shall be low-odor and meet VOC’s requirements; in all cases, adhesives shall not exhibit any long lasting noxious off-gassing. Provide white colored adhesives for all areas.
C. Other Materials: Provide incidental and accessory materials, tools, methods and equipment required for completion of resilient base installation.

PART 3 - EXECUTION

3.01 EXAMINATION
A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

3.02 PREPARATION
A. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.
B. Remove all dirt, oil, grease, and other contaminants affecting bond.
   1. Comply with any additional instructions and recommendations of adhesive manufacturers for proper preparation.

3.03 INSTALLATION
A. Base
   1. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
   2. Miter internal corners. At external corners, use pre-molded units. At exposed ends, use pre-molded units.
   3. Install base on solid backing. Bond tightly to wall and floor surfaces.
   4. Scribe and fit to door frames and other interruptions.
B. Reducers and Moldings: Bond reducers and molding to substrate, in straight, true lines. Install in longest available lengths.
   1. Install reducers where flooring material terminates exposing the edge of material and where flooring material terminates in doorway. Center reducers under doors.
   2. Install moldings where one flooring material transitions to another.

3.04 CLEANING
A. Remove excess adhesive from floor, base, and wall surfaces without damage.

END OF SECTION
1.01 SUMMARY
A. This Section includes specifications for sprayed acoustic insulation (sprayed acoustic treatment).

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
1. Section 03 30 00, Cast-In-Place Concrete: Substrate for insulation.
2. Section 04 20 00, Unit Masonry: Substrate for insulation.
3. Section 07 21 00, Thermal Insulation.

1.02 REFERENCES
A. This Section incorporates by reference the latest revisions of the following documents.

B. American Society for Testing and Materials:
1. American Society for Testing and Materials International (ASTM)
   a. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   c. ASTM E 84 Surface Burning Characteristics of Building Materials

1.03 SYSTEM DESCRIPTION
A. Performance Characteristics: Sprayed-on acoustical insulation shall comply with following:
1. Meet "Physical Properties" requirements of ASTM C 1014.
2. Acoustical Performance: Minimum NRC of 0.70, at nominal applied thickness when tested in accordance with ASTM C 423 on solid backing.

B. Minimum Applied Thickness: 1.5 inches (required for low frequency sound absorption).

1.04 SUBMITTALS
A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Submit manufacturer's brochure on insulation materials, including application instructions and procedures.
C. Samples for Verification: Submit samples of spray-on acoustical insulation in selected color, minimum 1/2-inch thickness by 12 inches square, one showing spray-textured finish and color to be expected in the finish work, two showing texture back rolled, and three sample with texture tamped. Submit additional samples if required for approval by the Resident Engineer.

1.05 QUALITY ASSURANCE
A. Applicator’s Qualifications: Licensed or approved by insulation manufacturer.
B. Mock-Ups: Minimum 100 square feet in location designated by Resident Engineer

1.06 DELIVERY, STORAGE & HANDLING
A. Deliver materials in unopened containers or packages bearing manufacturer’s name, trade name, type. Keep materials off the ground, under cover, and away from damp surfaces. Discard materials exposed to moisture.

1.07 PROJECT CONDITIONS
A. Environmental Conditions: Maintain ambient conditions during installation and for cure period following installation as recommended by manufacturer.
B. Temperature: Maintain a temperature of not less than 40 degrees F for 24 hours before, during and for 24 hours after application of sprayed insulation. If necessary for job progress, provide enclosures with heat to maintain temperature.

1.08 SEQUENCING AND SCHEDULING
A. Coordination: Install clips, hanger supports, and other attachments to the substrate prior to application of insulation material, where their locations can be determined in advance. Delay installation of mechanical and electrical ducts, piping and conduit until insulation application has been completed.

PART 2 - PRODUCTS

2.01 MATERIALS
A. Sprayed Acoustic Insulation Products (SAT-1): Subject to compliance with requirements, provide one of the following.
   2. Isolatek International “Sound Shield”, mineral fiber.
   3. ThermocCon Spray Acoustic Insulation “ThemoCon” cellulose fiber.
   5. Approved equal
B. Color: Medium grey.
C. Bonding Adhesive: Type as recommended and approved by insulation manufacturer for type of substrate.
PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

A. General: Verify that surfaces and conditions are acceptable to receive acoustical insulation. Do not proceed with application in areas of discrepancy until all discrepancies have been fully resolved.

B. Verify Following Conditions:
   1. Verify that surfaces to receive acoustical insulation are free of oil, grease, or other substances which may impair proper adhesion.
   2. Verify clips, hangers, supports, sleeves, and other items required to penetrate insulation are in place.
   3. Verify that substrates are not obstructed by ducts, piping, equipment, or other suspended construction which might interfere with application of insulation.

C. Clean surfaces of substances which might be incompatible with or interfere with bond of adhesive and acoustical insulation.

D. Commencement of application indicates acceptance of surface conditions and full responsibility for failure of bond between insulation and substrate.

3.02 APPLICATION

A. Mixing & Application: Mix and apply the bonding adhesive and acoustical insulation in strict accordance with manufacturer's printed instructions using only approved equipment.
   1. Apply bonding adhesive to substrate at rate recommended by manufacturer.
   2. If required by manufacturer due to overall thickness, mix insulation with binding adhesive and water to ensure complete and total bonding.
   3. Apply insulation over bonding adhesive in two or more passes as necessary to cover with monolithic blanket of uniform density and texture matching approved sample. It is the intent that a sprayed-textured finish with no further treatment will be acceptable. If required, hand tamp insulation to achieve desired results.

B. Mechanically control material and water ratio. Do not retemper material. Complete application in an area before removing equipment and proceeding with further work.

C. Patch insulation which has been damaged by construction operations. Costs for patching damaged insulation shall be borne by the trade causing such damage. All patched areas shall match adjacent area in texture and color.

3.03 CLEAN-UP

A. Cleanup: Clean floors, walls, and other surfaces of overspray and material deposits on a daily basis.

END OF SECTION
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PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: (PNT-1, Thru PNT-9) In general, the principle items of work include, but are not limited to, the following:

1. Preparation of surfaces.

2. Painting and finishing of all exposed-to-view interior and exterior surfaces, except as otherwise indicated or specified.

B. Field painting of all exposed-to-view metal fabrications, mechanical and electrical items such as pipes, ducts, hangers, conduits, and like items in rooms or areas scheduled to be painted, or where run through existing rooms which are painted.

a. Field painting of factory finished equipment is not required.

b. Apply one coat of flat black enamel to all ductwork and lining and to conduit or piping which can be seen through grilles, registers or diffusers, and to speaker enclosures behind speaker cloth; minimum 12 inches from view.

C. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 03 45 00, Precast Architectural Concrete
2. Section 05 05 13, Shop-Applied Coatings for Metal
3. Section 05 05 14, Fluoropolymer Coatings for Metal.
4. Section 05 50 00, Metal Fabrications
5. Section 05 51 00, Metal Stairs
6. Section 08 11 13, Hollow Metal Doors and Frames
7. Section 08 31 13, Access Doors and Frames: Field-painted finish
8. Section 09 06 00, Schedule for Finishes.
9. Section 09 21 16, Gypsum Board Assemblies
10. Section 09 96 00, High-Performance Coatings: (PNT-1H, etc.) Finish designations PNT-# suffixed H require high performance coatings of same colors as PNT-# systems specified in this section.
1.02 DEFINITIONS

A. Exposed Surfaces: The term “exposed surfaces” includes areas visible when permanent or built-in fixtures, covers, grilles, and similar components are in place. Extend painting in these areas as required to maintain the system integrity and provide desired protection.

B. DFM (dry film mils): Minimum thickness, measured in mils, of a coat of paint in the cured state.

C. Gloss Levels: The following terms are used to specify specular gloss of finish coats in accordance with those listed by MPI (Master Painter Institute) when measured in accordance with ASTM D523.

<table>
<thead>
<tr>
<th>Gloss Level</th>
<th>Description</th>
<th>Gloss @ 60 degrees</th>
<th>Sheen @ 85 degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Traditional matte finish - flat</td>
<td>Maximum 5 units</td>
<td>and 10 units</td>
</tr>
<tr>
<td>Level 2</td>
<td>High side sheen flat – a ‘velvet-like’ finish</td>
<td>Maximum 10 units</td>
<td>10-35 units</td>
</tr>
<tr>
<td>Level 3</td>
<td>Traditional ‘eggshell-like’ finish</td>
<td>10-25 units</td>
<td>10-35 units</td>
</tr>
<tr>
<td>Level 4</td>
<td>‘Satin-like’ finish</td>
<td>20-35 units</td>
<td>Minimum 35 units</td>
</tr>
<tr>
<td>Level 5</td>
<td>Traditional semi-gloss</td>
<td>35-70 units</td>
<td></td>
</tr>
<tr>
<td>Level 6</td>
<td>Traditional gloss</td>
<td>70-85 units</td>
<td></td>
</tr>
<tr>
<td>Level 7</td>
<td>High gloss</td>
<td>More than 85 units</td>
<td></td>
</tr>
</tbody>
</table>

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Submit complete list of products proposed for use, including technical data on each product to verify compliance; organize list to indicate painting systems to be used with each substrate.

1. Submit paint list with paint manufacturer, paint name, coverage and VOC content listed.

2. Submittal shall contain any proposed revisions to Contract Specifications (for example surface preparation, and method of application) which painting contractor feels are necessary in their execution of the Contract.

3. All proposed revisions must be approved by the Resident Engineer prior to proceeding with the Work.

4. The submission of paint product data is to be in conjunction with steel submittals where the steel is being painted. This is to confirm that the shop applied steel primer is compatible with the intermediate coat and final paint coats. This submittal will not be considered complete and acceptable if either product is not compatible with each other.

C. Samples: Using approved paint products, prepare and submit samples of each type of finish, gloss level, and color for approval. Refer to Article 2.04, herein, for requirements. Label samples with color number, product name and date. Provide three samples of each color and sheen.
1. For deep tone or accent colors paint finish applied to drywall or plaster, prepare paint samples on 24-inch square gypsum drywall; drywall shall have Level 5 finish treatment.

2. For all remaining colors, prepare paint samples on 8-1/2 inch by 11-inch heavy, durable non porous paper.

3. Adjustments to the overall sheen in one or more of the colors may be required. Such adjustments (if any) shall be made at no additional cost. Additional samples will be required should adjustments be made.

4. Initial color samples which have been approved are subject to final acceptance at time of field mock-up examination.

D. Contract Closeout Submittal: Include the following at time of Project Closeout:

1. Extra Materials: Coordinate submittal of extra maintenance materials with requirements of Section 01 60 00, Product Requirements and Article 1.07, herein, for quantities and other requirements.

2. Color Mix: Submit color mix formula for each required paint color. Mix formula must be in measured increments of 48ths of an ounce; include the manufacturer's color and number identification, color chip, location list where said colors were applied and paint manufacturer of base.

1.04 QUALITY ASSURANCE

A. Single Source:

1. To the maximum extent practicable, select a single manufacturer to provide all materials required by this Section, using additional manufacturers to provide systems not offered by the selected principal manufacturer.

2. For each individual system, provide primer and other undercoat paint produced by same manufacturer as finish coat. Use only thinners approved by paint manufacturer and use only within recommended limits.

B. Visual Standards: Each distinct area of the finished Work shall be free of variations in color and sheen, runs, sags, holidays, blistering, checking, cracking, scratches and other signs of poor workmanship. Deep tone and accent color walls shall be free from joint banding, flashing, photographing, and uneven appearance.

C. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Wall: Provide two samples of at least 100 square feet each (slightly different colors) in each room.

2. Apply benchmark samples after permanent lighting and other environmental services have been activated.

   a. If permanent lighting is not operational, provide temporary lighting of same color temperature (degrees K) for Resident Engineer's evaluation or the samples.

3. Final approval of color selections will be based on benchmark samples.
1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to building in sealed, original, labeled containers bearing manufacturer's name, type of material, brand name, color designation, and instructions for mixing and thinning.

B. Store materials when not in actual use in a place specifically assigned for that purpose which is dry and out of direct sunlight. Store materials in a manner so as not to exceed the manufacturer's temperature limitations.

1.06 PROJECT CONDITIONS

A. Environmental Conditions: Air temperature and substrate temperature and relative humidity shall be within the manufacturer's established limits. Do not apply exterior paint when the following conditions exist, unless requirements of paint manufacturers are more restrictive.

1. Temperature: If surface and ambient temperature is above 90 degrees F, or below 50 degrees F.

2. Weather: Do not apply paint in snow, rain, fog, when excessively windy or during mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

B. Lighting: Do not proceed with work under this section unless adequate lighting is available. Provide lighting level of at least 50 candlepower per square foot, measured mid-height at substrate surface.

C. Ventilation: Provide adequate ventilation as required for the type of paint and cleaning materials used. If necessary, consult paint manufacturer for recommendations.

D. Protection: Protect surrounding areas against damage due to painting operations. At a minimum, surrounding areas shall be covered with polyethylene sheeting and waterproof masking tape. Sound Transit will not be responsible for the Contractor's selection or method of protection.

1. Protective coverings shall be secured against wind and shall be vented to prevent collection of moisture on covered surfaces.

2. Provide "wet paint" signs as required to protect newly painted surfaces.

E. Precautions: Take all precautions to prevent fire; open containers of flammable materials only when needed; keep rubbing cloths and oily rags in tightly closed containers and remove from site daily. Dispose of hazardous materials in accordance with all local, State and Federal regulations.

F. Coordination: Review other sections of herein in which prime paints are to be provided to ensure compatibility of total coating system for various substrates. Notify Resident Engineer in writing of any anticipated problems using specified coating systems with substrates primed by others.
1.07 EXTRA MATERIALS

A. See Section 01 60 00, Product Requirements, for additional provisions.

B. Supply five gallons of each paint type and color; consisting of 1 gallon containers, store where directed.

C. Label each container with color and color mix number in addition to the manufacturer's label.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS - GENERAL

A. Manufacturers: Refer to Paint Schedules at end of this Section for manufacturer's product names and paint systems which are included to establish the required level of quality. Additionally the following list of manufacture's are acceptable, contingent upon meeting level of paint quality indicated in the Paint Schedules, and for which a substitution request is not required.

1. ICI Dulux Paints / Devoe Performance Coatings
2. Benjamin-Moore
4. Sherwin Williams:
5. Tnemec Company.

B. Paint Grade: Professional grade coatings meeting the equivalent performance requirements listed in the Master Painter Institute Approved Product List and suitable for its intended use.

C. Colors: Each paint color must be accurately mixed to ensure color continuity. No allowance will be granted for mismatched paint of the same color when viewed under normal lighting conditions.

D. Provide primer and finish coats, which are compatible with each other and with prime coats provided under other Sections. Provide barrier coats over incompatible primers or remove and re-prime as required.

E. Tint each undercoat a lighter shade than finish coat so that numbers of coats can be easily discerned. No color mixing will be allowed at the job-site.

F. Thinner: Type as recommended by the paint manufacturer. Use thinner only when recommended by the paint manufacturer, and then only in a quantity as indicated on the label.

G. Primers: Primers, except metal primers and vivid color undercoats, shall be white in color for inspection purposes.

H. Secondary Products: Secondary products not specified by name and required for the job such as shellac, oils, patching compounds, or putty, shall be "best grade" products.
2.02 PRIMERS AND UNDERCOATS

A. Gypsum Board Primer:  ICI Dulux Prep + Prime 1040 High Build or approved equal latex primer capable of minimum 4-mil dry film thickness without sags or runs single coat coverage.
   2. VOC limit: 100 g/l.
   3. DFM: 4 mils.

B. Concrete and Concrete Masonry (CMU) Primer:  ICI Devoe Bloxfil 4000 HD Acrylic, Tnemec “Envirolif” Series 130 or approved equal latex masonry filler.
   2. VOC limit: 100 g/l.
   3. Nominal 8 mils DFM.
      a. Coverage - CMU: 75 s.f. per gallon.
      b. Coverage - Concrete: 100 s.f. per gallon.

C. Anti-Corrosive Metal Primer (Includes Ferrous and Non-Ferrous Metals):  ICI Devoe Devflex 4020 PF DTM, Tnemec “Uni-Bond DF” “Series 115”, or approved equal acrylic, rust-inhibitive primer recommended by manufacturer for use on both ferrous and non-ferrous metals.
   1. VOC limit: 91 g/l.
   2. DFM: 2.2 – 3.5 mils.
   3. Adhesion: Minimum rating of 5 when tested in accordance with ASTM D 3359, Method B on all of the following surfaces:
      a. Steel prepared in accordance with SSPC SP-10.
      b. Aluminum prepared in accordance with SSPC SP-1.
      c. Galvanized steel prepared in accordance with SSPC SP-1.

2.03 INTERMEDIATE AND FINISH COATS

A. Latex Flat:
   1. Acceptable products include:
      c. ICI Dulux Life Master 9100
      d. Or approved equal
   2. VOC limit: 20 g/l (with colorants).
B. Latex Eggshell/Satin:

1. Acceptable products include:
   c. ICI Dulux Life Master 9300.
   d. Or approved equal

2. VOC limit: 20 g/l (with colorants).

3. DFM: 1.2 mils.

C. High-Performance Acrylic Semi-Gloss:

1. Acceptable products include:
   c. ICI Devoe "Devflex" 4205.
   d. Tnemec “Enduratone” Series 1029.
   e. Or approved equal

2. VOC limit: 20 g/l (with colorants).

3. DFM: 1.4 mils.

D. Acrylic Dryfall: Tnemec Series 115 “Uni-Bond DF” or ICI Dulux Uni Grip Aquacrylic Dryfall 1482 -1200 or approved equal self-crosslinking acrylic, multi-substrate dryfall coating recommended by manufacturer for use on various substrates typically encountered with exposed structures.

1. Sheen: Eggshell (MPI Level 3)

2. VOC limit: 150 g/l.

3. DFM: 3.0 mils.

E. High-Build Acrylic: Tnemec Series 156 “Enviro-Crete” or approved equal self-crosslinking waterborne acrylic, sand texture coating.

1. Sheen: Matte.

2. VOC limit: 60 g/l.

3. DFM: 6.0 mils.

F. Sand-Texture Acrylic: Tnemec Series 157 “Enviro-Crete” or approved equal self-crosslinking waterborne acrylic, high-build coating.
G. Waterborne Acrylic Stain: One of the following or approved:
   1. Chemprobe/Tnemec Series 617 "Conformal Stain WB".
   2. United Coatings "Canyon Tone Stain".
   3. Tamms "Aqua Stain".

H. Waterborne Epoxy, Satin:
   1. Acceptable products include:
      a. Kelly Moore "Envir-Poxy" 7100 with flattrig agent
      b. Benjamin Moore "Acrylic Epoxy Coating" M43/M44 with flattrig agent.
      c. Sherwin-Williams "Epo-Plex Multi-Mil Water Based Epoxy (B71-100 Series B71V110 Low Luster Hardener)".
      d. ICI Devoe "Tru-Glaze" 4418.
      e. Tnemec "H.B. Tneme-Tufcoat" Series 113.
      f. Or approved equal
   2. Coverage: 4 mils per coat (coatings with less build per coat will require additional coats to achieve required system thickness).
   3. VOC limit: 240 g/l (with colorants).

2.04 PAINT COLORS

A. Match the following:
   1. PNT-1: TBD
   2. PNT-2: TBD
   3. PNT-3: TBD
   4. PNT-4: Concrete Gray NOT APPLICABLE FOR N140
      a. WSDOT "Washington Gray" NOT APPLICABLE FOR N140
   5. PNT-5: TBD

<table>
<thead>
<tr>
<th>Item</th>
<th>Color</th>
<th>Product</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNT-1</td>
<td>ST &quot;Dark Blue&quot;</td>
<td>ST Standard color</td>
<td>NA to N140</td>
</tr>
<tr>
<td>PNT-2</td>
<td>&quot;Charcoal Gray&quot;</td>
<td>ST Standard Color (BLACK)</td>
<td>MC-3 (expanded metal ceilings)</td>
</tr>
<tr>
<td>PNT-3</td>
<td>&quot;Old Monterey&quot;</td>
<td>ST Standard Color (MEDIUM GRAY)</td>
<td>GDR-1.5, HNDRL-1, Interior Hollow Metal Door Frames And Doors</td>
</tr>
<tr>
<td>PNT-4</td>
<td>&quot;Light Gray&quot;</td>
<td>ST Standard Color</td>
<td>Canopy Steel, MP-11, interior walls non-public areas</td>
</tr>
<tr>
<td>PNT-5</td>
<td>&quot;Ferrari Red&quot;</td>
<td>ST Standard Color</td>
<td>NA to N140</td>
</tr>
</tbody>
</table>
### PART 3 - EXECUTION

#### 3.01 EXAMINATION

**A. General:** Examine surfaces to receive paint finish for conditions that will adversely affect execution, performance, or quality of work and which cannot be put into an acceptable condition through reasonable preparatory work as specified herein.

1. Surfaces which are unfit to receive the work of this section shall be repaired, replaced or re-finished such that they are acceptable and such that the work of this section may be done as specified. It shall be the responsibility of the Contractor to ensure that these provisions are strictly enforced.

2. Commencement of Work constitutes acceptance of surfaces and conditions.

**B. Gypsum Wallboard:** Inspect wall surfaces of gypsum drywall which are scheduled to receive deep tone and accent paint colors prior to application of paint for signs of defects which could affect the finish appearance such as banding, flashing, or uneven texture.

1. Initial Inspection: Make initial inspection a normal viewing distance (approximately 4 feet) under normal lighting conditions.

2. Inspection after First Coat of Paint: Should defect become visible after first coat of paint has been applied, it shall be the Contractor’s responsibility to have all such conditions corrected by the drywall Installer/finisher. Any corrected areas shall be re-primed at no additional cost to the Sound Transit.

3. Finish Coats: Application of subsequent coats of paint shall constitute acceptance of the drywall substrate by the painting applicator.

**C. Concrete and Masonry:**

1. Alkali Content Testing: Test for alkalinity by performing appropriate tests, and neutralize as required for pH reading between 6.8 and 8.0, unless otherwise recommended by paint manufacturer. Test for pH following test method as described in ASTM D4262, utilizing litmus paper.

2. Moisture Content Testing: Test for moisture content by performing appropriate tests. Maximum moisture content shall not exceed 17 percent as determined by a moisture meter, unless otherwise required by paint manufacturer.

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<table>
<thead>
<tr>
<th>Item</th>
<th>Color</th>
<th>Product</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNT-6</td>
<td>“Pencil Yellow”</td>
<td>ST Standard Color</td>
<td>NA to N140</td>
</tr>
<tr>
<td>PNT-7</td>
<td>“Lime Green”</td>
<td>SW6915, “Citronella” LRV 39%</td>
<td>South entrance porcelain enamel panels (MP-2) and armature</td>
</tr>
<tr>
<td>PNT-8</td>
<td>“Marine Blue”</td>
<td>ICI #88GG 32/346 “Marine Blue”</td>
<td>North entrance porcelain enamel panels (MP-2) and armature</td>
</tr>
<tr>
<td>PNT-9</td>
<td>“White”</td>
<td>White white</td>
<td>MC-4</td>
</tr>
</tbody>
</table>
3.02 SURFACE PREPARATION (GENERAL)

A. General: Surface preparations and cleaning procedures shall be in strict accordance with the instructions and specifications of the paint manufacturer and with the requirements herein.

B. Removal of Fixtures: Cooperate with other trades and coordinate removal of fixtures, hardware items, and equipment, as required for painting work. Items to be removed on surfaces to be painted include: switch and receptacle plates, escutcheons and like plates, surface-mounted equipment, free-standing equipment which blocks access to painting surfaces, grilles and louvers at duct openings into finished spaces, and other items as required and directed.

C. Painting of Factory-Primed Door Hardware: Prior to painting, mask all operating parts so that item works freely after paint is dry. Remove excess paint from operating parts and clean and free-up the operation of all parts which do not operate smoothly due to the painting operation.

3.03 SURFACE PREPARATION

A. Uncoated Ferrous Metal: Thoroughly degrease surfaces using solvent (SSPC-SP 1) and remove rust and foreign matter by scraping, sanding, wire brushing, or other abrasion methods as necessary in accordance with SSPC-SP 2 and SSPC-SP 3. Remove pits and clean to bright metal before priming. Apply primer on the same day.

B. Shop-Coated Ferrous Metal: Thoroughly degrease surfaces and clean using solvent (SSPC-SP 1). Remove loose rust, blistered and peeling paint to bare metal by scraping, sanding, wire brushing, or other abrasion methods in accordance with SSPC-SP 2 or SP 3; feather edges of adjacent sound paint. Dull glossy surfaces by scuff-sanding and wipe down. Spot-prime all abraded portions, rust areas, and bare surfaces with specified primer on same day.

C. Galvanized Metal (Unpainted): Clean surfaces, wash and etch, to remove factory films and oily residue as recommended by the paint manufacturer. Responsibility for insuring that the surface is properly prepared rests with the painting Subcontractor. Clean galvanized metal the same day to be painted. If a pretreatment wash primer is recommended by manufacturer, apply pretreatment not more than 8 hours in advance of applying primer.

D. Concrete: Clean surfaces free from dirt, grease, oil, efflorescence, and other foreign substances. Remove mortar droppings, glaze, and scale.

E. Concrete Masonry: Remove all dust and loose mortar by brushing. Neutralize alkali or efflorescence with wash solution recommended by paint manufacturer. Thoroughly clean off resulting crystals with stiff brushes.

F. Gypsum Wallboard: Remove all dust and dirt with a brush; if necessary, clean surfaces using damp rags or sponges. Repair of surface defects and Level of finishing is specified in Section 09 21 16, Gypsum Board Assemblies.

3.04 CLEANING PRIOR TO PAINTING

A. Remove dust and loose deleterious materials from all surfaces before beginning painting operations. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.
3.05 APPLICATION OF PAINT

A. Mixing: Mix paint materials in accordance with the manufacturer's instructions and directions. Mix often enough during application to keep the paint uniform and to ensure complete dispersion of pigment and a uniform composition.

1. Prepare multiple component coatings using all of the contents of the container for each component as packaged by the manufacturer. Mixing of partial kits will not be permitted. Multiple component coatings that have been mixed shall not be used beyond their pot life. Only the components specified and furnished by the manufacturer, including thinner if required, shall be mixed.

B. Application: Apply paint in accordance with the manufacturer's directions. Use techniques best suited for substrate and type of material being applied. Apply using airless spray to greatest extent possible for doors and door frames and other medium to high gloss paints. Brushes and rollers shall be of a type best suited for the type of material being applied.

1. Apply intermediate and finish coats within the manufacturer's recommended top coating time periods.

2. When applying paint to drywall, use a roller nap no greater than 3/8 inch so as to achieve a light stipple finish.

3. If metal doors, and plaster surfaces are not sprayed, finish may be applied with 1/4 inch nap roller. Brush and level out paint applied to metal door frames to achieve a nearly sprayed-on appearance.

C. Apply each coat of paint as a continuous film of uniform thickness, free from holidays, sags, crawls, pinholes, blisters, unevenness in color, or other evidence of poor workmanship. Repaint thin spots or areas missed in the application and allow to dry before applying next coat of paint.

1. Give special attention to ensure that surfaces, such as edges, corners, crevices, welds and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

2. Each coat shall be free of dirt, dust, moisture, and other contaminates prior to application of next coat.

D. Allow each coat of paint to thoroughly dry, full thickness of the film, before application of the succeeding coat. Paint is considered dry for recoating when the next coat can be applied without the development of all detrimental film irregularities such as wrinkling, lifting, or loss of adhesion of the previous coat.

E. Coverage for each paint material is specified as either the total minimum dry film thickness in mils or the spreading rate in square feet per gallon over the surface designated. Actual coverage rate will vary depending upon the texture and porosity of the surface, and climatic conditions.

1. The number of coats specified is the minimum required, irrespective of the coating thickness.

2. In the event the required paint thickness is not achieved, or coating shows through, apply additional coats until the color appearance is uniform and required thickness is obtained. Cost for additional coats to prevent show through shall be borne by the Installer.
3. Do not exceed manufacturer's recommended maximum film build-up per coat (wet mils).

F. Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat to ensure a finish coat with no burn-through or other defects.

G. Sand lightly between coats of enamel to produce an even, smooth finish. Wipe to remove dust before recoating.

H. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.

I. Do not paint over code-required labels or equipment identification or nomenclature plates.

J. Tops and bottoms of doors shall be finished the same as the faces (primed and two finish coats of paint).

K. Door Frames: Unless otherwise indicated, provide color to match adjacent wall color.

3.06 DAMAGED PAINT SURFACES

A. General: Before final acceptance of the work by the Resident Engineer, repair or re-finish painted surfaces which have been damaged at no additional cost. Refinish whole wall where portion of finish is not acceptable.

B. Areas of chipped, peeled, or abraded paint shall be hand or power sanded, feathering the edges. Prime and finish coat the areas using the same material as originally scheduled. Depending on the extent of repair and its appearance, an overall finish coat may be required by the Resident Engineer to achieve uniform appearance.

3.07 CLEAN-UP

A. General: During the progress of the work, remove from the project all discarded paint materials, rubbish, cans and rags. Leave premises clean and in orderly condition.

B. Cleaning: Upon completion of painting work, clean window glass and other paint-splattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

3.08 PAINT SCHEDULE - EXTERIOR SURFACES

A. Typical Exposed Concrete. Waterborne acrylic stain.

1. Primer: None required.

2. Two Finish Coats: Waterborne acrylic stain.

3.09 PAINT SCHEDULE - INTERIOR SURFACES

A. Paint and Special Coating Designations:

1. PNT is used for both paint systems specified in this Section as well as high-performance coatings specified in Section 09 96 00, High-Performance Coatings.

2. EP designates waterborne epoxy paint system specified in this section.

4. Suffix -H following the color numeral indicates High Performance Coating specified in Section 09 96 00, High-Performance Coatings.

B. Exposed Structure (not in "touch zone" within ten feet of walking surface) – Painted (includes ductwork, conduit, piping, and miscellaneous metals of structure): Acrylic Dryfall. Do not paint acoustic insulation.

1. Primer: Metal primer or Acrylic dryfall.
2. One Finish Coat: Acrylic dryfall.

C. Other Exposed Metal: Latex Semigloss

1. Primer: Metal primer.
2. Two Finish Coats: Latex Semigloss.

D. Cementitious Wall Panels, Concrete and CMU: Sand-texture acrylic

1. Primer: Concrete and concrete masonry primer.

E. Gypsum Wallboard (typical walls): Latex eggshell.

1. Primer: Gypsum board primer.
2. Two Finish Coats: Latex Eggshell.

F. Gypsum Wallboard (typical ceilings): Latex, Flat.

1. Primer: Gypsum board primer.
2. Two Finish Coats: Latex Flat.

G. Gypsum Wallboard: Waterborne Epoxy

1. Primer: Gypsum board primer.
2. Two Finish Coats: Waterborne Epoxy.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for furnishing and applying high performance coating systems in the shop and field on certain items and types of work, as scheduled; including surface preparation, primer coats, intermediate coats, finish coats, field touch-up, and related thinners and associated materials. Coatings used in the systems specified in this Section include:

1. **HPC-2**: High-Performance Coating for Exposed Primed Structural Steel: High solids zinc-rich epoxy/acrylic urethane.

2. **HPC-4**: High-Performance Coating to Separate Dissimilar Metals: Coal Tar Epoxy Coating.

3. **HPC-5**: High-Performance Zinc-rich Primer.

4. Other High-Performance Coatings as described in this Section.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 03 35 00, Concrete Finishing, Coatings on finished concrete surfaces.

2. Section 05 05 13, Shop-Applied Coatings for Metal: Preparation and galvanizing of steel.

3. Section 05 05 14, Fluoropolymer Coatings for Metals: Factory applied, baked on fluoropolymer coating containing minimum 70 percent polyvinylidene fluoride (PVDF) by weight in resin system.

4. Section 05 12 00, Structural Steel Framing: Coordination to assure compatibility between steel shop primer and intermediate and finish high performance coatings.

5. Section 05 50 00, Metal Fabrications: Coordination to assure compatibility between metal shop primers and intermediate and finish high performance coatings.

6. Section 05 51 00, Metal Stairs: Coordination to assure compatibility between metal shop primers and intermediate and finish high performance coatings.

7. Section 07 42 13, Metal Wall Panels: Requirements for finishes provided in this Section.

8. Section 07 62 00, Sheet Metal Flashing and Trim: Requirements for finishes provided in this Section.
9. Section 08 11 13, Hollow Metal Doors and Frames: Requirements for finishes provided in this Section.

10. Section 08 33 23, Overhead Coiling Doors: Coatings required

11. Section 08 44 10, Glazed Aluminum-Framed Curtain Walls: Coatings required.

12. Section 08 56 29, Heat Resistive Window Wall Systems

13. Section 09 90 00, Painting and Coating: Requirements for finishes not provided in this Section.

14. Section 09 06 00, Finish and Color Schedule: Requirements for coatings, colors and gloss of materials in this Section.

15. Section 08 91 00, Louvers: Requirements for finishes provided in this Section.

1.02 REFERENCES

A. This Section incorporates by reference the following documents.

1. American Architectural Manufacturers Association (AAMA)


4. NAAMM (National Association of Architectural Metal Manufacturers) "Metal Finishes Manual for Architectural Metal Products"

5. Society for Protective Coatings (SSPC)
a. SSPC-SP 3 - Power Tool Cleaning; 1982 (Ed. 2004).
b. SSPC-SP 7 - Brush-Off Blast Cleaning; 2000 (Ed. 2004).
c. SSPC-SP 11 - Power Tool Cleaning to Bare Metal; 1987 (Ed. 2004).
d. SSPC-SP-10 Near-White Blast Cleaning

1.03 SYSTEM DESCRIPTION

A. Performance Requirements for HPC-1, HPC-2, and HPC-3:

1. Provide coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified:

   a. Abrasion resistance: 65, when tested in accordance with ASTM D 968.

   b. Adhesion: No pick-off, when tested in accordance with ASTM D 3359 Cross Cut Tape Test.

   c. Salt spray resistance: No field blisters, Max 1/32 inch creepage on scribe, when tested in accordance with ASTM B-117-85 5 percent Salt-Fog, 1000 hours.

   d. Chalking: Max. rating 8 for colors, 6 for whites, in accordance with ASTM D 659

   e. Accelerated Weathering:

      1) 60/60 cycle, 500 cycles, in accordance with ASTM D 3361, with chalk rating between 9 and 10 in accordance with ASTM D 659, and Color Change no more than 10 delta E units in accordance with ASTM D 2244, and Gloss Retention of min. 60 percent in accordance with ASTM D 523.

      2) 5000 hours, in accordance with ASTM D 822, with chalk rating of 8 to 10 in accordance with ASTM D 659, and color change of less than 5 delta E units in accordance with ASTM D 2244, and 60 percent gloss retention in accordance with ASTM D 523.

1.04 SUBMITTALS

A. Procedures: See Section 01 33 00, Submittal Procedures.

B. Submit complete high performance coating system submittals for all iron and steel work prior to or in conjunction with the steel shop drawings to assure compatibility between steel shop primer and intermediate and finish high performance coatings.

C. Product Data: Provide data indicating coating materials and standard color selections.

D. Samples: Submit four each samples 8 x 10 inches in size illustrating colors, gloss and finishes selected. Provide samples of both the thermo-curing and air drying PVDF coatings.

E. Manufacturer's Installation Instructions: Indicate special surface preparation procedures and perimeter conditions requiring special attention.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
G. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.

H. Certification: By manufacturer that all coatings do not contain any of the prohibited chemical specified; GreenSeal GS-11 shall constitute acceptable certification.

I. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

J. Applicators Quality Control procedures for shop and field painting and coating.

K. Manufacturers and Applicators Qualifications per Section 1.05; for all coating systems.

L. Warranties: Provide each Warranty listed, for review, per Section 1.07.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years documented experience, and acceptable to the manufacturer for all coating systems.

C. Mockup, In Place: Provide a full-size, full-height mockup of an exterior structural column to serve as the standard for the work of this Section. Comply with following:

1. Application of materials shall be performed using same materials, methods and procedures to be used throughout the balance of the Work.

2. Mock up shall incorporate specified surface preparation, including field touch of welds and abrasions with specified primer, tie/intermediate, as required, and finish top coatings, including Low-Temperature additive as proposed in the finish Work, as applicable.

3. Architect will direct location and extent of exterior structural steel to be coated.

4. Notify Architect in advance of dates and times when mockup is to be completed.

5. Architect's review and approval of mock up shall include, but not necessarily be limited to;
   a. Uniformity in color, gloss and hide characteristics of high performance finish.
   b. Applicator's ability to provide continuous film of uniform thickness, free from surface imperfections which show evidence of poor workmanship or the coating's inability to be applied in the proposed application method.
   c. Adhesion Testing as indicated in Article 1.08.


7. If the Architect determines that mockup does not meet requirements for accepted appearance, repaint using revised methods acceptable to the Architect.
8. Approved mockup may become part of the completed Work, if maintained undisturbed at time of Substantial Completion.

1.06 DELIVERY, STORAGE & HANDLING

A. Deliver materials to building in sealed, original, labeled containers bearing manufacturer's name, type of material, brand name, color designation, and instructions for mixing and thinning.

B. Store materials when not in actual use in a place specifically assigned for that purpose which is dry and out of direct sunlight. Store materials in a manner so as not to exceed the manufacturer's temperature limitations.

1.07 PROJECT CONDITIONS

A. Environmental Requirements: During field application or field touch up comply with the following:

1. Field apply coating only when the temperature of the surfaces to be coated and surrounding air temperature are above 55 degrees F as verified and documented, and are expected to remain so until the coating has fully dried or cured, unless other temperature limits are permitted by manufacturer's printed instructions.

2. Do not apply coatings in snow, rain, fog or mist or when the relative humidity exceeds 85 percent; or at temperatures less that 5 degrees F above the dew point; or to damp or wet surfaces. Allow wet or damp surfaces to dry thoroughly and attain the temperature and condition specified before proceeding with or continuing coating applications.

3. Work may continue during inclement weather only if areas and surfaces to be coated are enclosed and the temperature and humidity within the area can be maintained with limits specified by the manufacturer during application and curing periods.

4. Field applied coatings which, in the judgment of the Resident Engineer, are applied under improper conditions or which do not meet quality control standards shall be appropriately removed and reapplied at no additional cost to Sound Transit.

5. Provide lighting level of 80 foot candles measured mid-height at substrate surface.

6. Restrict traffic from area where coating is being applied or is curing.

1.08 TESTING FOR ADHESION

A. Field Testing: Field test tie/intermediate and finish coats which are to be applied and incorporate into requirements for in place mockup, above. The purpose of this field testing will be to ensure total adhesion of the materials to the various substrates. Notify Architect if results of any test are not in total conformance with the paint manufacturer's specifications. Commencement of work constitutes full responsibility for any resulting unsatisfactory finish.

1. Field test(s) shall be performed by the applicator according to procedure indicated and witnessed by the coating manufacturer's representative. Type and
frequency of tests shall be as stated, however additional tests may be directed by
the Architect to insure eligibility for Warranty.

a. Perform not less than two (2) each test(s) to finished mockup in exterior
locations least obvious to general viewing and can be easily repainted to
mask testing.

2. Test Procedure and Acceptance Criteria:

a. Test Method: ASTM D3359, Method B, Cross-Cut Tape Test; Standard
Test Methods for Measuring Adhesion by Tape Test.

b. Acceptance Criteria: Classification 4B, or better.

3. Test Area Restoration: Repair area from steel substrate to top coat in
accordance with manufacturer’s recommended procedures matching adjacent
coating appearance

1.09 WARRANTY

A. The warranty for each coating system shall be countersigned by both the coatings
manufacturer for materials, and by the applicator for workmanship.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for bond to substrate.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements of Article 1.05 of this Section and as approved
by the Resident Engineer.

B. HPC coating systems are to be from the same manufacturer.

C. Paint systems listed are Basis of Design. Other manufacturer’s systems are acceptable if
approved equal.

D. Substitutions: See Section 01 25 00, Substitution Procedures.

2.02 MATERIALS

A. General: Provide complete multi-coat systems formulated and recommended by
manufacturer for the applications indicated, in the thicknesses indicated. Number of
coats specified does not include primer or filler coats.

B. Maximum volatile organic compound (VOC) content: As limited by applicable regulations
of Authority Having Jurisdiction.

C. Colors: See Section 09 90 10, Finish and Color Schedule.

D. Sheen: Finish coats, where exposed to public view, shall have semi-gloss sheen.

E. Coatings: Numbers of Coats listed are minimums. Apply coats as required to achieve
specified dry film thicknesses (dft).
F. **HPC-2**: High-Performance Coating for Exposed Primed Steel: High solids zinc-rich epoxy/acrylic urethane. DeVoe, Tnemec or approved equal.

1. Number of Coats: 3 Coats Min.
2. Total Dry Film Thickness: 11-15 mils dft
3. Surface Preparation: SSPC-SP-10
4. Primer: See Section 05 05 13 – Shop Applied Coatings for Metal.
5. Intermediate: High-Build Epoxy, 4 mils dft
   a. DeVoe Devran 261QC
   b. Tnemec Series N69 Hi-Build Epoxoline II
6. Finish: Aliphatic Acrylic Polyurethane, 4 mils dft
   a. Tnemec Endura-Shield Series 750
   b. DeVoe Devthane 349QC

G. **HPC-4**: High-Performance Coating to Separate Dissimilar Metals: Coal Tar Epoxy Coating:

1. Two coats, Min. high-build, two-part, SSPC-Paint 16 at locations detailed or where recommended by envelope system manufacturers. Manufacturers listed dry film thicknesses are to be used as a min. dft for the system.

H. **HPC-5**: High-Performance Primers: As recommended by coating manufacturer for specific substrate, unless otherwise specified.

1. Type A: Zinc-Rich Primer
   a. Number of Coats: 1 Coat min.
   b. Total Dry Film Thickness: 3 mils dry film thickness
   c. Surface Preparation: SSPC-SP-10
   d. Primer: Zinc-Rich Primer, 3 mils dft

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**2.03 HIGH-PERFORMANCE STRUCTURAL STEEL COATINGS AT CONNECTIONS**

A. Faying surfaces and interiors of bolt holes for bolted structural steel connection in steel that is coated under this Section shall receive only primer prior to erection. Primer shall meet or exceed slip coefficient requirements for fully coated connections from AISC for buildings and AASHTO for bridges and tunnels.

1. Type: Urethane Primer
2. 63 percent solids by volume
3. 82 percent zinc in cured film
4. 23 pounds per gallon
5. VOC compliance
6. Lead free
7. Provides Class B faying surface of slip-critical joints in accordance with ASTM C1028

B. Bolts (except Tension control bolts) and other fasteners for bolted structural steel connections in steel that are coated under this Section shall be furnished with mechanical galvanizing in accordance with AASHTO M-298, Class 55, Type 1.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

C. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 16 percent.

D. Masonry: Verify masonry joints are struck smooth and mortar is fully cured.

3.02 PREPARATION

A. General: Surface preparations and cleaning procedures shall be in strict accordance with the instructions and specifications of the coating manufacturer and with the requirements of this specification.

B. Cleaning for Shop Primed Surfaces: Thoroughly clean steel surfaces to remove all surface oils and other contaminants. Clean surfaces using power washing equipment and non-phosphate, biodegradable chemical cleaner.

1. Field test on a small area to determine the most effective method (type of nozzle employed, operating pressure, and distance of nozzle from surface) to achieve maximum cleaning results without damaging or etching the existing primer.

2. After washing with cleaner, power wash surfaces thoroughly with fresh water under high pressure to remove all traces of the chemical cleaner.

C. Cleaning For Galvanized/Galvannealed Surfaces: Thoroughly clean steel surfaces to remove surface oils and other contaminants in accordance with SSPC SP-1 "Solvent Cleaning". Follow manufacturer's additional requirements for the removal of soluble salts as may be required in accordance with SSPC SP- COM.

D. Cleaning and Touch-Up for abraded areas in field erection and fabrication is included under respective referenced Sections.

3.03 APPLICATION

A. During application of each coating, remove all foreign material from applicators (brush, rollers or pads) and protect wet surfaces from contamination of air borne dust and debris.

B. Priming
1. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

2. Concrete Masonry: Apply masonry filler to thickness required to fill holes and produce smooth surface; minimum thickness of 30 mils.

3. Steel Primer: Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

C. Intermediate Coats:

1. Repair, and recoat any blisters, runs or sags in primer coat prior to application of intermediate coats.

2. Intermediate coats shall fully cover and hide primer coat.

D. Finish Coats:

1. Repair, and recoat any blisters, runs or sags in primer coat prior to application of finish coats.

2. Finish coats shall fully cover and hide intermediate coat. Prior to start of work, confirm to the Resident Engineer, proposed number of finish coats will result in specified dry film thickness requirements.

3.04 PROTECTION AND TOUCH-UP WORK:

A. After completion of field erection of steel work, remove rust, scale, dirt, grease, and other foreign material from connections, bolts, nuts, and areas around welds.

1. Field Repair of Zinc/Epoxy/Urethane Paint Systems:
   a. Where damage is limited to the epoxy or urethane coatings, use hand tool cleaning in accordance with SSPC-SP-2 or power tool cleaning in accordance with SSPC-SP-3 to visibly damaged areas. Feather edges by mechanical means. Spot prime with the epoxy and topcoat with the specified polyurethane.
   b. For minor scratches to the polyurethane top coat, clean and scuff sand the damaged area and apply the polyurethane in accordance with manufacturer’s recommendations.
   c. Scratches, gouges, and other damaged areas where the substrate is exposed, spot field blast in accordance with SSPC-SP-6. Spot prime with organic zinc, followed by epoxy and urethane in accordance with Contract Specifications.
   d. Solvent clean in accordance with SSPC-SP-1.

2. Coat connectors and disturbed surfaces to match adjacent surfaces. Field touchup work shall use the same sequence and thickness of coatings as specified for the original work. Touchup application efforts shall be done in accordance with the recommendations of the coating manufacturer, subject to acceptability to the Resident Engineer.

B. Coat connectors and disturbed surfaces to match adjacent surfaces. Field touchup work shall use the same sequence and thickness of coatings as specified for the original work.
Touchup application efforts shall be done in accordance with the recommendations of the coating manufacturer, subject to acceptability to the Resident Engineer.

C. Coated assemblies shall be adequately protected from handling and shipping damage with the use of padded slings, dunnage, separators, tie downs, or other protective devices and methods. Use of bare cables is prohibited.

D. Protect work of this and other trades, whether to be coated or not, against damage from coatings and coating operations. Correct damage by cleaning, repairing, replacing, or recoating as acceptable to the Resident Engineer. Leave affected surfaces in undamaged condition. Touchup areas shall blend with finish coats. Additional touchup or an addition finish coat shall be required if there are visual imperfections, due to touchup work, as determined by the Resident Engineer, when viewed from a distance of 10 feet.

E. Continue protection, repair procedures, and touchup procedures as necessary so that coatings will be in an undamaged condition at the time of substantial completion.

3.05 CLEANING

A. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 EXTRA STOCK

A. Provide maintenance materials in the following quantities:

1. Coating Products: Five gallons of each color and product type.

B. Label each container with manufacturer’s name, product number, finish color, sheen, date used, and locations where applied.

1. Label to include specific location, as indicated and coordinated with Room, Door, and other applicable contract document schedules.

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 10 14 00
SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:

1. Signage intended to include items for identification, direction, control, and information of building where installed as complete integrated system from a single manufacturer.

B. Related Sections:

1. Section 08 71 00, Door Hardware: Signage mounted on doors to remain unlocked during business hours.
3. Section 14 21 00, Electric Traction Elevators: Coordinator for frame mounted medical emergency designations identifiable signs.
4. Division 23, Section 23 05 53, "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for mechanical equipment.
5. Division 26, Section 26 05 53, "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.
6. Other signage such as illuminated exit signage, etc., (SBC 1011) are specified in Division 26.

C. Types of signs required by this work include, but are not limited to:

1. Exit Signs: To identity exits and exit access doors, (SBC 1011), and including under Related Sections.
2. Stairs, Stairway Landings: To identify access, stair number, floor number and existence or absence of roof access, (SBC 1020.1.6).
3. Elevator Signs: Emergency signs at each landing above ground floor to indicated exiting by stairs, (SBC 1109.6); Coordinate with Section 14 21 00.
4. Accessibility Signage: To indicate accessible parking stalls (SBC 1106.1), areas of refuge (SBC 1007.6.5), loading zones, toilet facilities, and directional signage to accessible facilities, (SBC 1110).
5. Posting Maximum Room (Occupancy) Capacity: Provide room capacity sign for assembly rooms and individual spaces as indicated, (SBC 1004.3).
6. Posting Maximum Live Loads: Provide loading capacity sign for room as required by (SBC 1603.3).
D. All sign copy shall be as required by the various codes involved.

E. Types of room required signs shall be in listed in 3.03 SIGN SCHEDULE, located at the end of this section.

1.02 REFERENCES

A. Governing Codes:
   1. International Code Council, Inc. (ICC), Seattle Building Code (SBC) 2006 ED, including State of Washington amendments, as applicable.
   2. Americans with Disabilities Act (ADA), ICC A117.1

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Submittals Required: The Contractor shall submit for review, before fabrication and after approval by the applicable code authorities, the following items for each type of sign to be provided in the Project:
   1. Product Data: Manufacturer’s information relating to the materials, finishes, and fasteners used in each type of sign.
   2. Shop drawings: Show type, size, color and thickness of typography, symbols, wording and attachment proposed for each type of sign.
   3. Product Schedule: Include location plan showing the exact location for all signs being provided.

C. Architect’s Review: The review made by the Architect shall be for general design coordination only and shall not relieve the Contractor from his responsibility to conform to the applicable codes.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of signage manufacturer for installation and maintenance of units required for this Project.

B. Source Limitations: Obtain each sign type through one source from a single manufacturer.

C. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and code provisions as adopted by authorities having jurisdiction.

1.05 COORDINATION

A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.
   1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

B. Coordinate installation with adjacent finish materials in manner not to destroy adjacent surfaces.
1.06  DELIVERY, STORAGE AND HANDLING

A. General: Comply with requirements of Section 01 60 00 – Product Requirements.

B. Handle signage in careful manner to prevent damage or marring of sign surfaces or adjacent finishes.

1.07  WARRANTY

A. General: Comply with Section 01 78 23 – Operation and Maintenance Data.

Manufacturer’s Warranty: Provide (5) five year limited warranty covering coating degradation, chalking, fading and delamination.

PART 2 - PRODUCTS

2.01  MANUFACTURER/FABRICATORS

A. Signage Manufacturers/Fabricators:

1. ASI
2. Fast Signs
3. Tube Art
4. Or approved equal

2.02  TYPICAL SIGNS

A. General: All materials shall be new and free from defects upon completion of the Contractor’s work, and unless other standards are specified elsewhere in the Contract Documents, shall be of the best type and quality available for the purpose. All material shall be the products of manufacturers or suppliers of established good reputations regularly engaged in the furnishing of such materials. All of the Contractor's work shall be performed with the highest degree of skill and completed in accordance with the Contract Documents.

B. Signs Description:

1. Material: Integral colored injection molded high impact UV resistant, colorfast, cast acrylic, nominal 1/8 inch thick with square corner and edges.

2. Type: Unframed

3. Mounting: Wall or vertical service as follows:

   a. Interior: Double sided vinyl tape.

4. Copy Process: Tactile and Braille; photo-etched plastic and laminated to the insert face in one piece. Individually applied characters and Braille strips are expressly disallowed.

5. Copy and Color: Black, Blue, Red or Yellow as shown in 3.03 SIGN SCHEDULE.

6. Nominal Size: 8 inches by 10 inches, or as noted.
2.03 TYPOGRAPHY

A. Typography shall comply with code requirements. All lettering shall be executed in such a manner that all edges and corners of the letter forms are correctly spaced, true, clean, and photographically precise and must accurately reproduce the letter form.

B. Type face shall be Humanist 777 Bold Condensed, unless otherwise noted, upper and lower case, unless otherwise required by code.

2. Color: Refer to 3.03 SIGN SCHEDULE for specific letter colors on backgrounds.
   a. White letters on Black background.
   b. Black letters on Yellow background.
   c. White letters on Red background.
   d. White letters on Blue background.
   e. Red letters on yellow background, unless otherwise indicated.

2.04 PAINT COLORS:

A. Paint Colors based on Matthews Paint.

1. Yellow: P4 MP31456
2. Blue: ADA Blue MP00366
3. Red: P3 MP00643
4. Black: Black
5. White: White

2.05 TACTILE (ADA) AND NON-TACTILE PLAQUE SIGNS INTERIOR APPLICATIONS

A. Tactile Signs: Faces shall consist of minimum 5/8 inch text in all caps. Text shall be raised a minimum of 1/32 inch above the surface of the sign panel. Grade 2 Braille shall be provided in a minimum dot height of .025 inch with inset round glass beads. Braille shall be separated 3/8 inch (9.5 mm) minimum from any other tactile characters. Adhesive-fixed characters are not acceptable.

B. Clean ability: Signs shall be cleanable with soap detergents and other similar non-abrasive cleaners without damage to the sign surface. Contractor shall provide complete cleaning instructions.

C. Mounting: Use foam tape in all interior areas.
PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Locate sign units and accessories where indicated, or directed by Architect using mounting methods of the type described and in compliance with the manufacturer's instructions.

   1. Comply with the ADA Accessibility Guidelines and ICC A117.1.

B. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

C. Signs shall be detailed to make all edges less vulnerable to prying or removal.

D. All plaque signs shall be flush mounted, leaving no space behind sign, and installed using tamper-proof fasteners.

E. For signage attachment refer to notes on Drawing sheet N21-AN100 “Signage Remarks”

3.02 CLEANING, PROTECTION, AND REPAIR

A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 5 feet.

B. Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project in accordance with provisions in Division 1.

3.03 SIGN SCHEDULE

A. Schedule: Refer to signage schedule and Drawings for sizes, locations, and layout of signage types, sign text copy, and graphics.
3.03 SIGN SCHEDULE

Sign Types

**J1.0**
- N5-M21
- SWITCHGEAR
- TPSS
- **ACCESS TO MECHANICAL ELECTRICAL**

Code Room ID (8x10)
3/4" + 5/8" + Braille
White copy on Black

**RW suffix:**
White copy on Red

**J1.1**
- N5-M21
- SWITCHGEAR
- TPSS
- **ACCESS TO MECHANICAL ELECTRICAL**

Code Room ID (8x10 and as required)
3/4" + 5/8" + Braille
White copy on Black

**RW suffix:**
White copy on Red

**J2.0**
- AUTHORIZED ACCESS ONLY
- DANGER HIGH VOLTAGE

Warning (8x10)
1" Copy + Braille
Red copy on yellow

(see J2.0)

**J2.1**
- AUTHORIZED ACCESS ONLY
- FALL RESTRAINT REQUIRED

(See J2.0)

**J2.2**
- AUTHORIZED ACCESS ONLY

Alarm (8x5) + Braille

(see J2.0)

**J2.3**
- ALARM WILL SOUND

**J2.4**
- SHAFTWAY

Code Warning Shaftway Sign
(8 x as required) 6" copy
White copy on red
J2.5 TRACTION POWER EMERGENCY TRIP STATION (ETS)

Caution:
Switch de-energizes both NB and SB Tracks
Contact Link Control via ETEL prior to de-energizing

ETS ID
(10 x as required)
1" + 5/6" Copy
White copy on red

J2.6 TRACTION POWER EMERGENCY TRIP STATION (ETS)

Caution:
Switches de-energize either NB or SB Tracks
Contact Link Control via ETEL prior to de-energizing

ETS ID
(10 x as required)
1" + 5/6" Copy
White copy on red

J2.7 DOOR TO REMAIN CLOSED AT ALL TIMES

Door Closed (8x6)
3/4" Copy

J3.0 N5-5P14 TOILET

Code Room ID (8x10)
3/4" + 5/8" + Braille
M+F Symbol
White copy on Black

J4.0 N5-5P14 EXIT STAIR 2

Stair ID (8x10)
3/4" + 1" Copy + Braille
White copy on Black
J4.1 Refuge Area ID (8x10)
3/4" + 1" Copy + Braille
White copy on Blue

J5.0 Combination Sign ID (8x10)
3/4" + 1" Copy + Braille
White copy on Black
Black copy on yellow

J6.0 NOT AN EXIT Sign (8x10)
Black copy on Yellow

J6.1 EXIT Sign (8x10)
3" Copy + Braille
White copy on Black

J7.0 MAXIMUM PLATFORM OCCUPANCY
1,308

J7.1 MAXIMUM FLOOR LOAD
XXX PSF
Floor Load (8x6)
3/4" Copy
White copy on Black
J10.0 STAIR 2

Stairway ID (18X12)
1-1/2" + 5" copy
+ Braille

J10.1 STAIR 2

Stair Level Sign ID (12X18)
1" + 5" copy + Braille

CONTINUE UP TO EXIT
ACCESS TO
S, M, B1, B1, B3, B4, P

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 10 14 53
TRAFFIC SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY
   A. This Section includes specifications for furnishing and installing permanent traffic signage, signage removal, signage relocation, and refacing existing signage as indicated.

1.02 REFERENCES
   A. This Section incorporates by reference the latest revisions of the following documents. It is a part of this Section as specified and modified. In case of a conflict between the requirements of this Section and those of a listed document, the requirements of this Section shall prevail. Precedence is in the order shown

   1. City of Seattle (COS)
      a. COS Standard Specifications for Road, Bridge, and Municipal Construction
      b. COS Standard Plans for Municipal Construction
      c. COS Traffic Control Manual For In-Street Work

   2. Washington State Department of Transportation (WSDOT)
      a. Standard Specifications for Road, Bridge, and Municipal Construction, M41-10
      b. Standard Plans for Road, Bridge, and Municipal Construction

   3. Federal Highway Administration (FHWA)
      a. Manual on Uniform Traffic Control Devices (MUTCD)

1.03 SUBMITTALS
   A. Procedures: Section 01 33 00, Submittal Procedures.
   B. Product Data: Submit to the Resident Engineer for approval, the respective manufacturers' product data for signage materials.

PART 2 - PRODUCTS

2.01 MATERIALS
   A. For roadway signage on Sound Transit owned streets, roadways, and parking lots, use materials, including posts, as indicated on the Contract Drawings and conform to the applicable provisions of WSDOT 8-21, unless specified otherwise.
B. For roadway signage on roadways and parking areas that will be owned or maintained by jurisdictions other than Sound Transit, use materials that conform to the applicable requirements of the jurisdictional agency’s standard drawings and specifications.

PART 3 - EXECUTION

3.01 CONSTRUCTION

A. For roadway signage on streets, roadways and parking areas that will be owned or maintained by jurisdictions other than Sound Transit, perform Work described in this Section in accordance with the applicable standard drawings and specifications of the respective jurisdictional agency.

B. Traffic sign, sign post, and post foundation removals and salvage will conform to requirements of COS standards and specifications.

C. Traffic sign removals will be performed upon approval from the Resident Engineer. Removal of traffic signs shall not result in a degradation of, or have an adverse affect on, traffic operations.

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 10 26 13

CORNER GUARDS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for wall corner guards as detailed or indicated on Drawings.
   1. Surface-mounted stainless steel guards.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 09 21 16, Gypsum Board Assemblies: Wall construction.
   2. Section 09 06 00, Schedule for Finishes: Locations, styles and colors.

1.02 REFERENCES

A. This Section incorporates by reference the following documents.
   1. American Society for Testing and Materials International (ASTM)

1.03 SUBMITTALS

A. Procedures: See Section 01 33 00, Submittal Procedures.

B. Product Data: Indicate physical dimensions, features, anchorage details, and rough-in measurements.

C. Samples: Submit four each sections of corner guard, 12 inches long, illustrating component design, configuration, color and finish.

1.04 DELIVERY, HANDLING & STORAGE

A. Deliver corner guards in unopened protective packaging. Maintain protective covers on all items until installation is complete. Remove covers at final clean-up of installation.

1.05 PROJECT CONDITIONS

A. Coordinate the work with wall or partition sections for installation of concealed blocking or anchor devices.
PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
   3. Substitutions: See Section 01 25 00, Substitution Procedures.

2.02 COMPONENTS

A. Stainless Steel Corner Guard (CG-1) - Surface Mounted:
   1. Fabricate from stainless steel sheet, minimum 0.059 inch thick (16 gage) type 430 stainless steel.
   2. Configuration: 90 degree with 1/8 inch radius nose, 2 inch wings, height as shown. Exposed edges eased.
   3. Mounting: Adhesive or Tape: Low-odor, low-VOC liquid adhesive or double-faced adhesive foam tape as recommended by corner guard manufacturer.
   4. Finish: Manufacturer's standard satin; provide adhesive paper to protect finish during construction operations.

2.03 FABRICATION

A. Fabricate components with tight joints, corners and seams.
B. Pre-drill holes for attachment.
C. Form end trim closure by capping and finishing smooth.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that rough-in for components are correctly sized and located.

3.02 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall-protection system components.
B. Before installation, clean substrate to remove dust, debris, and loose particles

3.03 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and/or plumb, secured rigidly in position to wall framing members only.
   1. Stainless steel corner guards: Apply adhesive or foam tape to back of corner guards and place in position, pressing firmly to wall; remove excess adhesive from around edges and allowed to dry a minimum of 24 hours.
2. Plastic corner guards: Install mounting brackets and attachment hardware as appropriate to substrate as recommended by manufacturer.

B. Position corner guard from 6 inches above finished floor to 78 inches high.

3.04 CONSTRUCTION

A. Erection Tolerances

1. Maximum Variation from Required Height: 1/4 inch.

2. Maximum Variation from Level or Plane for Visible Length: 1/8 inch.

3.05 CLEANING

A. Immediately after completion of installation, clean surfaces and accessories using a standard, ammonia-based, household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

3.06 SCHEDULE

A. CG-1: Corner guards, grey color, to external wall corners as indicated on Contract Drawings.

B. CG-2: Corner guards, stainless steel, at locations as indicated on Contract Drawings.

END OF SECTION
SECTION 10 28 10
TOILET AND UTILITY ROOM ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for furnishing and installing:
   1. Accessories for staff toilets and utility rooms.
   2. Grab bars.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.
   1. Section 06 10 00, Rough Carpentry: Backing and blocking
   2. Section 08 83 10, Vandal-Resistant Mirrors: Mirrors.
   3. Section 26 05 25, Wire and Cable: Wiring for electric hand dryer accessory.

1.02 REFERENCES

A. This Section incorporates by reference the following documents.
   1. American National Standards Institute (ANSI)
      c. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2005a.
      d. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.
1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

C. Submit blocking/reinforcement drawings showing anchorage requirements to be provided by Installer of wall framing specified in Section 09 21 16, Gypsum Board Assemblies. Deliver approved drawings to wall framing installer.

D. Manufacturer’s Installation Instructions: Indicate special procedures and conditions requiring special attention.

1.04 QUALITY ASSURANCE

A. All toilet and utility room accessories are required to comply with Sound Transit’s Accessibility Design Guidelines, ADAAG and ANSI/ICC A 117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Comply with all applicable standards referenced in Article 1.2A herein.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Execute product manufacturer’s special instructions to prevent damage to products. Store products in manufacturer's original shipping containers.

1.06 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by persons with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive and structurally support anchor attachments.

C. Coordinate with and match mirror trim specified in Section 08 83 10.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Toilet Accessories:


4. Substitutions: Section 01 25 00, Substitution Procedures.

B. All items of each type to be made by the same manufacturer.
2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

1. Grind welded joints smooth.

2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Provide two keys for each accessory to Sound Transit; master key all lockable accessories.

C. Stainless Steel Sheet: ASTM A 666, Type 316.

D. Stainless Steel Tubing: ASTM A 269, Type 316.


F. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.

G. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 ACCESSORIES

A. Toilet Room Accessories:

1. TA-1: Toilet Paper (Roll) Dispenser (TPD): Double roll, surface mounted bracket type, satin finished cast aluminum brackets, eccentric-shaped plastic spindle for 1/2 revolution delivery designed to prevent theft of tissue roll.

   a. Basis-of-Design Product: Bobrick, Model #B274
   
   b. Description: Double-roll dispenser.
   
   c. Mounting: Surface-mounted.
   
   d. Capacity: Designed for 4-1/2- or 5-inch- diameter tissue rolls.
   
   e. Material and Finish: Stainless Steel, No. 4 finish (satin).

2. TA-2: Combination Towel Dispenser/Waste Receptacle (PTD/WR): Recessed with projecting waste receptacle, stainless steel; seamless wall flanges, continuous piano hinges, tumbler locks on upper and lower doors. **Not Applicable for N140**

   
   b. Waste receptacle liner: Reusable, heavy-duty vinyl.
   
   c. Towel dispenser capacity: 700 multifold.
   
   d. Waste receptacle capacity: 12 gallons.
   
   e. Mounting: Recessed with projecting receptacle.

      1) Designed for nominal 4-inch wall depth.
3. **TA-3: Soap Dispenser (SD):** Liquid soap dispenser, wall-mounted, surface, for with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gage refill indicator, tumbler lock.
   a. **Basis-of-Design Product:** Bobrick, Model #B-2112
   b. **Description:** Designed for dispensing soap in liquid or lotion form.
   c. **Mounting:** Horizontally oriented, surface-mounted.
   d. **Capacity:** 40 oz.
   e. **Materials:** Stainless Steel, Satin Finish. Soap valve designed for dispensing soap in liquid form.
   f. **Lockset:** Tumbler type.
   g. **Refill Indicator:** Window type.

4. **TA-4: Mirrors (MIR):** See Section 08 83 10, Vandal-Resistant Mirrors for requirements.

5. **TA-5: Seat Cover Dispenser (SCD):** Stainless steel, surface-mounted, reloading by concealed opening at base, tumbler lock.
   a. **Basis-of-Design Product:** Bobrick, Model # B-221.
   b. **Mounting:** Surface mounted.
   c. **Minimum Capacity:** 250 seat covers.
   d. **Exposed Material and Finish:** Stainless steel, No. 4 finish (satin).
   e. **Lockset:** Tumbler type.

6. **TA-6: Grab Bars (GB):** Stainless steel, 1-1/2 inches outside diameter, minimum 0.05 inch wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.
   a. **Basis-of-Design Product:** Bobrick, Model #B-5804
   b. **Mounting:** Flanges with concealed fasteners.
   c. **Material:** Stainless steel, 18-gauge thick.
      1) **Finish:** Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.
   d. **Outside Diameter:** 1-1/4 inches.
   e. **Configuration and Length:** As indicated on Contract Drawings.

7. **TA-7: Surface-Mounted Electric Hand Dryer (EHD):**
   a. **Basis-of-Design Product:** Bobrick, Model #B-740
   b. **Description:** Surface-mounted hand dryer, auto pilot operation.
   c. **Mounting:** Surface mounted.
e. Color/Finish: Acid-resistant vitreous enamel, white color.
f. Cover Material: One-piece, minimum 1/8-inch thick, grey iron-casting.
g. Electrical Work Description: Provide wiring, power connection and load testing under work of Section 26 05 25.

8. TA-8: Combination Sanitary Napkin/Tampon Vendor (SNV): Stainless steel, recessed. **Not Applicable for N140**
   a. Basis-of-Design Product: Bobrick Model #B-43500X2 50; 50 cent coin operation.
   b. Door: Seamless 0.05 inch door with returned edges and tumbler lock.
   c. Cabinet: Fully welded, 0.03 inch thick sheet.
   d. Operation: 25 cent coin required to operate dispenser. Provide locked coin box, separately keyed.
   e. Identify dispensers slots without using brand names.
   f. Minimum capacity: 30 napkins and 20 tampons.

9. TA-9: Sanitary Napkin Receptacle Unit (SNR):
   b. Stainless steel, surface-mounted with adjustable flanges, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

    b. Material: Anti-microbial, molded, closed cell vinyl covers;
       1) 1/8" nominal wall thickness; 60-70 Shore A hardness,
       2) Finish: Smooth, high gloss;
       3) Color: To be selected from manufactures standard colors by Resident Engineer.

    b. Waste receptacle liner: Reusable, heavy-duty vinyl.
    c. Mounting: Surface-mounted.
    d. Capacity: 6.4 gallons.
12. **TA-12: Combination Sanitary Napkin/Tampon Vendor (SNV): Stainless steel, surface mounted**
   a. Basis-of-Design Product: Bobrick Model #B-2706 50; 50 cent coin operation.
   b. Door: Seamless 0.05 inch door with returned edges and tumbler lock.
   c. Cabinet: Fully welded, 0.03 inch thick sheet.
   d. Operation: 25 cent coin required to operate dispenser. Provide locked coin box, separately keyed.
   e. Identify dispensers slots without using brand names.
   f. Minimum capacity: 30 napkins and 20 tampons.

B. **Utility Rooms Accessories:**
   1. **Combination Utility Shelf/Mop and Broom Holder (MH):**
      a. Basis-of-Design Product: Bobrick, Model #B-224
      b. Description: Unit with shelf, holders, and rod suspended beneath shelf.
      c. Length: 30 inches.
      d. Material and Finish: Stainless steel, No. 4 finish (satin).
         1) Shelf: Not less than nominal 0.05-inch thick stainless steel.
      e. Hooks: 5, 0.06 inch stainless steel rag hooks at shelf front.

2.04 **FINISHES**

A. Stainless Steel: No. 4 satin random-orbital brushed finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B 456, SC 2, satin finish, unless otherwise noted.

C. Baked Enamel: Pre-treat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

D. Galvanizing for Items Other than Sheet: Comply with ASTM A 123/A 123M; galvanize ferrous metal and fastening devices.

E. Provide bituminous coating of components where contact is made with building finishes to prevent electrolysis. See Section 09 96 00 - High-Performance Coatings.

2.05 **FABRICATION**

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Resident Engineer.
PART 3 - EXECUTION

3.01 EXAMINATION
   A. Verify existing conditions before starting work.
   B. Verify exact location of accessories for installation.

3.02 PREPARATION
   A. Deliver inserts and rough-in frames to site for timely installation.
   B. Provide templates and rough-in measurements as required.
   C. Clean surfaces to receive accessories. Protect surrounding elements from damage during accessory installation.

3.03 INSTALLATION
   A. Install accessories in accordance with manufacturers' instructions.
   B. Install plumb and level, securely and rigidly anchored to substrate.
   C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings.

3.04 ADJUSTING
   A. Adjust accessories as required to provide smooth operation and trouble free servicing.

3.05 CLEANING
   A. Clean and polish exposed surfaces of accessories using accessory manufacturer's recommended procedures and cleaning agents.

3.06 PROTECTION
   A. Provide coverings as required to protect installed accessories.

END OF SECTION
1.01 SUMMARY

A. This Section includes specifications for:

1. Fire extinguishers.
   a. FE-1: Multipurpose dry chemical for general use, bracket mounted.
   b. FE-2: B-C dry chemical for electrical rooms, bracket mounted.

2. Fire extinguisher cabinets and wall mounted brackets.
   a. FEC-1: Non-rated fully recessed cabinet with FE-1.
   c. FEC-3: Stainless steel wall mounted brackets for both FE-1 and FE-2 fire extinguishers.

3. Accessories.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. National Fire Protection Association (NFPA)
   a. NFPA 10 - Standard for Portable Fire Extinguishers;

2. Underwriters Laboratories Inc., (UL)
   a. UL (FPED) - Fire Protection Equipment Directory;

1.03 SYSTEM DESCRIPTION

A. Performance Requirements

1. Conform to NFPA 10.

2. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.04 SUBMITTALS

A. Submittal procedures: Section 01 33 00, Submittals Procedures.

B. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguishers, cabinets, and mounting brackets.
C. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function.

D. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements, and location.

E. Extinguisher inventory list of all portable fire extinguishers for Owner inventory and Confidence Testing purposes. This list is to identify the type, rating, and location of each fire extinguisher by specific room number and location within the room. For corridors and large rooms, provide a wall orientation or other reference. (i.e., Room 423, SE corner, or, Corridor 200k, by Room 211).

1.05 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by UL or an Independent Testing Laboratory acceptable to the Seattle Fire Department.

C. Coordination: Verify that cabinets are sized to accommodate type and capacity of extinguishers indicated.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver fire extinguisher cabinets to building in unopened protective packaging, labeled with manufacturer's name and model numbers as they appear on products. Store cabinets in their original packaging in a dry location.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers

1. Amerex Corporation.
2. Ansul Incorporated; Tyco International Ltd.
4. JL Industries, Inc.
5. Larsen's Manufacturing Co.
8. Substitutions: See Section 01 60 00, Product Requirements.

B. Fire Extinguisher Cabinets

1. JL Industries, Inc.
2. Larsen's Manufacturing Co.
4. Strike First Corp. of America.
5. Substitutions: See Section 01 60 00, Product Requirements.

2.02 EQUIPMENT

   A. Fire Extinguishers

      1. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

         a. Provide extinguishers labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

      2. FE-1 - Multi-purpose Dry Chemical Type Fire Extinguishers:

         a. Nominal Size 10 pound.
         b. UL-rated 4A:40B:C or better.
         c. Finish: Red polyester powder coat.

      3. FE-2 - Fire Extinguishers for Electrical Rooms: BC Dry Chemical Type Fire Extinguishers:

         a. Nominal Size: 5 pounds.
         b. UL-rated 10B:C or better.
         c. Finish: Red polyester powder coat.

2.03 MOUNTING BRACKETS

   A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated.

2.04 CABINETS

   A. Fire Extinguisher Cabinets

      1. Metal: Formed stainless steel sheet; 0.036 inch thick base metal.

      2. FEC-1: Cabinet Configuration: Fully-recessed type with standard tub, similar to J.L. Industries "Ambassador" Series with flat trim and W style door.

         b. Trim: Flat, 1-1/2 or 1-3/4 inch wide face.

      3. FEC-2: Cabinet Configuration: Semi-recessed type with fire-rated tub, similar to J.L. Industries "Ambassador" Series with flat trim and W style door.

         b. Trim: 1-1/2 inch projection quarter-round or square return trim.
4. Door: 0.036 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with continuous piano hinge.
   a. Lock and handle: Cylinder lock with cam and safety release to permit opening of door with sharp pull; aluminum or zinc plated handle.
      1) J.L. Industries "Saf-T-Lok", Larsens "Larsen Loc" or equivalent.

5. Door Glazing: Glass, clear, 1/8 inch thick tempered. Set in resilient channel gasket glazing.


7. Weld, fill, and grind components smooth.

8. Finish of Cabinet Exterior Trim and Door: No. 4.


10. Lettering Identification: The words "FIRE EXTINGUISHER" located vertically in red color.

B. Fire Extinguisher Wall Mounted Brackets

   1. Material: Stainless steel with spring-type bands top and bottom.

   2. Basis of Design: Larsen’s Manufacturing; Bracket Model 846.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of Seattle Fire Department.

   1. Furnish fire extinguisher no sooner than 60 days, and no later than 14 days prior to scheduled substantial project completion.

   2. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

3.03 ACCEPTANCE

A. As a condition for final acceptance, the contractor shall submit the following documents to the Owner:

   1. Complete extinguisher inventory including all changes.
CONTRACT SPECIFICATIONS

SECTION 10 81 13

BIRD CONTROL DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for bird deterrent systems to deter birds from landing at station roofs and canopy edges and at other exposed structures at locations indicated on Contract Drawings. System types include.

1. Pin and wire. (BCD-1)
2. Electric track. (BCD-2)

B. Related Sections:

1. Division 26: Conduit for wiring from power pack to electric track. Power supply for power pack.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Society for Prevention of Cruelty to Animals (ASPCA)

   a. ASPCA HANDBOOK

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Manufacturer's descriptive product data.

C. Shop Drawings:

1. Indicate typical layout in plan and elevation including dimensions and anchoring provisions, type design and spacing for each substrate and condition for track. Show position of track to building edge conditions for viewing angle.

2. Submit detail drawings of special accessory components not included in manufacturer's product data.

3. Show orientation and mounting provisions for charger units.

4. Wiring diagrams and power requirements.

D. Verification Samples:

1. Pin and wire system:

   a. Wire support posts for approval.
b. Control wire, 6 inches long each.

2. Electric track system:
   a. 24-inch long section of track with couplings.
   b. Each type of exposed mounting hardware

E. Manufacturer’s Installation Instructions: Indicate preparation and installation instructions.

F. Manufacturer’s Certificate: Certify that products meet or exceed specified requirements.

G. Certificate from Seattle DPD indicating approval of system and materials used.

H. Qualification statements for installing mechanics.

1.04 SYSTEM DESCRIPTION

A. Humane pin-and-wire bird deterrent system to deter birds from roosting at edges of facility and creating nuisance and potential health hazard.

B. Low-visibility, bird-shock track system, complete with power pack (charging unit) for producing an intermittent pulse of high voltage, low amperage current to prevent damage to building from bird droppings.

C. ASPCA approval systems.

1.05 QUALITY ASSURANCE

A. Manufacturer qualifications: Company specializing in manufacturing the products specified in this Section with minimum 3 years documented experience.

B. Installer Qualifications: Company completely familiar with installation of products similar to those required for this Contract.

C. Mock-Up
   1. Install one pin-and-wire assembly representative of each design required on Contract.
   2. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
   3. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups that are not accepted.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store and handle materials to avoid damage to products and injury to Installers.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Post and Wire System:

2. Other acceptable manufacturers and products:

B. Electric Track System:
   2. Other acceptable manufacturers and products:
      a. Hot Foot America, "Electrack A.S"

C. Substitutions: Section 01 25 00, Substitution Procedures.

2.04 BIRD SPIKES

A. Basis of Design Bird Barrier America, Inc. “Bird-Flite Wide or Bird-Flite Xtra Wide”
   1. Rod Material: 302 Stainless Steel, (Wide; 18 per foot or Xtra Wide; 30 per foot).
   2. Base Material: Ultra-violet stabilized polycarbonate
   3. Lengths: 36-inches, trim to length required.
   4. Mounting Systems:
      a. Bird Barrier Bond (2 hr cure) or Super Bond (1 hr cure) adhesive.
      b. Self-tapping stainless steel screws where allowed.

2.02 PIN AND WIRE SYSTEM COMPONENTS

A. Humane Bird Control Wire Deterrent System
   1. Stainless steel posts with flat base minimum 4 inches by 4 inches for adhesive attachment of system to roof membrane substrate.
   2. Nylon-coated wire.

B. Finish: Natural stainless steel finish.

2.03 ELECTRIC TRACK SYSTEM COMPONENTS

A. Power Pack (Charger)
   1. Input Voltage: 120 Volts AC.
2. Output Voltage: 7.5KV (+ or -) 2KV, 3 amps (+ or -) 1 amp.
3. Intermittent DC output.

B. Track System.
   2. Width: 1.5-inch.
   3. Height: 1/4-inch.
   4. Mounting: Non-penetrating, adhesive as recommended by manufacturer.
   5. Lengths: 50-feet standard lengths capable of maintaining design current.

C. Lead-Out Wire:
   1. Material: Heavy insulated 14 double gauge copper wires.
   3. Height: 3/8-inch.
   5. Length: 50-feet standard lengths as required.

D. Mounting Accessories: Type and configuration recommended for weathertight installation.

PART 3 - EXECUTION

3.01 EXAMINATION
   A. Verify that installation surfaces are ready to receive architectural bird control. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION
   A. Install architectural bird control in accordance with manufacturer's printed instructions.
   B. Bird Spikes
      1. Snap off flexible base to desire lengths as suggested by manufacturer for areas where spikes are to be used.
      2. Determine the spacing of between spike strips and between spike strips and wall.
      3. Attach spike strips to surface with adhesive as recommended by manufacturer.
   C. Pin and Wire System
      1. Attach bird wire posts to metal roof surfaces or to roof membrane with adhesive product approved by roofing manufacturer.
      2. Install bird wire posts at spacing specified in manufacturer's installation instructions, for uniform appearance and without end-to-end gaps.
3. Install wire and tension springs as specified in manufacturer’s installation instructions.

D. Electric Track System:

1. Track System: Install materials neatly, tangent to surface, straight and uniform in appearance, and with uniform clearance from building features in a continuous loop.

2. Install lead-out wire from power pack to track and secure to prevent damage by construction sequencing and building maintenance personnel

E. Inspect finished installations and make adjustments as necessary.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY
   A. Section Includes: commissioning process requirements for Equipment
      1. Level 1 commissioning activities for Equipment
   B. Related Sections:
      1. Section 01 91 13, General Commissioning Requirements
      2. Section 11 24 23, Roof Safety Anchors
      3. Section 11 24 24, Fall-Arresting Systems
      4. Section 11 24 25 Window Washing Equipment

1.02 REFERENCES
   A. This Section incorporates by reference the latest revisions of the following documents.
      1. American Society for Testing and Materials International (ASTM)
         a. ASTM E165 - Standard Practice for Liquid Penetrant Examination for General Industry
         b. ASTM E709 - Standard Guide for Magnetic Particle Testing
      2. American Welding Society (AWS)
         a. ANSI/AWS B1.10 - Guide for the Nondestructive Examination of Welds

1.03 DEFINITIONS
   A. Systems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, equipment, and components.

1.04 SYSTEM DESCRIPTION
   A. Commissioning work includes: Furnish labor and material to accomplish building commissioning as specified in Division 01 Section “General Commissioning Requirements” and herein, including:
      1. Provide to the Commissioning Coordinator preliminary O&M information for use in developing commissioning test procedures.
      2. Assist the Commissioning Coordinator in developing commissioning activity procedures and data forms submittals for work specified in this Section.
      3. Provide information to the Commissioning Coordinator needed for control interface wiring diagrams submittals for the work of this Section.
4. Perform Level 1 commissioning activities specified in this Section, including installation verification, static tests, start-up, component tests, equipment tests, systems tests.

5. Operate equipment and system during commissioning activities as required by the Commissioning Coordinator.

6. Perform and document commissioning tests to verify readiness for commissioning test demonstration. Commissioning tests are specified herein.

7. Correct issues and repeat commissioning tests when results do not meet acceptance criteria.

8. Commissioning Test Demonstrations: General requirements for commissioning test demonstrations are specified in Division 01 Section 01 91 13, General Commissioning Requirements, Article 3.04, Level 1 and Level 2 Commissioning Activity Commissioning Test Demonstrations.
   a. Repeat commissioning tests on a sample basis to demonstrate acceptable performance: Level 1 Component, Equipment, and System Commissioning Tests, and for Level 2 Intra-station system interface tests.
   b. Record and submit commissioning test demonstration data and issues.
   c. Correct issues and repeat commissioning test demonstration when results do not meet Acceptance Criteria.

9. Attend commissioning meetings as requested by the Commissioning Coordinator.

10. Report any inconsistencies or issues in system operations or performance.

11. Provide personnel to support commissioning test demonstration specified herein as requested by the Commissioning Coordinator.

12. In the event that a commissioning test demonstration fails, assist in determining the cause of failure. Make corrections as necessary.

13. Cooperate with Commissioning Coordinator to make equipment and systems ready for commissioning tests specified herein as early in the construction schedule as possible.

   B. Cooperate with Commissioning Coordinator to accomplish commissioning work on schedule and in coordination with other trades.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT
   A. Provide test equipment and instrumentation, including consumable supplies, required to execute commissioning activities. Unless noted otherwise, test equipment and instrumentation remain the property of the Contractor. Test equipment includes:

   B. Test weight, 400-pound.

   C. For wireless type remote control station only: Wireless test transmitter, operating on the same frequency as the wireless type remote control station.
2.02 PROPRIETARY TEST INSTRUMENTS

A. Provide proprietary test instruments or tools required by the equipment manufacturer. Provide and operate the proprietary test instruments or tools as required for commissioning work.

PART 3 - EXECUTION

3.01 LEVEL 1 COMMISSIONING ACTIVITIES REQUIREMENTS

A. Level 1 commissioning activities scope: Technical requirements for commissioning of Equipment are specified herein.

B. Provide technicians, instrumentation, and tools to perform commissioning activities in accordance with accepted commissioning activity procedures at the direction of the Commissioning Coordinator.

C. Scope of Equipment commissioning activities applies to all portions of the Equipment installation described in the test. Where sampling is specified, it applies only to the commissioning test demonstration.

D. Preparation

1. Certify that Equipment, subsystems, and equipment have been completed, calibrated, and started; and are operating in accordance with Contract Documents.

2. Testing Instrumentation: Install measuring instruments and logging devices to record test data in accordance with accepted commissioning test procedures as directed by the Commissioning Authority.

3. Certify that Equipment instrumentation and control systems have been completed and calibrated; are operating according to the Contract Documents; and that pretest set points have been recorded.

4. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions) in accordance with accepted commissioning test procedures as directed by the Commissioning Coordinator.

E. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions.

F. Perform tests using design conditions whenever possible.

G. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Provide equipment to simulate loads. Set simulated conditions in accordance with accepted commissioning test procedures as directed by the Commissioning Coordinator. Document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

H. Request approval to alter set points when simulating conditions is not practical.

I. Request approval to alter sensor values with a signal generator when design or simulating conditions and altering set points are not practical.

J. If tests cannot be completed because of a deficiency outside the scope of the Equipment system, document the deficiency and report it to Sound Transit. After deficiencies are resolved, reschedule tests.
K. Where seasonal testing is specified, complete appropriate initial commissioning tests and documentation within the Construction Period. Schedule and execute seasonal tests when specified conditions are expected.

3.02 LEVEL 1 COMMISSIONING ACTIVITY PROCEDURES

A. Submit level 1 commissioning activity test procedures and data forms for the following types of commissioning activities, requirements for which are specified herein.

1. Level 1 commissioning activities:
   a. Installation verification
   b. Start-up procedures
   c. Equipment tests
   d. System tests

3.03 LEVEL 1 INSTALLATION VERIFICATION CHECKLIST REQUIREMENTS

A. Scope: Installation verification requirements apply to the following:

1. Section 11 24 23, Roof Safety Anchors
2. Section 11 24 24, Fall-Arresting Systems
3. Section 11 24 25 Window Washing Equipment

B. Installation Verification Scope: Technical requirements for Installation Verification of Equipment are specified herein.

C. Installation verification checklist forms shall include the following:

1. Organized to prompt the installer to check off quality criteria for each discrete portion of the Work.
2. Identify the system or features to which the installation verification checklist applies at the top of the form.
3. Section for verification of delivery of accepted materials.
4. Section for condition of materials at delivery.
5. Section for installation. Include manufacturer’s installation instructions.
6. Space at the end of the form for the installer to print their name and company name, fill in the date, and sign or initial.
7. Space to identify the area of work for which the installer is executing the Installation Verification Checklist.
8. Description of the quality criteria as it pertains to the specific work. Include a check-box for each criterion.

D. Quality Criteria: Installation verification checklists shall address the following quality criteria.

1. Material, make and model match accepted submittals.
2. Equipment is installed without visible damage.
3. Location is as indicated on drawings.
4. Equipment is accessible for maintenance using safe work practices.
5. There is sufficient space to remove and replace components intact without demolishing other work.
6. Equipment surfaces are clean and free of dust, dirt, oil and other contaminants.
7. Roof safety anchors: Including visual inspections by the contractor in accordance with Section Roof Safety Anchors, Article Field Quality Control.
8. Fall-arresting system: Including comparison with accepted mockups.

E. Fill out and sign installation verification checklists for Equipment while the Work is being installed. The intent is for the installing tradesperson to fill out and sign the installation verification checklist as work proceeds to improve the quality of the installation. Retain completed installation verification checklists on site for review.

F. Before performing a commissioning test, submit completed installation verification checklists for work included in the commissioning test.

3.04 LEVEL 1 INSTALLATION VERIFICATION

A. Installation verification checklists are required for the following, minimum:
   1. 1108-IV-01 Roof Safety Anchors
   2. 1108-IV-02 Fall-Arresting Systems
   3. 1108-IV-03 Window Washing Equipment

3.05 LEVEL 1 START-UP

A. 1108-SU-01: Electric Window Washing Hoist Start-up
   1. System/Equipment to be Tested:
      a. Electric window washing hoist
   2. Functions to be Tested:
      a. Equipment start-up.
   3. Conditions of the Test:
      a. As required by the manufacturer’s written start-up instructions.
   4. Acceptable Results:
      a. Completion of manufacturer’s start-up procedures with results that meet manufacturer's criteria.

B. 1108-SU-02: Electric Window Washing Hoist Remote Control Station Start-up
   1. System/Equipment to be Tested:
      a. Remote control station
   2. Functions to be Tested:
      a. Equipment start-up.
3. Conditions of the Test:
   a. As required by the manufacturer’s written start-up instructions.

4. Acceptable Results:
   a. Completion of manufacturer’s start-up procedures with results that meet manufacturer’s criteria.

3.06 LEVEL 1 EQUIPMENT TESTS

A. 1108-E-01: Roof Safety Anchors
   1. System/Equipment to be Tested:
      a. Roof safety anchors, including attachment to structure.
   2. Functions to be Tested: Perform the following inspections and tests in accordance with Section Roof Safety Anchors, Article Field Quality Control.
      a. Nondestructive Testing
      b. Magnetic Particle Inspection
      c. Liquid Penetrant Inspection
   3. Conditions of the Test:
      b. Magnetic Particle Inspection: ASTM E709.
      c. Liquid Penetrant Inspection: ASTM E165.
   4. Acceptable Results:
      a. As specified by the listed standards.

B. 1108-E-02: Fall-arresting Systems
   1. System/Equipment to be Tested:
      a. Fall-arresting systems, including attachment to structure.
   2. Functions to be Tested: Perform the following inspections and tests in accordance with Section Fall-Arresting Systems, Article Testing.
      a. Load performance.
   3. Conditions of the Test:
      a. Load cell tests in accordance with manufacturer’s recommendations.
   4. Acceptable Results:
      a. As specified in Section Fall-Arresting Systems.

3.07 LEVEL 1 SYSTEM TESTS

A. 1108-S-01: Electric Window Washing Hoist Remote Control
   1. System/Equipment to be Tested:
a. Remote control station for electric window washing hoist.

b. Electric window washing hoist.

2. Functions to be Tested:
   a. Hoist lowering.
   b. Hoist raising.
   c. Default stop.
   d. End-of-travel stop.
   e. Hoist weight capacity.
   f. Hoist travel speed.
   g. Interference resistance (wireless option only).

3. Conditions of the Test: Apply conditions appropriate to accepted material; wired type or wireless type.
   a. Locate the hoist assembly as directed by the ST witness during the Commissioning Test Demonstration.
   b. Attach 400-pound test weight to cable.
   c. Wired type control station: Issue commands from the wired control station.
   d. Wireless type control station: Issue commands from locations on the ground immediately adjacent to the building, using the wireless remote controller. ST witness will designate locations during Commissioning Test Demonstration.
   e. The following conditions apply to either wired or wireless type control station:
      1) Raise the cable in two steps to full retraction. Release the control key or control button at the end of each step; do not turn the key or hit a stop button.
      2) Continue to drive the hoist up for five seconds after it is fully retracted.
      3) Lower the cable in three steps to full extension. Release the control key or control button at the end of each step; do not turn the key or hit a stop button.
      4) Continue to drive the hoist down for five seconds after it is fully extended.
      5) Time the retraction of the cable from full extension to full retraction.
      6) Time the extension of the cable from full retraction to full extension.
   f. The following conditions apply to wireless type control station:
1) Operate a wireless test transmitter, located within 50 feet of the cable location, on the same communication band used by the wireless remote control station. Issue six commands, alternating between raising and lowering the cable while the wireless test transmitter is actively transmitting.

4. Acceptable Results:
   a. Wired or wireless control station:
      1) Cable retracts smoothly. Releasing the key or button stops the cable without further action by the operator. Cable stops smoothly at each step.
      2) Hoist motor is deenergized when the cable is fully retracted.
      3) Cable extends smoothly. Releasing the key or button stops the cable without further action by the operator. Cable stops smoothly at each step.
      4) Hoist motor is deenergized when the cable is fully extended.
      5) Calculated cable speed is not less than 30 feet per minute, nor greater than 40 feet per minute, or as designated in the accepted submittal.
   b. Wireless control station only: Wireless control station operates without functional interference from the wireless test transmitter.

3.08 ATTACHMENTS
   A. Attachment A: Example Installation Verification Checklist
   B. Attachment B: Example Commissioning Test

END OF SECTION

ATTACHMENTS
Attachment A: Example Installation Verification Checklist

I. OBJECTIVES
   A. Document proper installation and condition of exhaust fans, per contract requirements.
   B. Reference Section nnnnnn

II. SYSTEMS AND EQUIPMENT TO BE TESTED
   A. Supply and exhaust fans and associated controls:
      1. EF-nnn

III. ACCEPTANCE CRITERIA
   A. Observed results shall comply with acceptance criteria that appear on the attached installation verification checklist.

IV. TEST RESULTS
   A. Record observed conditions and results on the attached installation verification checklist in the spaces provided at the time of the inspection. Record results legibly in ink.
   B. If results do not comply with Acceptance Criteria, complete a Commissioning Deficiency Report Form Part 1, make necessary corrections, repeat and document the Commissioning Test, submit Commissioning Deficiency Report Form Part 2, and repeat the Commissioning Test Demonstration.
   C. Describe any deviation, or elaboration, on the inspection procedure in the Notes sections. Attach additional pages for notes if necessary.
   D. Initial completed lines as each portion of the inspection is completed and recorded. Sign and date the Data Form when the tests are complete.

Issues Noted? Yes____ No____

Issue Report Numbers:__________________________________________

Notes:

Signatures: The undersigned certify the above installation is in accordance with the approved installation verification checklist, accepted submittals, and contract documents and that the results recorded were the actual results observed.

Company / Print Name / Signature / Date

Installing Contractor:______________________________________________

Owner’s witness:__________________________________________________
<table>
<thead>
<tr>
<th>Model Verification</th>
<th>Submitted</th>
<th>Delivered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Manufacturer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Serial Number</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>4. Arrangement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Air flow, Design / Minimum (cfm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Fan Motor Power / Speed (hp / rpm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Voltage / Phase / Frequency (V / Ø / Hz)</td>
<td></td>
<td></td>
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<td>8.</td>
<td></td>
<td></td>
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<tr>
<td>9.</td>
<td></td>
<td></td>
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<tr>
<td>10.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Physical Checks |
|-----------------|-----------------|
| 11. Unit is free from physical damage | Yes | No |
| 12. The air openings are sealed with plastic | Yes | No |
| 13. All components present and in proper order | Yes | No |
| 14. All access doors are operable | Yes | No |
| 15. Installation and startup manual provided | Yes | No |
| 16. Unit tags affixed and legible | Yes | No |
| 17. Unit secured as required by manufacturer and specifications | Yes | No |
| 18. Adequate clearance around unit for service | Yes | No |
| 19. All components accessible for maintenance and replacement | Yes | No |
| 20. Unit can be removed from the building | Yes | No |
| 21. Internal vibration isolators in good condition and shipping bolts are removed | Yes | No |
| 22. All fasteners are tight | Yes | No |
| 23. | Yes | No |
## Ductwork

<table>
<thead>
<tr>
<th></th>
<th>Adequate locations available for testing and balancing of unit</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>24.</td>
<td>All dampers and sensors are accessible (access panels)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>25.</td>
<td>All dampers close tightly and stroke fully and easily</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>26.</td>
<td>Ductwork is clean and free of debris</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>27.</td>
<td>No fittings within 2 ½ times fan wheel diameter</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>28.</td>
<td>Adequate locations available for testing and balancing of unit</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>29.</td>
<td>All dampers close tightly and stroke fully and easily</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>30.</td>
<td>Ductwork is clean and free of debris</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

## Mechanical

<table>
<thead>
<tr>
<th></th>
<th>Inspect the equipment for any shipping damage. Remove any foreign material such as tags or packing from any moving parts or from within the fan housing.</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.</td>
<td>Compare the voltage, hertz, and phase stamped on the motor with the current characteristics of the line to which the motor is to be connected.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>32.</td>
<td>Lock out power source at disconnect switch.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>33.</td>
<td>Turn motor, drive, and impeller by hand to see that no misalignment has taken place in shipment. Check V-belt drive for proper alignment and belt tension.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>34.</td>
<td>Check all bolts, screws, and fasteners, and tighten if necessary.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>35.</td>
<td>Make certain all setscrews, locking collars and bearing mounting bolts are secure.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>36.</td>
<td>Secure and check clearance of access doors, belt guards and inlet and outlet guards.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>37.</td>
<td>Jog the fan electrically and note rotation. Reverse two electrical leads, if necessary, to obtain proper rotation as marked with rotation arrow on fan. Do not allow the impeller to run backwards except momentarily.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>38.</td>
<td>Unit is clean.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>39.</td>
<td>Internal isolators free to move.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>40.</td>
<td>Fans and motors lubricated and aligned.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>41.</td>
<td>Motor and fan drive pulleys aligned.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>42.</td>
<td>Fan belts have proper tension and are in good condition.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>43.</td>
<td>Protective shrouds for fans and belts in place and secure.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>44.</td>
<td>Filters installed properly (no bypass air) and are clean.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>45.</td>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
### Electrical

<table>
<thead>
<tr>
<th>Item #</th>
<th>Description</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>46.</td>
<td>Local disconnect installed in accessible location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47.</td>
<td>All electrical connections are tight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48.</td>
<td>All electrical components are grounded</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49.</td>
<td>VFD installed (if applicable)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.</td>
<td>Motor nameplate matches line characteristics: Voltage / Phase / Frequency (V / Ø / Hz)</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

### Manufacturer

<table>
<thead>
<tr>
<th>Item #</th>
<th>Description</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>51.</td>
<td>Manufacturer’s installation checklist completed and attached, if appropriate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### "No" Responses

<table>
<thead>
<tr>
<th>Item #</th>
<th>Date</th>
<th>Reason for “No” Response</th>
</tr>
</thead>
</table>

### Corrective Action

<table>
<thead>
<tr>
<th>Item #</th>
<th>Date</th>
<th>Corrective Action</th>
<th>Completed By:</th>
</tr>
</thead>
</table>

Signatures: The undersigned have performed the above installation check and verified that the installation is complies with the manufacturer’s and contract requirements.

Company / Print Name / Signature / Date

Installing Contractor: _____________________________________________________________

Owner’s witness: ________________________________________________________________

END OF INSTALLATION VERIFICATION CHECKLIST
Attachment B: Example Commissioning Test

I OBJECTIVES
A. Verify opening, closing, operation and safety features of motor operated overhead coiling grilles.

II SYSTEMS AND EQUIPMENT TO BE TESTED
A. Motor operated overhead coiling grilles specified in Special Doors in Division 08.

III PREREQUISITES
A. Final installation of this system? ................................................................. Y___ N___
B. Documented completion of installation verification checklist, including correction of deficient conditions? ................................................................. Y___ N___

IV MINIMUM PARTICIPANTS
A. Owner’s Witness (OW)
B. Contractor’s Representative: Commissioning Coordinator

V TEST EQUIPMENT
A. Wood block, 4” x 4”, approximately 18” long.
B. Stop watch.

VI TEST PROCEDURE
A. In accordance with general conditions of the contract, contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of this test. Stop the test and notify the owner if it is determined that any part of the test cannot be performed safely.
B. Control from interior and exterior control stations
   1. Begin the test with the grille fully open. From the exterior controller, close the grille to approximately 75% open.
      a. Acceptance: Response for each grille is as indicated.
         1) The grille moves smoothly without unusual noises to the desired position. (Yes/No)
            | Door ID | 116B | 116C | 116D | 221B | 281C |
            | Response 1) |       |       |       |      |      |
            | Date |       |       |       |      |      |
            | OW Initials |       |       |       |      |      |
   2. From the interior controller, reopen the grille completely.
      a. Acceptance Criteria: Response for each grille is as indicated.
         1) The grille moves smoothly without unusual noises to the full open position. (Yes/No)
            | Door ID | 116B | 116C | 116D | 221B | 281C |
            | Response 1) |       |       |       |      |      |
            | Date |       |       |       |      |      |
            | OW Initials |       |       |       |      |      |
3. From the interior controller, close the grille completely while measuring the closing time.
   a. Acceptance Criteria: Response for each grille is as indicated.
      1) The grille moves smoothly without unusual noises. (Yes/No)
      2) The grille closes completely in less than 10 seconds. (Record actual time, sec.)

<table>
<thead>
<tr>
<th>Door ID</th>
<th>116B</th>
<th>116C</th>
<th>116D</th>
<th>221B</th>
<th>281C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response 1)</td>
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<td>Response 2)</td>
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<td>Date</td>
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<td>OW Initials</td>
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</table>

4. From the interior controller, open the grille completely while measuring the opening time.
   a. Acceptance Criteria: Response for each grille is as indicated.
      1) The grille moves smoothly without unusual noises. (Yes/No)
      2) The grille closes completely in less than 10 seconds. (Record actual time, sec.)

<table>
<thead>
<tr>
<th>Door ID</th>
<th>116B</th>
<th>116C</th>
<th>116D</th>
<th>221B</th>
<th>281C</th>
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<tbody>
<tr>
<td>Response 1)</td>
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<td>Response 2)</td>
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5. Disconnect power from the grille operator by opening the manual disconnect. Manually close and reopen the grille. Pause at 50% closed before completing the closing.
   a. Acceptance Criteria: Response for each grille is as indicated.
      1) The grille moves with reasonable manual effort without unusual noises. (Yes/No)
      2) When pausing during closing, the grille retains its position. (Yes/No)

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<tr>
<th>Door ID</th>
<th>116B</th>
<th>116C</th>
<th>116D</th>
<th>221B</th>
<th>281C</th>
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<tbody>
<tr>
<td>Response 1)</td>
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<td>Response 2)</td>
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</table>

6. Reconnect power to the grille operator by closing the manual disconnect. Place a block of wood on the floor under the grille. From the exterior controller, attempt to close the grille.
   a. Acceptance Criteria: Response for each grille is as indicated.
      1) The grille moves smoothly without unusual noises. (Yes/No)
      2) When the grille bottom edge contacts the wood block, the grille stops momentarily, and then reverses. (Yes/No)

<table>
<thead>
<tr>
<th>Door ID</th>
<th>116B</th>
<th>116C</th>
<th>116D</th>
<th>221B</th>
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<tbody>
<tr>
<td>Response 1)</td>
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<td>Response 2)</td>
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<td>OW Initials</td>
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</tr>
</tbody>
</table>
C. System Restoration

1. Restore the grilles to normal automatic operation.
   a. Acceptance Criteria: Response for each grille is as indicated.
      1) The grille has been restored to normal automatic operation. (Yes/No)

<table>
<thead>
<tr>
<th>Door ID</th>
<th>116B</th>
<th>116C</th>
<th>116D</th>
<th>221B</th>
<th>281C</th>
</tr>
</thead>
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<tr>
<td>Response 1)</td>
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VII ACCEPTANCE CRITERIA

A. Observed results shall comply with acceptance criteria that appear below each step of the procedure above.

VIII TEST RESULTS

A. Record test conditions and results on the Data Form that follows at the time of the test. Record results legibly in ink.

B. If results do not comply with Acceptance Criteria above, terminate the test, complete a Commissioning Deficiency Report Form Part 1, make necessary corrections, repeat and document the Commissioning Test, submit Commissioning Deficiency Report Form Part 2, and repeat the Commissioning Test Demonstration.

C. Describe any deviation, or elaboration, on the test procedure in the Notes sections. Attach additional pages for notes if necessary.

D. Initial completed lines as each portion of the test is completed and recorded. Sign and date the Data Form when the tests are complete.

Issues Noted? Yes____ No____
Issue Report Numbers: ___________________________________________________

Notes:
Signatures: The undersigned have witnessed the above test and verified that the test was performed in accordance with the Approved Commissioning Test Procedure and that the results recorded were the actual results observed.

Company / Print Name / Signature / Date

Commissioning Coordinator: ____________________________________________
Installing Contractor: ________________________________________________
Owner’s witness: ____________________________________________________

END OF COMMISSIONING TEST
CONTRACT SPECIFICATIONS

SECTION 11 24 29
FACILITY FALL PROTECTION

PART 1 - GENERAL

1.01 SUMMARY
A. This Section includes specifications for Lifeline Fall-Arresting Cable Systems including the designing, furnishing, and installing of a complete fall-arresting lifeline and safety tieback anchor system as defined by OSHA; for safe maintenance and access at Vent Shafts, and Exterior Building Roof Perimeters, as indicated on Drawings and/or provided by design-build supplier.

B. Related Sections:
1. Section 05 50 00, Metal Fabrications
2. Section 11 08 00, Commissioning of Equipment.

1.02 REFERENCES
A. This Section incorporates by reference the latest revisions of the following documents.

B. American Institute of Steel Construction (AISC):
1. AISC S342L, with Supplement No.1 "Load and Resistance Factor Design Specification for Structural Steel Buildings".
2. AISI SG-971 Specification for Design of Cold-Formed Steel Structural Members.

C. American Welding Society (AWS):
1. AWS D1.1 Structural Welding Code - Steel.

D. American National Standards Institute (ANSI):
2. ANSI Z 359.1 American National Standard Safety Requirements for Personal Fall Arrest Systems and Components

E. American Society for Testing and Materials International (ASTM):
1. ASTM A123 Standard Specification for Zinc Coating (Hot-Dip Galvanizing) of Iron and Steel Products

F. Occupational Safety and Health Administration (OSHA):
1. OSHA 1926.502 Fall Prevention Systems and Criteria and Practices

1.03 SUBMITTALS
A. Procedures: Section 01 33 00, Submittal Procedures
B. Detailed shop drawings showing fabrication for the complete lifeline systems as well as the safety tieback and suspension anchors.

1. Include layout drawings of each system and anchor in relation to the supporting structure indicating the locations of all components in the system properly labeled for identification.

2. Installation and rigging instructions and all necessary Restrictive and Non-Restrictive Working Usage Notes and General Safety Notes.

3. Indicate welds, both shop and field, using standard welding symbols of ANSI/AWS A2.4. Show the size, length, and type of each weld on drawings.

4. Indicate individual welders’ identification on Contract record drawing

C. Design analysis and calculations.

D. Systems Manual including the following:

1. Maintenance Procedures: Including parts list and maintenance requirements for all equipment.


3. Test Certificate: Indicating completion of proof load testing on installed systems.

4. Product certificate: containing the manufacturer’s serial number, name and part number of each individual component used in the system; manufacturer’s catalog data indicating the sizes, descriptions, capacities, test certifications, and other descriptive data showing sufficient detail that the product complies with the contract requirements.

5. As-Built Drawings: A copy of as-built drawings shall be included in the systems manual. As-built drawings shall include layout drawings of each system and anchor in relation to the supporting structure indicating the locations of all components in the system properly labeled for identification.

E. Manufacturer’s Instructions: Manufacturer’s instructions indicating the manufacturer’s recommended method and sequence of installation for the following: lifeline anchors, safety tieback anchors, energy-absorbing devices, body harnesses, and lifeline cable.

F. Product Data: Material, equipment, and fixture lists. Manufacturer’s catalog data indicating the sizes, descriptions, capacities, test certifications, and other descriptive data showing in sufficient detail that the product complies with the contract requirements. Equipment and performance data including but not limited to: lifeline anchors, safety tieback anchors, energy-absorbing devices, body harnesses, lifeline cable.

G. Evidence of Liability Insurance: Provide written documentation in evidence and demonstration of fulfillment of requirements of Article 1.05C, herein below.

1.04 PERFORMANCE REQUIREMENTS

A. Design fall-arresting lifeline and safety tieback anchor system that will allow the user to walk uninterrupted the entire length of the system and provide secure anchorage to arrest a fall by the users in accordance with Contract Documents, standards, and regulations/codes contained. Design system to fully protect the user at all times while in the area of potential fall hazard. Design lifeline system for two simultaneous users. Use
safety tieback and suspension anchors that are rated for attachment of a single user. Include all components required to provide a complete and fully operational system.

B. Structural Performance: Provide fall-arresting lifeline and safety tieback anchor system capable of withstanding design loads as required by governing regulations and codes. Where component design loads are specified herein, they represent design minimum requirements. Design the fall arresting lifeline and safety tieback anchor system and window-washing suspension anchor system as specified herein, and all associated connections to conform to the conditions shown on the Contract Drawings. Ensure that all anchor components conform to proper engineering principles and have been designed by a professional engineer who is legally qualified and registered to practice in the State of Washington where Contract is located and who is experienced in the design of fall arresting and anchoring systems, its application and safety requirements. Sound Transit takes no responsibility for product design, manufacture, delivery and handling, or connection to basic structure. Furnish and install all necessary bracing, ties, anchorage, distribution members, and similar elements in conformance with submitted drawings and calculations.

C. The Engineer retained by the Contractor shall be responsible for verifying that system components are attached in such a manner that their forces cause no distress to the basic structure. Where necessary, provide additional structural elements to safely distribute forces.

1. Provide submittal to Structural Engineer of record for review during submittal process and prior to installation.

D. Locate anchorages to suit suspension equipment used on the building with respect to items such as reach, rigging, spacing, roof edge condition, and similar items.

E. Design all anchor components to provide adequate attachment to the building and suited to current suspended maintenance practices. Ensure compatibility with industry standard equipment.

F. Design system fall-arresting lifeline and safety tieback anchor system and window-washing suspension anchor system to comply with the following structural requirements:

1. Safety Tieback Anchors: designed to allow the user to connect personnel fall arrest equipment and designed with a minimum 2:1 factor of safety.

1.05 QUALITY ASSURANCE

A. Manufacturer: specializing in the design, fabrication and installation of fall-arresting lifeline and safety tieback anchor systems having a minimum of 5 years documented experience.

B. Loading and safety assurance: meet the requirements of governing codes and jurisdiction and comply with properly engineered loading and safety criteria for the intended use.

C. Insurance: Manufacturer shall carry specific liability insurance (products and completed operations) in the amount of $2,000,000.00 to protect against product/system failure.

D. Welding: executed by certified welders in accordance with AWS requirements.

E. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer registered to practice in the State of Washington.
1. **Fall-Arresting System Pre-Approval:** Obtain approval of authority having jurisdiction before proceeding.

2. **Mock-Up Requirement:**

3. Provide mock-up of each type of anchor, tie-back, safety anchor or suspension system to the Resident Engineer for approval.

4. If accepted, mock-up shall represent minimum standard for the Work of this section.

5. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups that are not accepted.

### 1.06 REGULATORY REQUIREMENTS

A. Comply with the following OSHA regulations:

1. 1910, Subpart D (Walking and Working Surfaces).

2. Appendix C to 1910 Subpart F (Personal Fall Arrest Systems).

3. "OSHA Ruling on Window Cleaning by Bosun's Chair" Memorandum to Regional Administrators from P. K. Clark, Director, Directorate of Compliance Programs.

4. OSHA 1926.502 Fall Prevention Systems and Criteria and Practices.

### 1.07 MAINTENANCE DATA

A. Submit one copy of system Equipment Manual & Inspection Log Book, with "Initial Inspection - Certification for Use" and "Inspection Sign-Off" forms completed.

B. Submit two copies of a reduced plastic laminated as-built shop drawing showing equipment locations and details. Post this drawing near exits onto the roof.

### 1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original unopened packaging. Store materials in original protective packaging inside a well ventilated area protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

### 1.09 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural framing and other construction contiguous with lifeline and safety tieback anchor system and window-washing suspension anchor system equipment by field measurements before fabrication and indicate measurements on Shop Drawings.

### 1.10 COORDINATION

A. Coordinate installation of anchorages for anchor system equipment items and accessories with structural steel fabricator, roofing installer, and other trades that may be affected by the work. For informational purposes, furnish setting drawings, templates, directions for installation of anchorages, or other documentation to the Contract site before impact on other construction and trades.
PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Accepted Fall-Arresting System Products and Suppliers:


3. Substitutions: Section 01 25 00, Substitution Procedures.

2.02 MATERIALS

A. Fall-Arresting System

1. All materials shall be new, and completed fall protection system shall be the product of one manufacturer or the manufacturer's authorized installer regularly engaged in the design and production of such equipment. Provide flexible lifeline and multiple span horizontal cable systems as approved by Resident Engineer.


3. Lifeline supports and anchors: Fabricate supports required for additional lifeline support plus safety tieback and suspension anchors from carbon steel with a corrosion resistant finish.

4. Fasteners: The lifeline systems and anchors shall be attached to the supporting structure with appropriate fasteners. The fasteners shall be designed to support a load on the system using the corresponding factor of safety without failure.

5. Horizontal lifeline cable: Marine grade stainless steel wire rope with a minimum breaking strength of 10,000 pounds.

6. Force limiting anchorage posts: Designed to limit load to 2,250 pounds in the event of a fall and absorb the energy integrally. The body of the anchorage is to deploy in the event of a fall pulling the fixings in shear and preventing damage to the roof system. Weather proof construction and design for attachment to all major composite, built-up on site, standing seam and single ply membrane roofing. Attach by means of stitching screws, split clamps and toggle bolts with no need for fixing to purlins or structural steel.

7. Swaging: in-line with the anchor point, with a slip indicator.

8. Shock absorber: Limit load in-line shock absorber to 3,000 pounds maximum for multi-span systems and 4,500 pounds maximum for single span systems. Visually display deployment in the event a load such as a fall has occurred on the system.

9. End anchors: 316 stainless steel end anchors with minimum breaking strength of 10,000 pounds.

10. Transfastener/Trolley: 316 stainless steel with a minimum tensile load of 3,600 pounds. Allow for easy pass-through of support points without disconnecting from the system.
11. Tension indicator: Allow the user to physically inspect that the correct cable tension is achieved.

12. Other components including corner assemblies, turnbuckles, and other components: 316L stainless steel.

13. Deceleration device: Provide six appropriate length lanyards that meet or exceed applicable standards of ANSI Z 359.1 and OSHA 1926.104.

14. Harnesses: Provide six full-body harnesses with single back D-ring that meet or exceed applicable standards of ANSI Z 359.1 and OSHA 1926.104.

2.03 SERIAL NUMBERS
A. On all fall-arresting system components, permanently stamped or engraved, identifying the specific project and system they are used for. Record serial numbers in the system manual.

2.04 FABRICATION
A. Fabricate work true to dimension, square, plumb, level and free from distortion or defects detrimental to appearance and performance.

B. Grind off surplus welding material and ensure exposed internal corners have smooth lines.

C. Fabricate system components of the same material unless otherwise indicated.

D. Fabricate anchoring devices as recommended by the manufacturer to provide adequate support for intended use.

E. Fabricate joints in a manner to discourage water accumulation. Provide weep holes to drain all water that could accumulate in the exposed joints.

PART 3 - EXECUTION

3.01 EXAMINATION
A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions upon which the work of this Section depends. Report to the Contractor in writing defects in work prepared by other trades and other unsatisfactory site conditions that would cause defective installation of products or cause latent defects in workmanship and function.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

2. Commencement of work shall imply acceptance of prepared work.

3.02 INSTALLATION, GENERAL
A. Install equipment in accordance with approved shop drawings and manufacturer's instructions.

B. Co-ordinate installation with work of related trades.

C. Install all work true, level, tightly fitted, and flush with adjacent surfaces as required.
D. Deform threads of tail end of anchor studs after nuts have been tightened to prevent accidental removal or vandalism.

E. Lifeline systems and anchors: installed by manufacturer’s authorized, trained, and certified personnel.

F. Refer to 03 15 25 for requirements for anchors in concrete.

G. Install anchorage and fasteners in accordance with manufacturer’s recommendations to obtain the allowable working loads published in the product literature and in accordance with these Contract Specifications.

H. Do not load or stress lifeline systems or anchors until all materials and fasteners are properly installed and ready for service.

I. Install all lifeline systems and anchors a minimum of 6 feet from the roof edge.

3.03 FINAL ADJUSTING AND INSPECTION

A. Adjust and leave equipment in proper working order.

3.04 TESTING

A. Test all anchorage systems relying upon chemical adhesive fasteners 100 percent, on site using load cell test apparatus in accordance with manufacturer’s recommendations.

B. Test using load cell test apparatus in accordance with manufacturers recommendations.

3.05 CLEANING

A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.

3.06 OPERATOR TRAINING

A. Provide a minimum of 4 hours of operator training after system has been installed and proof tested. Provide training for the users of the system and conduct at the installation site.

3.07 PROTECTION

A. Protect roof mounted horizontal maintenance equipment and accessories from damage during construction period with temporary protective coverings approved by manufacturer. Remove protective covering at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of damaged work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

3.08 COMMISSIONING

A. See Section 11 08 00 Commissioning of Equipment, for commissioning requirements pertaining to the work of this Section.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for the coordination of artwork within the station.

B. Art will be included in the construction of the North Link Light Rail, including discrete artworks, artistic enhancements and functional elements of facilities.

C. Artwork installed in this Contract is integrated into the architecture and requires coordination and preparation by the Contractor as itemized in this specification section.

D. Artists are under contract to Sound Transit.

1.02 DEFINITIONS

A. Artist: The Artist and/or the Artist’s sub-contractor for fabrication and/or installation.

1.03 SCHEDULING

A. Coordinate artwork installation with the artists through the Resident Engineer.

B. Designate one field engineer whose responsibility is the coordination of the artwork.

C. Upon notification by the Resident Engineer, initiate and lead at least one coordination meeting involving the Contractor designated field engineer and the Resident Engineer. The Resident Engineer will coordinate the inclusion of the artists, architects and Sound Transit’s Art Program Administrator. The purpose of the meeting is to coordinate construction schedules, outline procedural issues and define roles and responsibilities. Provide 2 weeks advance notice for the meeting(s).

D. Provide a task-specific construction schedule to the Resident Engineer and the Art Program Administrator clearly defining requirements for proper coordination of artwork installation. Provide updated schedules with changes that affect artwork coordination as changes occur.

PART 2 - PRODUCTS

2.01 COMPONENTS

A. Artist Furnished – Artist Installed Artwork: TBD

B. Artist Furnished – Contractor Installed Artwork: TBD

C. Installation of Existing Sculptures: TBD
PART 3 - EXECUTION

3.01 INSTALLERS

A. SAFETY

1. On-site Artists and Artists’ sub-contractors performing work within the confines of the Contract prior to Final Acceptance of the Contract will comply with the Contractor’s safety program.
   
   a. Provide a safety orientation/training class and outline safety standards and requirements of the Contract for all artists and artist’s personnel as required.
   
   b. Artists and Artists’ sub-contractors are responsible for supplying and donning protective attire including proper shoes, hardhat, safety glasses, hearing protection, safety harnesses, gloves, and safety vests as required by the Contractor.

3.02 PREPARATION

A. Artist Furnished – Artist Installed Artwork

1. Unless noted otherwise, Artist Furnished – Artist Installed artwork will be installed upon Substantial Completion of the station facility by Sound Transit and at the direction of the Resident Engineer. Contractor is responsible for coordination and installation of specific artwork components as described herein.

2. Coordinate and review all installation details and provisions of the Contract with the Resident Engineer and Artist prior to fabrication and installation of Contractor-provided attachment systems, electrical systems and their connections, and surrounding construction. This includes but is not limited to confirmation of dimensions for Contractor-supplied foundations, recesses in concrete slabs, and all attachments to the building structure, utilities, mechanical or electrical systems.

3. Coordinate scheduling and duration of work supporting the artist’s installation with the Resident Engineer and provide access to the construction site for the Artists and Artists’ sub-contractors for site inspection.

4. The Resident Engineer will accommodate Artist and Artist sub-contractor for access to the worksite in a manner permitting a continuous workflow insofar as practical.

5. The Resident Engineer will provide the Artist with 12-month and 1-month notice prior to artwork installation. Coordinate changes in schedule with the Resident Engineer and Artist to allow for proper scheduling of Artists’ sub-contractors.

6. The Resident Engineer will provide on-site access to artist equipment such as trucks, lifts, staging, scaffolding or cranes as might be needed for the Artist’s installation of the artwork.

7. The Resident Engineer will provide reasonable access to temporary power, lighting, water and toilet facilities as available and reasonably required for the work of the Artists.
8. The Artist will be responsible for secure on-site staging and storage areas supporting artwork installation. Location will be as mutually agreed between the Artist and Resident Engineer.

9. The Artist will take all necessary precautions to protect all finished surfaces from damage caused by installation of the artwork.

10. The Artist will remove all tools, temporary supports, staging and equipment promptly at the conclusion of installation and repair all surfaces damaged during art installation.

B. Artist Furnished – Artist & Contractor Installed Artwork

1. The Contractor will coordinate with the Resident Engineer and Artist in developing delivery schedules, installation durations, handling, site access, site preparation, installation and protection of the artwork after installation.

2. The Contractor will review all installation details and provisions of the Contract with the Resident Engineer and Artist prior to Artist's or Contractor's fabrication or construction of their respective work.

3. The Contractor will provide the Resident Engineer with 12-month and 1-month notice prior to artwork installation. Changes in schedule shall be coordinated with the Artist through the Resident Engineer.

4. The Contractor will hold a coordination meeting approximately 2 weeks prior to scheduled installation to discuss unloading, staging, rigging and hoisting requirements and all other aspects of the final artwork installation.

5. Attachment methods, templates and all other installation details will be furnished in the Contract Drawings or by the Artist one month prior to installation. The Contractor will provide a schedule for installation to the Resident engineer to allow Artist time to furnish all required installation details.

6. The Artist will provide information to the Contractor on pick points for all sculptures requiring hoisting for installation.

7. The Contractor will provide a safe and secure site for storage of the artwork prior to installation. If the Contractor is not ready to receive the artwork, the artwork may be stored off-site by the Contractor. The Contractor will be responsible for its insured storage and delivery to the site at the time of installation. The Contractor will be liable for damage to the work while in storage or transport. Artist will deliver artwork FOB jobsite or Contractor’s warehouse for Contractor unloading.

8. The Contractor will coordinate all adjacent construction to minimize conflicts with artwork installation and take all necessary steps to protect the finished artwork from damage after installation.

9. The Contractor will provide all hoisting equipment, temporary rigging and supports as necessary for the complete installation of artwork. Include operators and rigging personnel for all hoisting and rigging tasks.

10. The Contractor will provide personnel lifts to access all attachment points to structure.
11. The Artist and Resident Engineer will be present for oversight when artwork is installed. The Artist will provide artwork assembly, hardware including fasteners and struts and all permanent rigging from artwork to structure.

12. Artwork will be installed in a continuous operation in-so-far as practical. All Contractor work necessary for artwork installation shall be coordinated to make this continuous operation possible.

3.03 INSTALLATION

A. Artist Furnished – Artist Installed Artwork

1. Art Mural No. 1: and Art Mural No. 2:
   a. Artist Responsibilities:
      1) Review shop drawings and installation of backing wall with Resident Engineer.
      2) Provide protection of all finished surfaces to the approval of the Resident Engineer.
      3) Provide staging, scaffolding and personnel lifts as necessary for the work to be accomplished.
      4) Provide supplemental heat and ventilation as necessary for the work.
      5) Provide all labor and material for painting.
      6) Repair any finishes damaged in performance of the work to the satisfaction of the Resident Engineer.
   
   b. Contractor Responsibilities:
      1) Provide backing wall as detailed in contract drawings and contract specifications ready for artist paint work.
      2) Coordinate and provide site access for artist work through the Resident Engineer.
      3) Adjust and aim art lighting fixtures at the direction of the Resident Engineer with the Artist.

B. Artist Furnished – Contractor Installed Artwork

1. Suspended Sculptures:
   a. Artist Responsibilities:
      1) Fabricate finished artwork, suitably store, crate and deliver to the jobsite FOB. Provide all necessary fasteners, tools, permanent rigging and accessories for a complete installation.
      2) Review structural steel shop drawings for locations of strut rigging points with Resident Engineer. Provide information for adjustments to location, quantity and orientation of all attachment points.
3) Provide labor and materials to unpack, assemble and provide technical support for temporary rigging and hoisting.

4) Provide labor and materials for installation of all permanent rigging from artwork to station structure.

5) Broom clean affected work areas. Breakdown crates and make ready for Contractor’s removal and disposal.

6) Repair any finishes damaged in performance of the work to the satisfaction of the Resident Engineer.

b. Contractor Responsibilities:

1) Provide protection of station surfaces to prevent damage from assembly and installation of artwork.

2) Coordinate delivery of art components and equipment with the Resident Engineer.

3) Transport artwork, tools and materials from surface (or storage location) to platform.

4) Provide personnel hoists for artwork assembly and installation of the artwork’s permanent rigging to station structure. Provide at least 2-500# personnel lifts capable of reaching the outermost rigging points on the upper strut from the platform.

5) Provide temporary rigging and hoisting equipment for artwork assembly, positioning and permanent attachment to station structure. Positioning the artwork will require simultaneous use of multiple hoists.

6) Provide operator and rigging personnel for all hoisting and temporary rigging tasks.

7) Adjust and aim art lighting fixtures at the direction of the Resident Engineer with the Artist.

8) Remove and dispose of crates and packing material.

c. Approximate physical dimensions:

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 12 93 00

SITE FURNISHINGS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for furnishing and installing bicycle racks and lockers, custom and manufactured benches and seating elements; bollards; tree grates; trench drain grate; waste receptacles; handrails; custom leaning rails; skateboard deterrents; edge restraints; and custom tree mulch rings.

B. Related section: The Work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this Work.

1. Section 03 30 00, Cast-in-Place Concrete.
2. Section 05 50 00, Metal Fabrications.
3. Section 05 52 00, Metal Railings.
4. Section 05 53 33, Aluminum Grating.
5. Section 09 90 00, Painting and Coating.
6. Section 32 13 13, Concrete Paving.
7. Section 32 90 00, Planting.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

5. NAAMM – National Association of Architectural Metal Manufacturers “Metal Finishes Manual for Architecture and Metal Products”.
   c. ASTM A53/A53M-01, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.

e. ASTM A307-00, Standard Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength.

1.03 SUBMITTALS

A. Submit the following for approval in accordance with Section 01 33 00, Submittal Procedures, and with the additional requirements as specified for each.

B. Manufactured Items:

1. Manufacturer’s Product Literature: Identify specific product, model, finishes, and features for all specified manufactured items.

2. Manufacturer’s installation instructions.

3. Samples of all specified materials, fasteners, and finishes:
   a. Tree grate: Two 12 inch squares (including typical edge condition).
   b. Trench drain grate: Two 12 inch lengths.
   c. Edge restraint Type 1 and Type 2: Two 12 inch lengths.

4. Shop Drawings:
   b. Include shop drawings for all candidates submitted for equivalency status to specified products.
   c. Obtain approval for minor variations in detail for the purpose of improving fabrication and installation procedures, but not affecting general design for structural stability or size.

C. Fabricated Items:

1. Samples of all specified materials, fasteners, and finishes:
   a. Metal seats types 1, 2 and 3
   b. Bicycle rack type 3.
   c. Railings.
   d. Skateboard deterrent: Two 12 inch units.
   e. Tree mulch ring: Two 12 inch lengths.

2. Shop Drawings: Provide details of construction and installation including materials, dimensions, methods of joining, fastenings and anchoring for:
   a. All fabricated items including metal seats type 1, 2 and 3; bicycle rack type 3; and skateboard deterrents, and tree grate frame.
b. Obtain approval for minor variations in detail for the purpose of improving fabrication and installation procedures, but not affecting general design for structural stability or size.

3. Metal fabrication shall be in accordance with Section 05 50 00, Metal Fabrications.

4. Weld Certificates.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in good condition.
B. Store products to prevent corrosion, deterioration and damage.
C. Handle products to prevent damage.
D. Bent, scratched, or otherwise damaged items are not acceptable.

1.05 QUALITY ASSURANCE

A. Manufacturer's instructions: Adhere to manufacturer's instructions for product handling, assembly and installation, and maintenance.
B. Manufacturer’s original factory finish must be intact for the installation to be considered satisfactory. On-site touch-up painting or finishing will not be accepted.
C. Inspect surfaces to receive furnishings prior to any installation. Verify accuracy of layout. Insure that surface and grades are complete and meet quality requirements of Contract Documents and the Resident Engineer. If layout, grades and or surface do not meet quality requirements, notify Resident Engineer immediately.
D. Ensure furnishings are plumb, and are centered and aligned with other furnishings or pavement patterns as shown in Contract Documents.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations and dimensions of walls, pavements and other construction contiguous with fabrications by field measurements to ensure that actual dimensions correspond to established dimensions.
B. Provide allowance for trimming and fitting on site.

1.07 MOCK-UPS

A. Install the following mock-ups of fabricated items for acceptance by the Resident Engineer:
   1. Bicycle rack type 3: One.
   2. Metal seats type 1, 2, and 3: One each.
   4. Skateboard deterrent: One installed in section of concrete retaining wall.
   5. Tree mulch ring: One, complete with mulch.
B. Do not begin final installation prior to acceptance of mock-up by Resident Engineer.

C. Protect and maintain accepted mock-up as standard of quality for Work of this Section. Accepted mock-ups may be retained as part of final installation.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. General:
   1. Comply with Manufacturer’s recommendations. Where these may be in conflict, the more stringent requirements prevail.
   2. All products shall be supplied as specified, or accepted equal. Refer to Section 01 25 00, Substitution Procedures for product substitution requirements.

B. Bicycle Rack Type 1:
   1. Manufacturer: Cora Bike Rack Inc., or accepted equal.
   3. Model: Expo® ‘W’ Series, 7510
   4. Design: Racking design to accommodate all types of bicycles. Allows user to lock both the bicycle frame and wheel.
   5. Dimensions: Length: 74-3/8 inches (ten bikes); height: 34 inches; depth: 30 inches.
   6. Material and Construction:
      b. Heavy duty high quality steels. Anchor mount.
      d. Color: Manufacturer’s standard black.
      e. Lock support ASTM A36, 3/4 inch H.R. Round bar.

C. Bicycle Rack Type 2:
   1. Manufacturer: Dero Bike Rack Co., or accepted equal.
   4. Design: Racking design to accommodate all types of bicycles. Allows user to lock both the bicycle frame and wheel.
      b. Floor mounted.
c. Double-sided.

5. Dimensions:
   a. Length: 88 inches.
   b. Height: 62 inches.
   c. Depth: 56 inches.

6. Material and Construction:
   a. High quality heavy duty steel with anchor mount.
   b. Finish: Powder coat.
   c. Color: Manufacturer's standard black.

D. Bicycle Rack Type 3:
   1. Fabricated from manufactured rack.
   2. Manufacturer: Dero Bike Rack Co., or accepted equal.
   5. Design: Custom fabricated from manufactured bicycle rack as shown on Contract Drawings.
   7. Material and Construction:
      a. High quality heavy duty steel with anchor mount.
      b. Finish: Stainless Steel.

E. Bicycle Lockers
   1. Manufacturer: Dura Bike Locker, or accepted equal.
   2. Address: 4019 Leos Lane #3, Carmichael, CA 95608. Telephone: (800) 722-2453.
   4. Design: Rectangular, 2 bikes.

F. Bench Type 1:
   1. Manufacturer: Landscape Forms, Inc., or accepted equal.


5. Supports: End supports are type 319 ASTM B 26 aluminum sand castings.

6. Frame: Front seat rail is 1.5 inches outside diameter by 0.12 inch wall normalized 4130 welded steel tubing with type 304 ASTM A 276 stainless steel threaded inserts welded inside each end. Rear seat rail is 1.5 inches outside diameter by 0.12 inch wall ASTM A 513 type 1 steel tubing. Seat panel connections are 0.25 inch by 0.75 inch by 0.80 inch type 304 ASTM A 276 stainless steel flat bar welded to rails. Upper and lower back rails are 6061-T6 or 6005A-T5 ASTM B 211 aluminum extrusions. Upper rail is 1.375 inch diameter. Lower rail is 0.875 inch diameter.

7. Seat and Back Panels: Seat panel is 0.12 inch thick ASTM A 1011 hot rolled pickled and oiled commercial steel type B perforated and formed. Seat panel connections are 0.188 inch by 1 inch by 1.5 inch type 304 ASTM A 276 stainless steel flat bar welded to panel. Back panel is 0.125 inch thick 3003-H14 ASTM B 209 aluminum sheet perforated and formed. Back panel is welded to back rails.

8. Surface Mount Hardware: Plates are 0.375 inch thick 6061-T6511 ASTM B 221 aluminum flat bar. Anchors are 1/2 inch by 4-3/4 inch stainless steel sleeve anchors.


10. Seat Dividers: Type 319 ASTM B 26 aluminum sand castings.

11. Fasteners: All threaded fasteners are stainless steel or Magni 565 coated carbon steel. Seat dividers are attached with nylon shoulder and flat washers to protect the seat panel finish.

12. Mounting Options: May be embedded or surface mounted.

13. Finishes: Finish on metal is Landscape Forms’ Pangard II® finishing process that includes a rust inhibitor and top coat finish of thermosetting polyester powdercoat that is UV, chip and flake resistant.

14. Colors: Manufacturer’s standard black.

15. Installation: Benches are shipped assembled. Install in accordance with the Contract Documents. Stay bench must be installed on a level concrete base at least 5 inches thick for surface mounting and at least 4-1/2 inches thick for embedding.

16. Manufacturer’s warranty: Products to be free from defects in material and/or workmanship for a period of three years from the date of invoice.

G. Bench Type 2:

1. Manufacturer: Forms and Surfaces, or accepted equal.
2. Address: 6395 Cindy Ln, Carpinteria, CA, 93013.


6. SB-5B: (Typical for all IB Pedestrian Plaza Seating): Backless seats, intermediate armrests, no external armrests, five seat - 17-3/4 inch by 116-1/2 inch by 17-1/2 inch (seat height).

7. Material and Construction:
   a. Die cast aluminum mounting post: 4.724 inch diameter at the base that tapers to 4.213 inch diameter at the top. Total height shall be 12.795 inches. Aluminum alloy type GA1 Si 12 cu. in accordance with ISO 3522/81 and UNI 5076. Install with neoprene gasket to provide isolation from adjacent materials.
   b. Cylindrical support beam: 3.346 inch diameter extruded aluminum in accordance with UNI 9002.
   c. Die cast aluminum seat, armrests, and connectors: Aluminum alloy type GA1 Si 12 cu. in accordance with ISO 3522/81 and UNI 5076. Seats shall have open slots of 0.50 inch for ventilation and drainage.
   d. Internal tie rod: Tubular carbon steel, 0.118 inch wall thickness, to run the length of the beam assembly.
   e. End caps: Molded black textured plastic, 3 inches in diameter. Caps should conceal the beam end bolt socket heads and washers.
   f. Materials shall fit internal keyways to mate to corresponding pieces to provide a unified, rigid structure.
   g. Finish: Aluminum components to be deburred, fine sandblast with hot dip chromate undercoating and 4 mils polyester powdercoat. Powder coat shall have anti-graffiti properties. Steel components to receive anti-corrosion phosphate/manganese coating.
   h. Color:
      1) Seats and mounting posts: Manufacturer's standard black.
      2) Armrests: Manufacturer's standard silver.

8. Manufacturer's Warranty: Five years material and workmanship.

H. Metal Seat Type 1

1. Fabricated.

   a. Finish: See Contract Drawings
5. Fabrication Warranty: One year from date of receipt and acceptance by the buyer.

I. Metal Seat Type 2
   1. Fabricated.
      a. Finish: See Contract Drawings
   5. Fabrication Warranty: One year from date of receipt and acceptance by the buyer.

J. Metal Seat Type 3
   1. Fabricated.
      a. Finish: See Contract Drawings
   5. Fabrication Warranty: One year from date of receipt and acceptance by the buyer.

K. Bollard Type 1:
   1. Manufacturer: Creative Pipe, Inc., or accepted equal.
   2. Address: P.O. Box 2458, Rancho Mirage, CA 92270-1087, telephone: (800) 644-8467, www.creativepipe.com
   3. Model: CBR-6-RB-E-P-FT (fixed).
   4. Design: 36 inches tall, round bollard, 6 inches inside diameter, schedule 40 steel pipe, inset reveal, embedded mount, TGIC polyester powder coat, flat top.
   5. Material and Construction:
   6. Manufacturer’s warranty: For a period of one year from the date of receipt and acceptance by the buyer, its bollards will be free from defects in material or workmanship.
L. Bollard Type 2:

1. Manufacturer: Creative Pipe, Inc., or accepted equal.
4. Design: 36 inches tall, Eliminator bollard, 6 inches inside diameter, schedule 40 steel pipe, internally locking removable embedded mounting system, TGIC polyester powder coat, hot-dipped galvanized finish on the flange and hinged hole cover, removable flat cap, internal lifting handle.
5. Material and Construction:
6. Manufacturer’s warranty: For a period of one year from the date of receipt and acceptance by the buyer, its bollards will be free from defects in material or workmanship.

M. Tree Grates and Tree Grate Frame:

1. Tree Grate is manufactured, and grate frame is fabricated.
2. Manufacturer: Grating Pacific, or accepted equal.
5. Material and Construction:
   b. Finish: Standard
6. Refer to Section 05 53 33, Aluminum Grating PART 2 for aluminum, fasteners, and frame materials and fabrication requirements.
7. Refer to Section 05 50 00, Metal Fabrications 2.01 Materials and 2.02 Fabrication for applicable material and fabrication requirements.
8. Design: As shown on Contract Drawings.

N. Trench Drain Grates:

1. Manufacturer: Iron Age Designs, or accepted equal.
2. Address: Iron Age Designs, 2104 SW 152 ND ST #4, Burien, WA  98166, telephone: (206) 276-0925.
4. Materials and Construction:
a. Cast Aluminum.
b. Finish: Natural.

5. Design: To be used in conjunction with the following drain body types:
   a. ACO H80K, H100K and K100S.
   b. MEADRAIN Shallow Channel System (LZ 80 & LZ 60).

6. Dimensions: No openings greater than 3/8 inch, total thickness 3/4 inch, 5 inch width, 24 inch length segments. Due to casting inconsistencies all dimensions are nominal.

O. Waste Receptacles:
   1. Manufacturer: per STDCM, or accepted equal.
   2. Address: to be determined.
   3. Model: Per STDCM
   4. Materials and Construction:
      a. Perforated metal.
      b. Finish: Powder coat.
      c. Color: Manufacturer's standard black.

P. Railings:
   1. Fabricated.
   3. Material and Construction:
      a. Stainless steel.
      b. Finish: Brushed
      c. Refer to Section 05 52 00, Metal Railings for applicable design, material, fabrication and installation requirements.

Q. Skateboard Deterrents:
   1. Fabricated.
   2. Design: Cast-in-place metals bars with two integral imbeds welded to the base of each unit to prevent lifting from concrete wall. Locate and install per Contract Drawings.
   3. Material and Construction:
      a. Stainless steel.
b. Finish: Standard mill finish

c. Refer to Section 05 50 00, Metal Fabrications 2.01 Materials and 2.02 Fabrication for applicable material and fabrication requirements.

4. Dimensions:

a. Type 1: 1/2 inch thick by 2 inches tall by 12 inches long. Radius all exposed corners 1/2 inch. Ease all exposed edges.

b. Type 2: 1/2 inch thick by 2 inches tall by 8 inches long. Radius all exposed corners 1/2 inch. Ease all exposed edges.

R. Edge Restraint:

1. Manufactured.

2. Type 1: Permaloc StructurEdge aluminum edging, 3/16 inch thickness, 2-1/4 inch depth, mill finish, 6063 alloy, or accepted equal.

3. Type 2: Permaloc PermaStrip aluminum edging, 3/16 inch thickness, 3-1/2 inch depth, mill finish, 6063 alloy, or accepted equal.

S. Tree Mulch Ring:

1. Fabricated.

2. Material and Construction:

a. Galvanized steel.

b. Refer to Section 05 50 00, Metal Fabrications 2.01 Materials and 2.02 Fabrication for applicable material and fabrication requirements.

3. Dimensions: 1/2 inch thick bar stock by 3 inch depth by 6 foot radius.

4. Design: Tree mulch ring is to be fabricated in a maximum of two segments.

5. Installation: Secure to the ground with a minimum of four 10 inch galvanized steel spikes. Segments are to be installed flush with one another and the adjacent finished grade. Install center of ring to match center of tree trunk.

T. Anchors, Fasteners, Fittings, and Hardware: Stainless steel, or Manufacturer's standard, corrosion-resistant-coated or non-corrodible materials; commercial quality, tamperproof, vandal and theft-resistant, concealed, recessed, and capped or plugged.

2.02 FABRICATION

A. Metal Components: Form to required shapes and sizes with true, level and consistent curves, lines, and angles. Cut, drill and punch metals cleanly and accurately. Remove burrs and sharp or rough areas on exposed surfaces, and ease edges unless otherwise indicated. Separate metals from dissimilar materials to prevent electrolytic action. Cut, reinforce, drill and tap metal fabrications as indicated to receive finish hardware, bolts, and similar items.

B. Welded Connections: Weld connections continuously. Weld solid members with full length, full penetration welds and hollow members with full-circumference welds. Use materials and methods that minimize distortion and develop strength and corrosion.
resistance of base metals. Obtain fusion without undercut or overlap. Remove weld flux immediately. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Shop Assembly: Preassemble items in the shop to the greatest extent possible to minimize field assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation. Clearly mark units for assembly in the field.

D. Cut, reinforce, drill and tap metal fabrications as indicated to receive finish hardware, bolts, and similar items.

E. Concrete shall be as specified in Section 03 30 00, Cast-In-Place Concrete and Section 32 13 13, Concrete Paving.

2.03 FINISHES

A. Comply with National Association of Architectural Metal Manufacturer’s “Metal Finishes Manual for Architecture and Metal Products” for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of accepted Submittals. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of accepted Submittals and are assembled or installed to minimize contract.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify installation conditions as satisfactory to receive Work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning of installation constitutes acceptance of existing conditions.

B. See Section 01 56 39, Temporary Tree and Plant Protection for guidelines regarding work adjacent to existing tree critical root zones.

3.02 INSTALLATION GENERAL

A. Stake location of site furnishings for review of the Resident Engineer.

B. Install all manufactured items in accordance with Specifications, Contract Drawings and manufacturer’s directions. Where these may be in conflict, the more stringent requirements govern.

C. Set fabrications accurately in location, alignment and elevation; with edges and surfaces level, plumb, true and free of rack; and measured from established lines and levels. Maximum variation of seats or mounts from level or plumb is 1/16 inch unless otherwise noted.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
E. Comply with the following for field welding: Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove weld flux immediately. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

F. Fastening to in-place construction: Provide fasteners where metal fabrications are required to be fastened to in-place construction.

3.03 INSTALLATION OF MANUFACTURED ITEMS

A. General:

1. Install in accordance with manufacturer’s specifications.

2. Includes:
   a. Bicycle racks Type 1 and 2.
   b. Bicycle lockers.
   c. Benches Type 1 and 2.
   d. Bollards Type 1 and 2.
   e. Tree grates.
   f. Trench drain grates.
   g. Waste Receptacles.
   h. Edge restraints.

3. Ensure units are plumb, level, and are centered and aligned with adjacent elements and pavement patterns as indicated on the Contract Drawings. Locate as indicated on the Contract Drawings.

4. Securely anchor units level and square in accordance with manufacturer’s instructions. Install units without damage to shape or finish.

5. Install with galvanic isolation from surface to which unit is mounted.

B. Bicycle Racks

1. Field-verify site dimensions and location.

C. Bicycle Lockers

1. Field-verify site dimensions and location.

D. Benches:

1. Field-verify site dimensions. Benches cannot extend beyond edges of planting areas into path of travel.

E. Bollards:

1. Install in accordance with manufacturer’s specifications for footing depth and width, using preset anchorage.
F. Tree Grates:
   1. Cast tree grate frames into the concrete surround, level and flat to prevent rocking and allowing grates to lie flat.
   2. Gaps between adjacent units not to exceed 1/8 inch.

G. Trench Drain Grates:
   1. Gaps between adjacent units not to exceed 1/8 inch.

H. Waste Receptacles:
   1. Align receptacle opening perpendicular to the path of travel, with all openings facing the same direction.

I. Edge Restraints:
   1. Field-verify locations.

3.04 INSTALLATION OF FABRICATED ITEMS

A. General:
   1. Install in accordance with Contract Drawings.
   2. Includes:
      a. Bicycle racks Type 3.
      b. Metal seats Types 1, 2, and 3.
      c. Railings
      d. Skateboard deterrents.
      e. Tree mulch ring.
      f. Tree grate frame

B. All fabricated items shall be installed consistent with the measured plans provided in the Contract Drawings.

C. Do not start Work prior to approval of shop drawings by the Resident Engineer.

D. Verify dimensions before proceeding with work. Verify measurements at Site.

E. Ensure units are plumb, level, and are centered and aligned with adjacent elements and/or pavement patterns as indicated on the Contract Drawings. Locate as indicated on the Contract Drawings.

F. Securely anchor units level and square in accordance with Contract Drawings. Install units without damage to shape or finish.

G. Provide anchorage to substrates indicated in accordance with Contract Drawings and shop drawing submittals.

H. Special instructions:
1. Metal Seats Types 1, 2 and 3:
   a. To be determined.

2. Leaning Rail
   a. Install lean rail segments along arcs to form consistent line that follows the arc of pavement edges. Sections of lean rail that create variations will be rejected.

3. Skateboard deterrents.
   a. To be determined.

4. Tree mulch ring.
   a. To be determined.

3.05 CLEAN UP

A. Remove all metal, wood, and debris, protective wrappings and coverings, and shipping materials from the project site. Remove all residues, repair all stains, scuffs, abrasions, and marks from the finished product prior to requesting inspection. Fully restore all areas of the site that were impacted by the installation activities.

3.06 EXHIBITS

A. Site Furnishing Schedule:

1. Roosevelt Station:
   a. Bicycle racks, Types 1 and 2.
   b. Bicycle lockers.
   c. Benches, Type 1.
   d. Railings.
   e. Waste receptacles.
   f. Trench drain grates.

2. Brooklyn Station:
   a. Bicycle racks, Types 1, 2, and 3.
   b. Bicycle lockers.
   c. Metal Seats, Types 1, 2 and 3.
   d. Tree grates.
   e. Waste receptacles.

3. Northgate Station:
   a. Bicycle racks, type to be determined.
b. Bicycle lockers.
c. Benches, type to be determined.
d. Railings.
e. Tree grates.
f. Waste receptacles.
g. Bollards, type to be determined.
h. Trench drain grates.
i. Skateboard deterrents.
j. Edge restraints.
k. Tree mulch ring.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: commissioning process requirements for Conveying Equipment:
   1. Level 1 commissioning activities for Conveying Equipment.
   2. Level 2 commissioning activities for Conveying Equipment.
   3. Support for Level 3 commissioning activities related to Conveying Equipment.
   4. Support for Level 4 commissioning activities related to Conveying Equipment.

B. Related Sections:
   1. Section 01 91 13, General Commissioning Requirements
   2. Section 14 21 00, Electric Traction Elevators
   3. Section 14 31 00, Escalators

1.02 DEFINITIONS

A. Systems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, equipment, and components.

1.03 SYSTEM DESCRIPTION

A. Commissioning work includes: Furnish labor and material to accomplish building commissioning as specified in Division 01 Section "General Commissioning Requirements" and herein, including:
   1. Provide to the Commissioning Coordinator preliminary O&M information for use in developing commissioning test procedures.
   2. Assist the Commissioning Coordinator in developing commissioning activity procedures and data forms submittals for work specified in this Section.
   3. Provide information to the Commissioning Coordinator needed for control interface wiring diagrams submittals for the work of this Section.
   4. Perform Level 1 commissioning activities specified in this Section, including installation verification, static tests, start-up, component tests, equipment tests, systems tests.
   5. Perform Level 2 commissioning activities specified in this Section, including intra-station system interface tests.
   6. Provide support for Level 3 commissioning activities, including jointly with the communications system contractor field testing points in the interface terminal strips,
being present during level 3 testing with adequate labor and support personnel to adjust equipment and troubleshoot system failures that might arise. When material or equipment provided by this Division is found to be in conflict with specified criteria, adjust or replace said material or equipment, with the assistance of manufacturer as needed.

7. Provide support for Level 4 commissioning activities, including providing adequate labor and support personnel to adjust equipment and troubleshoot system failures that might arise during pre-revenue testing.

8. Operate equipment and system during commissioning activities as required by the Commissioning Coordinator.

9. Perform and document commissioning tests to verify readiness for commissioning test demonstration. Commissioning tests are specified herein.

10. Correct issues and repeat commissioning tests when results do not meet acceptance criteria.

11. Commissioning Test Demonstrations: General requirements for commissioning test demonstrations are specified in Division 01 Section 01 91 13, General Commissioning Requirements, Article 3.04, Level 1 and Level 2 Commissioning Activity Commissioning Test Demonstrations.

   a. Repeat commissioning tests on a sample basis to demonstrate acceptable performance: Level 1 Component, Equipment, and System Commissioning Tests, and for Level 2 Intra-station system interface tests.

   b. Record and submit commissioning test demonstration data and issues.

   c. Correct issues and repeat commissioning test demonstration when results do not meet Acceptance Criteria.

12. Attend commissioning meetings as requested by the Commissioning Coordinator.

13. Report any inconsistencies or issues in system operations or performance.

14. Provide personnel to support commissioning test demonstration specified herein as requested by the Commissioning Coordinator.

15. In the event that a commissioning test demonstration fails, assist in determining the cause of failure. Make corrections as necessary.

16. Cooperate with Commissioning Coordinator to make equipment and systems ready for commissioning tests specified herein as early in the construction schedule as possible.

B. Cooperate with Commissioning Coordinator to accomplish commissioning work on schedule and in coordination with other trades.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. Provide test equipment and instrumentation, including consumable supplies, required to execute commissioning activities. Unless noted otherwise, test equipment and instrumentation remain the property of the Contractor.
2.02 PROPRIETARY TEST INSTRUMENTS

A. Provide proprietary test instruments or tools required by the equipment manufacturer. Provide and operate the proprietary test instruments or tools as required for commissioning work.

PART 3 - EXECUTION

3.01 LEVEL 1 COMMISSIONING ACTIVITIES REQUIREMENTS

A. Level 1 commissioning activities scope: Technical requirements for commissioning of Conveying Equipment are specified herein.

B. Provide technicians, instrumentation, and tools to perform commissioning activities in accordance with accepted commissioning activity procedures at the direction of the Commissioning Coordinator.

C. Scope of Conveying Equipment commissioning activities applies to all portions of the Conveying Equipment installation described in the test. Where sampling is specified, it applies only to the commissioning test demonstration.

D. Preparation

1. Certify that Conveying Equipment and subsystems have been completed, calibrated, and started; and are operating in accordance with Contract Documents.

2. Testing Instrumentation: Install measuring instruments and logging devices to record test data in accordance with accepted commissioning test procedures as directed by the Commissioning Authority.

3. Certify that Conveying Equipment instrumentation and control systems have been completed and calibrated; are operating according to the Contract Documents; and that pretest set points have been recorded.

4. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions) in accordance with accepted commissioning test procedures as directed by the Commissioning Coordinator.

E. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions.

F. Perform tests using design conditions whenever possible.

G. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Provide equipment to simulate loads. Set simulated conditions in accordance with accepted commissioning test procedures as directed by the Commissioning Coordinator. Document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

H. Request approval to alter set points when simulating conditions is not practical.

I. Request approval to alter sensor values with a signal generator when design or simulating conditions and altering set points are not practical.

J. If tests cannot be completed because of a deficiency outside the scope of the Conveying Equipment system, document the deficiency and report it to Sound Transit. After deficiencies are resolved, reschedule tests.
K. Where seasonal testing is specified, complete appropriate initial commissioning tests and documentation within the Construction Period. Schedule and execute seasonal tests when specified conditions are expected.

3.02 LEVEL 1 AND LEVEL 2 COMMISSIONING ACTIVITY PROCEDURES

A. Submit level 1 commissioning activity test procedures and data forms for the following types of commissioning activities, requirements for which are specified herein.

1. Level 1 commissioning activities:
   a. Installation verification
   b. Start-up procedures
   c. System tests

B. Cooperate with the Commissioning Coordinator to develop level 2 commissioning activity test procedures and data forms related to the work of this Division. Provide information as needed, including interfaces with equipment and systems installed by others.

1. Level 2 commissioning activities:
   a. Intra-station system interface tests

3.03 LEVEL 1 INSTALLATION VERIFICATION CHECKLIST REQUIREMENTS

A. Scope: Installation verification requirements apply to the following:

1. Section 14 21 00, Electric Traction Elevators
2. Section 14 31 00, Escalators

B. Installation Verification Scope: Technical requirements for Installation Verification of Conveying Equipment are specified herein.

C. Installation verification checklist forms shall include the following:

1. Organized to prompt the installer to check off quality criteria for each discrete portion of the Work.
2. Identify the system or features to which the installation verification checklist applies at the top of the form.
3. Section for verification of delivery of accepted materials.
4. Section for condition of materials at delivery.
5. Section for installation. Include manufacturer’s installation instructions.
6. Space at the end of the form for the installer to print their name and company name, fill in the date, and sign or initial.
7. Space to identify the area of work for which the installer is executing the Installation Verification Checklist.
8. Description of the quality criteria as it pertains to the specific work. Include a check-box for each criterion.
D. Quality Criteria: Installation verification checklists shall address the following quality criteria.

1. Make and model match accepted submittals, including motor full load amperage rating and winding insulation class.

2. Equipment is installed without visible damage.

3. Location is as indicated on drawings.

4. Equipment is accessible for maintenance using safe work practices.

5. There is sufficient space to remove and replace components intact without demolishing other work.

6. Equipment surfaces are clean and free of dust, dirt, oil and other contaminants.

7. Power unit is accessible for adjustment, maintenance, and testing, including replacement of components or the entire assembly.

8. Hoistway is accessible for adjustment, maintenance, testing and replacement of fire alarm, fire detection and fire suppression devices and equipment.

9. Locations of fire detection and fire suppression devices and equipment are effective for intended functions.

10. Hoistway shaft penetrations are sealed.

E. Fill out and sign installation verification checklists for Conveying Equipment while the Work is being installed. The intent is for the installing tradesperson to fill out and sign the installation verification checklist as work proceeds to improve the quality of the installation. Retain completed installation verification checklists on site for review.

F. Before performing a commissioning test, submit completed installation verification checklists for work included in the commissioning test.

3.04 LEVEL 1 INSTALLATION VERIFICATION

A. Installation verification checklists are required for the following, minimum:

1. 1408-IV-01 Electric Traction Elevators
   a. Hoistway, pit, and hoistway equipment.
   b. Elevator machine room and equipment.
   c. Power, control, monitoring, and communication wiring installation and termination, including traveling cables.
   d. Elevator cab, including access card reader, telephone, public address speakers, and CCTV camera.
   e. Elevator door and landing equipment.

2. 1408-IV-02 Escalators
   a. Escalator wellway, pit and equipment.
   b. Escalator machine room and equipment.
c. Power, control, and monitoring wiring installation and termination.

3.05 LEVEL 1 START-UP

A. 1408-SU-01: Electric Traction Elevators

1. System/Equipment to be Tested:
   a. Elevators and associated elevator equipment and controls, 14 21 00, Electric Traction Elevators.

2. Functions to be Tested:
   a. Installation verification and start-up.

3. Conditions of the Test:
   a. As required by the manufacturer’s written installation verification and start-up instructions.

4. Acceptable Results:
   a. Manufacturer’s criteria are met.

B. 1408-SU-02: Escalators

1. System/Equipment to be Tested:
   a. Escalators and associated escalator equipment and controls, 14 31 00, Escalators.

2. Functions to be Tested:
   a. Installation verification and start-up.

3. Conditions of the Test:
   a. As required by the manufacturer’s written installation verification and start-up instructions.
   b. Additional start-up parameters:

   1) Connection of dry contact for remote control of each escalator by the Link Control Center.

   2) Connection of normally open dry contacts for each of the following status items for each escalator for remote monitoring of each escalator by the Link Control Center:

      a) Escalator Running/Off
      b) Escalator Traveling Up/Down
      c) Escalator Fail
      d) Escalator Emergency Stop Button
4. Acceptable Results:
   a. Manufacturer’s criteria are met.
   b. Additional start-up criteria are met.

3.06 LEVEL 1 EQUIPMENT TESTS

A. 1408-E-01: Electric Traction Elevator Access Card Reader

1. System/Equipment to be Tested:
   a. Elevators and associated access card reader, 14 21 00, Electric Traction Elevators.

2. Functions to be Tested:
   a. Connection of card reader to Interface Terminal Cabinet.

3. Conditions of the Test:
   a. Verify individual data input and output points and commands between card reader and Interface Terminal Cabinet.

4. Acceptable Results:
   a. Input and output points are correctly identified and communicated.
   b. Commands are correctly executed.

B. 1408-E-02: Electric Traction Elevator CCTV Camera

1. System/Equipment to be Tested:
   a. Elevators and associated CCTV camera, 14 21 00, Electric Traction Elevators.

2. Functions to be Tested:
   a. Connection of CCTV camera to Interface Terminal Cabinet.
   b. Control and monitoring of CCTV camera.

3. Conditions of the Test:
   a. Verify CCTV camera image Interface Terminal Cabinet, in accordance with Division 14 Section 14 21 00, Electric Traction Elevators, Article, Demonstration.
   b. Verify correct CCTV camera identification on computer connected to Interface Terminal Cabinet.
   c. Verify ability to control focus, aim and iris adjustment on computer connected to Interface Terminal Cabinet.

4. Acceptable Results:
   a. CCTV camera image is focused, adjusted for elevator cab light conditions, and appropriately aimed.
b. CCTV camera is correctly identified with the image at computer connected to Interface Terminal Cabinet.

c. CCTV camera responds appropriately to commands from computer connected to Interface Terminal Cabinet to control focus, aim and iris adjustment.

C. 1408-E-03: Electric Traction Elevator Public Address

1. System/Equipment to be Tested:
   a. Elevators and associated public address (PA) speakers and PA amplifier, 14 21 00, Electric Traction Elevators.

2. Functions to be Tested:
   a. Connection of PA speakers to PA amplifier.
   b. Connection of PA amplifier to Interface Terminal Cabinet.

3. Conditions of the Test:
   a. Verify individual elevator car speaker address and connection to PA amplifier by issuing audio message from elevator system.
   b. Verify speaker address and connection to system by issuing audio message from Interface Terminal Cabinet.

4. Acceptable Results:
   a. Elevator system messages are communicated audibly and intelligibly in appropriate elevator car.
   b. Communication system messages are communicated audibly and intelligibly in elevator car.

3.07 LEVEL 1 SYSTEM TESTS

A. 1408-S-01: Electric Traction Elevator Operation

1. System/Equipment to be Tested:
   a. Elevators and associated elevator equipment and controls, 14 21 00, Electric Traction Elevators.

2. Functions to be Tested:
   a. Call and dispatch controls
   b. Proximity detection device operation
   c. Elevator car telephone
   d. Public address
   e. Elevator alarm
   f. Intercom
3. Conditions of the Test:
   a. From each floor; call the car to the test floor; dispatch the car to each other station.
   b. At each floor; place an object in the path of the closing door.
   c. Operate telephone per posted instructions in normal power condition.
   d. Issue message from communication system during announcement of elevator system-generated message in normal power condition.
   e. Operate the emergency stop button in normal power condition.
   f. Operate the elevator alarm button in normal power condition.
   g. Operate the intercom in normal power condition.
   h. Operate telephone per posted instructions in emergency power condition.
   i. Issue message from communication system during announcement of elevator system-generated message in emergency power condition.
   j. Operate the emergency stop button in emergency power condition.
   k. Operate the elevator alarm button in emergency power condition.
   l. Operate the intercom in emergency power condition.

4. Acceptable Results:
   a. Car responds to calls and dispatches appropriately. Doors open and close as required. Arrival signals function as expected.
   b. Proximity detection device stops door closure.
   c. Telephone connects as required in normal power condition in accordance with Division 14 Section 14 21 00, Electric Traction Elevators, Article, Equipment.
   d. Messages from communication system cause elevator system-generated messaged to be delayed in normal power condition.
   e. Car stops and alarm is initiated in normal power condition.
   f. Elevator alarm is initiated in normal power condition.
   g. Intercom communicates as required in normal power condition.
   h. Telephone connects as required in emergency power condition.
   i. Messages from communication system cause elevator system-generated messaged to be delayed in emergency power condition.
   j. Car stops and alarm is initiated in emergency power condition.
   k. Elevator alarm is initiated in emergency power condition.
   l. Intercom communicates as required in emergency power condition.
B. 1408-S-05: Escalator Emergency Stop

1. System/Equipment to be Tested:
   a. Escalators and associated escalator equipment and controls, 14 31 00, Escalators.

2. Functions to be Tested:
   a. Escalator emergency stop button response.

3. Conditions of the Test:
   a. Activate red emergency stop button during normal operation.

4. Acceptable Results:
   a. The escalator stops smoothly. An audible warning signal is activated. The signal has a minimum sound intensity of 80 dBA at the button location.

C. 1408-S-06: Escalator Airborne Noise Control

1. System/Equipment to be Tested:
   a. Escalators and associated escalator equipment and controls, 14 31 00, Escalators.

2. Functions to be Tested:
   a. Control of airborne noise generated by escalator operation.

3. Conditions of the Test:
   a. Unloaded: With other equipment not operating, and no passengers on escalator, measure sound 3 feet 0 inches above operating escalator at three points of its length using the "A"-weighted scale.

   b. Loaded: With other equipment not operating, and a rated load on escalator, measure sound 3 feet 0 inches above operating escalator at three points of its length using the "A"-weighted scale.

4. Acceptable Results:
   a. For all conditions, noise levels relating to escalator equipment and its operation do not exceed 60 dBA.

D. 1408-S-07: Escalator Step Speed

1. System/Equipment to be Tested:
   a. Escalators and associated escalator equipment and controls, 14 31 00, Escalators.

2. Functions to be Tested:
   a. Control of escalator step speed.

3. Conditions of the Test:
a. Unloaded: With no passengers on escalator, measure step speed in upward and downward directions.
b. Unloaded: With rated load on escalator, measure step speed in upward and downward directions.

4. Acceptable Results:
   a. Under all loading conditions step speed shall be 100 feet per minute plus or minus 10 percent. (For 20-foot travel, time is no less than 10.9 seconds nor greater than 13.3 seconds) in upward direction and in downward direction.

E. 1408-S-08: Escalator Handrail Speed.

1. System/Equipment to be Tested:
   a. Escalators and associated escalator equipment and controls, 14 31 00, Escalators.

2. Functions to be Tested:
   a. Control of handrail speed relative to step speed.

3. Conditions of the Test:
   a. Unloaded: With no passengers on escalator, measure handrail speed in upward and downward directions.
   b. Unloaded: With rated load on escalator, measure handrail speed in upward and downward directions.

4. Acceptable Results:
   a. Under all conditions handrail speed is consistent with step speed. Error does not exceed one inch of alignment change between step and handrail over the full length of travel.

F. 1408-S-09: Escalator Brake Operation

1. System/Equipment to be Tested:
   a. Escalators and associated escalator equipment and controls, 14 31 00, Escalators.

2. Functions to be Tested:
   a. Deceleration, stopping and holding performance of the brakes.

3. Conditions of the Test:
   a. Unloaded: With no passengers on escalator, measure deceleration and observe ability to stop and hold in upward and downward direction.
   b. Unloaded: With rated load on escalator, measure deceleration and observe ability to stop and hold in upward and downward direction.

4. Acceptable Results:
a. Under all loads, brakes safely decelerate, stop, and hold rated load in accordance with Code requirements. Brakes stop escalator operating in the down direction at a rate not greater than 3 feet/second/second.

G. 1408-S-10: Escalator Local Control

1. System/Equipment to be Tested:
   a. Escalators and associated escalator equipment and controls, 14 31 00, Escalators.

2. Functions to be Tested:
   a. Key control of escalator start and stop operation.

3. Conditions of the Test: Use the key-operated switches located at upper and lower newel or stanchion-mounted operating station to perform the following functions:
   a. At upper operating station, start escalator in up direction.
   b. At upper operating station, stop escalator.
   c. At upper operating station, start escalator in down direction.
   d. At lower operating station, stop escalator.
   e. At lower operating station, start escalator in up direction.
   f. At upper operating station, stop escalator.

4. Acceptable Results:
   a. For all conditions, escalator starts and stops as indicated by key position.
   b. b. Witness and document L&I and/or City of Seattle inspections
   c. 1) Witness and provide written documentation of the L&I and/or City of Seattle inspectors inspections.

3.08 LEVEL 2 INTRA-STATION SYSTEM INTERFACE TESTING REQUIREMENTS

A. 1408-IS-01: Electric Traction Elevator Fire Alarm Response

1. System/Equipment to be Tested:
   a. Elevators and associated elevator equipment and controls, 14 21 00, Electric Traction Elevators.
   b. Fire alarm controls, 28 31 00 Fire Detection and Alarm.

2. Functions to be Tested:
   a. Fire alarm response

3. Conditions of the Test:
   a. Observe elevator response to fire alarm condition in normal power mode.
   b. Observe elevator response to fire alarm condition in emergency power mode.
c. Operate telephone per posted instructions during fire alarm.
d. Operate the emergency stop button during fire alarm.
e. Operate the elevator alarm button during fire alarm.
f. Operate the intercom during fire alarm.

4. Acceptable Results:
   a. Elevator responds to fire alarm as required in normal power mode.
   b. Elevator responds to fire alarm as required in emergency power mode.
   c. Telephone connects as required during fire alarm.
   d. Car stops and alarm is initiated during fire alarm.
   e. Elevator alarm is initiated during fire alarm.
   f. Intercom communicates as required during fire alarm.

B. 1408-IS-02: Washington State Elevator Inspection Readiness

1. System/Equipment to be Tested:
   a. Elevators and associated elevator equipment and controls, 14 21 00, Electric Traction Elevators.

2. Functions to be Tested:
   a. Readiness for Washington State Labor and Industries Elevator Inspection

3. Conditions of the Test:
   a. Perform the tests that the Washington State Elevator Inspector will require, according to Labor and Industries procedures.

4. Acceptable Results:
   a. Performance meets or exceeds Labor and Industries requirements in advance of elevator inspection by the Washington State Elevator Inspector.

C. 1408-S-03: City of Seattle Elevator Test (Provide consistent inspector labels)

1. System/Equipment to be Tested:
   a. Elevators and associated elevator equipment and controls, 14 21 00, Electric Traction Elevators.

2. Functions to be Tested:
   a. As required by Elevator Section of the City of Seattle Department of Planning and Development.

3. Conditions of the Test:
   a. Perform tests specified in Division 14, Section 14 21 00, Electric Traction Elevators, Article, System Startup.
4. Acceptable Results:
   a. Performance meets or exceeds requirements of Elevator Section of City of Seattle Department of Planning and Development.

D. 1408-S-04: Washington State Elevator Tests

1. System/Equipment to be Tested:
   a. Elevators and associated elevator equipment and controls, 14 21 00, Electric Traction Elevators.

2. Functions to be Tested:
   a. As required by Washington State Labor and Industries in accordance with procedures described in ASME A17.2.1 Inspectors' Manual for Electric Elevators.

3. Conditions of the Test:
   a. Perform tests specified in Division 14, Section 14 21 00, Electric Traction Elevators, Article, System Startup.

4. Acceptable Results:
   a. Performance meets or exceeds requirements of Washington State Labor and Industries, and as specified in Division 14, Section 14 21 00, Electric Traction Elevators.
   b. Washington State Labor and Industries issuance of permanent operating permit.

3.09 ATTACHMENTS

A. Attachment A: Example Installation Verification Checklist
B. Attachment B: Example Commissioning Test

END OF SECTION

ATTACHMENTS
Attachment A: Example Installation Verification Checklist

I. OBJECTIVES
   A. Document proper installation and condition of Hydraulic Elevators per contract requirements.
   B. Reference Section nnnnnn
   C. Reference Section 14 21 00

II. SYSTEMS AND EQUIPMENT TO BE TESTED
   A. Hydraulic elevators and associated controls:
      1. C21-ELEV-1
      2. C21-ELEV-2
   B. As required by attached manufacturer’s installation checklist.

III. TEST PROCEDURE
   A. In accordance with general conditions of the contract, contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of this test. Stop the test and notify the owner if it is determined that any part of the test cannot be performed safely.
   B. Test procedure comprises the manufacturer’s installation checklist form and the Installation Checklist included herewith.
      1. Provide the manufacturer’s installation checklist form for use during the installation check.

IV. ACCEPTANCE CRITERIA
   A. Observed results shall comply with acceptance criteria that appear on the Installation Checklist included herewith and on the contractor-provided manufacturer’s installation checklist form.

V. TEST RESULTS
   A. In the event checklist items on the Installation Checklist included herewith are essentially the same as items on the contractor-provided manufacturer’s installation checklist form, record the results on the form with the more rigorous criteria. In such case, make a note on the other form referencing the line number on the form where the item was verified.
   B. Attach completed contractor-provided manufacturer’s installation checklist form to this test.
   C. If results do not comply with Acceptance Criteria above, terminate the test, complete a Commissioning Deficiency Report Form Part 1, make necessary corrections, repeat and document the Commissioning Test, submit Commissioning Deficiency Report Form Part 2, and repeat the Commissioning Test Demonstration.
   D. Describe any deviation, or elaboration, on the test procedure in the Notes sections. Attach additional pages for notes if necessary.
   E. Initial completed lines as each portion of the test is completed and recorded. Sign and date the Data Form when the tests are complete.
Describe Test Procedure documentation attached to this test:

<table>
<thead>
<tr>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Installation Checklist 1408-IV-240.111-ELEV1</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
</tr>
</tbody>
</table>

A. Record observed conditions and results on the attached manufacturer’s installation checklist in the spaces provided at the time of the inspection. Record results legibly in ink.

B. If results do not comply with Acceptance Criteria, complete a Commissioning Deficiency Report Form Part 1, make necessary corrections, repeat and document the Commissioning Test, submit Commissioning Deficiency Report Form Part 2, and repeat the Commissioning Test Demonstration.

C. Describe any deviation, or elaboration, on the inspection procedure in the Notes sections. Attach additional pages for notes if necessary.

D. Initial completed lines as each portion of the inspection is completed and recorded. Sign and date the Data Form when the tests are complete.

Issues Noted? Yes____ No____ Issue Report Numbers:__________________________

Notes:

Signatures: The undersigned have witnessed the above test and verified that the test was performed in accordance with the Approved Commissioning Test Procedure and that the results recorded were the actual results observed.

Company / Print Name / Signature / Date

Installing Contractor: ______________________________________________________

Owner’s witness: __________________________________________________________
### Model Verification

<table>
<thead>
<tr>
<th></th>
<th>Submitted</th>
<th>Delivered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Manufacturer</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Model</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Serial Number</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Arrangement</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Voltage / Phase / Frequency (V / Ø / Hz)</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Motor FLA</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Motor winding insulation class</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Capacity (lbs, Class A loading)</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Physical Checks

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10.</td>
<td>Unit is free from physical damage</td>
<td>Yes</td>
</tr>
<tr>
<td>11.</td>
<td>All components present and in proper order</td>
<td>Yes</td>
</tr>
<tr>
<td>12.</td>
<td>All access doors are operable</td>
<td>Yes</td>
</tr>
<tr>
<td>13.</td>
<td>Installation and startup manual provided</td>
<td>Yes</td>
</tr>
<tr>
<td>14.</td>
<td>Unit tags affixed and legible</td>
<td>Yes</td>
</tr>
<tr>
<td>15.</td>
<td>Unit secured as required by manufacturer and specifications</td>
<td>Yes</td>
</tr>
<tr>
<td>16.</td>
<td>All fasteners are tight</td>
<td>Yes</td>
</tr>
<tr>
<td>17.</td>
<td>Adequate clearance around unit for service</td>
<td>Yes</td>
</tr>
<tr>
<td>18.</td>
<td>All equipment installed so it may be easily removed for maintenance and repair.</td>
<td>Yes</td>
</tr>
<tr>
<td>19.</td>
<td>All equipment installed for ease of maintenance.</td>
<td>Yes</td>
</tr>
<tr>
<td>20.</td>
<td>All equipment installed to afford maximum accessibility, safety, and continuity of operation.</td>
<td>Yes</td>
</tr>
<tr>
<td>21.</td>
<td>All elevator equipment provided under this Contract, including power conversion unit, controller and their support, mechanically isolated from the building structure and from electrically induced vibration to minimize the possibility of objectionable noise and vibrations being transmitted to the car, building structure, or occupied areas of building.</td>
<td>Yes</td>
</tr>
<tr>
<td>22.</td>
<td>Manual on/off valve(s) installed in oil line(s) adjacent to pump unit and jack unit(s) in pit adjacent to jack unit(s).</td>
<td>Yes</td>
</tr>
<tr>
<td>23.</td>
<td>Muffler in discharge oil line near pump unit.</td>
<td>Yes</td>
</tr>
<tr>
<td>24.</td>
<td>Ventilation: Three-speed exhaust blower mounted to car canopy on isolated rubber grommets. Morrison Products, Model AA with diffuser and grille or approved equal.</td>
<td>Yes</td>
</tr>
<tr>
<td>25.</td>
<td>Door Protection: Infrared, full screen device, with differential timing and nudging and interrupted beam time</td>
<td>Yes</td>
</tr>
<tr>
<td>26.</td>
<td>Vibration Control: All elevator equipment provided under this Contract, including power unit, controller, oil supply lines, and their support are mechanically isolated from the building structure and electrically isolated from the building power supply and to each other to minimize the possibility of objectionable noise and vibrations being transmitted to occupied areas of the building.</td>
<td>Yes</td>
</tr>
<tr>
<td>27.</td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Mechanical

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>28.</td>
<td>Inspect the equipment for any shipping damage. Remove any foreign material such as tags or packing from any moving parts or from within the unit.</td>
<td>Yes</td>
</tr>
<tr>
<td>29.</td>
<td>Check all bolts, screws, and fasteners, and tighten if necessary.</td>
<td>Yes</td>
</tr>
<tr>
<td>30.</td>
<td>Unit is clean.</td>
<td>Yes</td>
</tr>
<tr>
<td>31.</td>
<td>Fans and motors lubricated and aligned.</td>
<td>Yes</td>
</tr>
<tr>
<td>32.</td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Electrical

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>33.</td>
<td>Local disconnect installed in accessible location</td>
<td>Yes</td>
</tr>
<tr>
<td>34.</td>
<td>All electrical connections are tight</td>
<td>Yes</td>
</tr>
<tr>
<td>35.</td>
<td>All electrical components are grounded</td>
<td>Yes</td>
</tr>
<tr>
<td>36.</td>
<td>Motor nameplate matches line characteristics: Voltage / Phase / Frequency (V / Ø / Hz)</td>
<td>Yes</td>
</tr>
</tbody>
</table>
37. Spare Conductors: 10 percent spare conductors throughout. Spare wires run from car connection points to individual elevator controllers in the machine room. Spares tagged in machine room. | Yes | No

38. Spare Conductors: Four pairs of spare shielded communication wires in addition to those required to connect specified items. | Yes | No

39. Lighting: Battery standby power for operation. Fluorescent fixtures with wiring and hook up. Installation coordinated with emergency lighting requirements. Emergency lighting integral with portion of normal car lighting system. Required transformer included. Separate constant pressure test button in car service compartment. | Yes | No

40. Door Protection: Battery pack standby power provision | Yes | No

41. GFCI convenience outlets in pit and machine room. | Yes | No

42. Battery Lowering Device: A standby power source provided via 12-volt D.C. battery units installed in machine room, including solid-state charger and testing means mounted in a common metal container. Batteries are rechargeable lead-acid or nickel-cadmium with a 10-year life expectancy | Yes | No

43. | Yes | No

Manufacturer

44. Manufacturer’s installation checklist completed and attached, if appropriate | Yes | No

45. All equipment installed in accordance with Manufacturer’s instructions, referenced Codes, Contract Specifications and approved submittal. | Yes | No

46. | Yes | No

“No” Responses

| Item # | Date | Reason for “No” Response |

Corrective Action

| Item # | Date | Corrective Action | Completed By: |

Signatures: The undersigned have performed the above installation check and verified that the installation is complies with the manufacturer’s and contract requirements.

Company / Print Name / Signature / Date

Installing Contractor: 

Owner’s witness: 

END OF INSTALLATION CHECKLIST
Attachment B: Example Commissioning Test

1. OBJECTIVES
   A. Verify the ability of the elevator hoist motor to operate continuously under rated load for Code-mandated duration.

2. SYSTEMS AND EQUIPMENT TO BE TESTED
   A. Elevator hoist motors and associated equipment and controls.

3. PREREQUISITES
   A. Completion of installation verification: 1408-IV-05 Elevator Installation Verification.
   B. Completion of start-up 1408-SU-08 Elevator Start-up.

4. MINIMUM PARTICIPANTS
   A. Elevator trade representative.
   B. Commissioning Coordinator

5. TEST EQUIPMENT
   A. Weights equal to the rated load of the elevator, or as required by Code.
   B. Air temperature thermometer.
   C. Surface temperature thermometer.
   D. Stopwatch.

6. TEST PROCEDURE
   A. In accordance with general conditions of the contract, contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of this test. Stop the test and notify the owner if it is determined that any part of the test cannot be performed safely.
   B. Load the elevator with weights as required by Code.
      Record weight (pounds)  __________________
   C. Maximum allowable hoist motor temperature.
      Temperature ( °F)  __________________
   D. Measure ambient air temperature in elevator machine room before test starts.
      Temperature ( °F)  __________________
   E. Measure hoist motor surface temperature before test starts.
      Temperature ( °F)  __________________
   F. Operate the elevator continuously for 30 minutes. The elevator shall travel the full distance between lowest and highest stops, stopping at each level and proceeding immediately to the next level. Monitor and record hoist motor surface temperature at 5-minute intervals, minimum, or as required by Code.
      
      | Elapsed Time (minutes) | Temperature (°F) | Voltage (A/B/C) | Amperage (A/B/C) |
      |------------------------|-----------------|-----------------|-----------------|
      | 0                      |                 |                 |                 |
      | 5                      |                 |                 |                 |
      | 10                     |                 |                 |                 |
      | 15                     |                 |                 |                 |
      | 20                     |                 |                 |                 |
      | 25                     |                 |                 |                 |
      | 30                     |                 |                 |                 |
   G. Note the highest hoist motor surface temperature observed during the 30-minute period.
      Temperature ( °F)  __________________
   H. Calculate the temperature rise (difference between hoist motor surface temperature measured before the test and the highest hoist motor surface temperature).
      Temperature rise ( °F)  __________________
   I. Is the temperature rise less than or equal to the maximum allowed by Code?
      (Yes / No)  __________________

7. ACCEPTANCE CRITERIA
   A. Temperature rise is less than or equal to the maximum allowed by Code.
Issues Noted? Yes____ No____

Issue Report Numbers: ____________________________________________________________

Notes:

Signatures: The undersigned have witnessed the above test and verified that the test was performed in accordance with the Approved Commissioning Test Procedure and that the results recorded were the actual results observed.

Company / Print Name / Signature / Date

Commissioning Coordinator: _______________________________________________________

Installing Contractor: ____________________________________________________________

Owner’s witness: ________________________________________________________________

END OF COMMISSIONING TEST PROCEDURE
SECTION 14 21 00
ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for furnishing and installing and providing preventive maintenance for Gearless Passenger traction elevators as specified and detailed on the Contract Drawings.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 01 91 13, General Commissioning Requirements
2. Section 08 80 00, Glazing
3. Section 09 96 00, High Performance Coatings
4. Section 14 08 00, Commissioning of Conveying Equipment

C. Related Work Provided Under Other Sections

1. Hoistway and Pit:
   a. Clear, plumb, substantially flush hoistway with variations not to exceed 1 inch at any point.
   b. Bevel cants not less than 75 degrees from the horizontal on any rear or sidewall ledges and beams that project or recess 2 inches or more into the hoistway. Not required on hoistway divider beams.
   c. Supports at each floor for car and counterweight guide rail fastening. Intermediate car counterweight guide rail support when floor heights exceed 14 feet 0 inch. Building supports not to deflect more than 1/8 inch under normal conditions, 1/4 inch under seismic conditions.
   d. Installation of guide rail bracket supports in concrete. Inserts or embeds, if used, will be furnished under this Section.
   e. Wall blockouts and fire rated closure for control and signal fixture boxes that penetrate walls.
   f. Cutting and patching walls and floors.
   g. Wall pockets and/or structural beams for support of machine, sheave, and dead-end hitch beams. Do not exceed support deflection of 1/1666 of span under static load. Erect from elevator hoistway wall after elevator entrances.
   h. Grout around hoistway entrances and sills.
   i. Pit access ladder for each elevator.
j. Structural support for car and counterweight buffer impact loads, guide rail loads, and compensation sheave tie-down upthrust.

k. Waterproof pit. Dry sump with flush grate or indirect drain. Pits shall be equipped with audible alarm sensors tied to the Building Management System to notify LCC if water has exceeded capacity of sump. Alarm not required if drain provided due to code requirement.

l. Protect open hoistways and entrances during construction in accordance with OSHA Regulations 29 CFR Part 1926.

m. Protect car enclosure, hoistway entrance assemblies, and special metal finishes from damage after installation.

n. Hoistway venting or pressurization to prevent accumulation of smoke and gas as required by Local Building Code.

o. Hoistway Cooling: Fixed louvers and supplemental exhaust venting to not exceed maximum temperature. No hoistway heating provided.
   1) Maximum temperature: Hoistway maximum temperature not to exceed 104 degrees F.
   2) Maintain maximum 80 percent relative humidity, non-condensing

p. Seal fireproofing to prevent flaking.

2. Machine Room, Control Room and Machinery Spaces:

a. Self-closing and locking access door.

b. Ventilation and heating.
   1) Minimum temperature: Maintain minimum temperature of 55 degrees F.
   2) Maximum temperature: Maintain maximum temperature of 90 degrees F.
   3) Maintain maximum 80 percent relative humidity, non-condensing

c. Paint walls, ceiling, and floor.

d. Class ABC fire extinguisher.

e. Seal fireproofing to prevent flaking.

f. Fire sprinklers as required by code.

3. Electrical Service, Conductors, and Devices:

a. Lighting and Ground Fault Circuit Interrupter (GFCI) convenience outlets in pit, machine room, and overhead machinery space.

b. Conduit from the hoistway of each elevator to the firefighter’s control room and communications distribution cabinet. Coordinate size, number, and location of conduits.
c. Three-phase mainline copper power feeder to terminals of each elevator controller in the machine room with protected, lockable OPEN, disconnect switch.

d. Single-phase copper power feeder to each elevator controller for car lighting and exhaust blower with individual protected, lockable OFF, disconnect switch.

e. Products-of-combustion sensor (NFPA No. 72, Chapter 5-3) in each elevator lobby, for each group of elevators or single elevator and each machine room to initiate firefighters' return feature. Device at top of hoistway if sprinklered. Provide means for service access from outside the hoistway. Provide sensor signal wiring from hoistway or machine room connection point to elevator controller terminals.

f. Temporary power and illumination to install, test, and adjust elevator equipment.

g. Means to manually and automatically disconnect power to affected elevator drive unit and controller prior to activation of machine room overhead fire sprinkler system, and/or hoistway overhead fire sprinkler system. Locate manual shut-off means outside bounds of machine room.

h. When sprinklers are provided in the hoistway, identify all electrical equipment, except seismic protective devices, located less than 4 feet 0 inch above the pit floor for use in wet locations. (ANSI/NFPA 70).

i. Power feeders to main control console and firefighters' control panel.

j. Power feeder to elevator Public Address (PA) amplifier in the elevator machine room.

k. Single-phase power feeders to machine room elevator group control monitor with single-phase, protected, lockable OFF, disconnect switch.

4. Standby Power Provision:

a. Standby power of the same voltage characteristics via normal electrical feeder to run all elevators at full-rated car speed and capacity.

b. Conductor from auxiliary form "C" dry contacts, located in the standby power transfer switch to a designated elevator control panel in each elevator group and/or single elevator unit. Provide time delay of 30-45 seconds for pre-transfer signal in both directions.

c. Standby single-phase power to group controller, and each elevator controller for lighting, exhaust blower, emergency call bell, intercom amplifier, and hoist machine cooling fan.

d. Means for absorbing regenerated power during an overhauling load condition, in accordance with NEC 650-101. Elevator shall employ SCR IBGT drive, presenting a non-linear active load.

e. IBC Rule 3005.1 requires elevator machine room ventilation or air conditioning to function under a standby power condition.

D. Preventive maintenance as described herein.

E. Equipment furnished by Sound Transit, installed under this Section:

1. Radio antenna

2. Production of combustion sensor
F. Contractor will review Contract Documents for compatibility with its product prior to bidding. Review structural, architectural, electrical and mechanical, and communication systems documents and elevator specification. Compliance with all provisions of Contract Documents is assumed and required. Sound Transit will not pay for changes to structural, mechanical, electrical, or other systems required to accommodate Contractor’s equipment.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Society of Mechanical Engineers (ASME)
   a. ASME A17.1 National Safety Code for Elevators and Escalators
   b. ASME A17.2.1 Inspector’s Manual for Electric Elevators
   c. ASME A17.5 Elevator and Escalator Electrical Equipment

   a. ASTM A36 Standard Specification for Carbon Structural Steel
   c. ASTM A568 Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements
   d. ASTM A1008 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
   e. ASTM A1011 Standard Specifications for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy with Improved Formability
   f. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
   g. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes

3. National Fire Protection Association (NFPA)
   a. NFPA No. 70 National Electrical Code
   b. NFPA No. 72 National Fire Alarm Code
   d. NFPA No. 130 Standard for Fixed Guideway Transit and Passenger Rail Systems

4. Federal Standard and NAAMM nomenclature

5. American National Standards Institute (ANSI)
   a. ANSI Z97.1 Safety and Glazing Materials used in Building Safety

a. CPSC 16 CRF Part 1201 Safety Standard for Architectural Glazing Materials

7. Washington Administrative Code (WAC)

8. Occupational Safety & Health Administration (OSHA)
   a. 29 CFR Part 1926, Safety and Health Regulations for Construction

9. Americans with Disabilities Act of 1990 (ADA)

10. Seattle Building Code

11. American National Standards Institute (ANSI)
   a. ANSI Z97.1 American National Standard For Safety Glazing Materials Used in Buildings

12. Federal Communications Commission (FCC)
   a. EMI Shielding Guidelines

1.03 DEFINITIONS

A. Terms used are defined in the latest edition of the Safety Code for Elevators and Escalators, ASME A17.1.

B. Reference to a device or a part of the equipment applies to the number of devices or parts required to complete the installation.

1.04 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.
   1. Within 60 Days after Notice to Proceed and before beginning equipment fabrication, submit shop drawings and required material for review. Allow 30 days for response to initial submittal.

B. Scaled or Fully Dimensioned Layout: Plan of pit, hoistway, and machine room indicating equipment arrangement, elevation section of hoistway, details of car enclosures, hoistway entrances, and car/hall signal fixtures.

C. Design Information: Indicate equipment lists, reactions, and design information on layouts.

D. Power Confirmation Sheets: Include motor horsepower, code letter, starting current, full-load running current, and demand factor for applicable motors.

E. Fixtures: Cuts, samples, or shop drawings.

F. Finish Material: Submit 3-inch by 12-inch samples of actual finished material for review of color, pattern, and texture of exposed finishes. Compliance with other requirements is the exclusive responsibility of the Contractor.

G. Acknowledge and/or respond to review comments within 7 days of return; promptly incorporate required changes due to inaccurate data or incomplete definition so that delivery and installation schedules are not affected. Revision response time is not justification for equipment delivery or installation delay.

H. Closeout Submittals: Operation and Maintenance Manuals
1. Provide three sets of neatly bound written information necessary for proper maintenance and adjustment of equipment within 30 days following final acceptance. Final retention will be withheld until data is received and reviewed by the Resident Engineer. Include the following as minimums:

a. Printed Instructions: Three sets of neatly bound instructions explaining all operating features.

b. Wiring Diagrams: Three sets of as-installed straight-line wiring diagrams showing the electrical connections of all equipment and all modifications to control circuits. One set of straight-line wiring diagrams shall be reproducible original. Furnish a legend sheet with each set of drawings to provide the following information:

1) Name and symbol of each relay, switch, or other apparatus.

2) Location on drawings, drawing sheet number and area, and location of all contacts.

3) Location of apparatus, whether on controller or on car.

4) Lubricating instructions, including recommended grade of lubricants.

c. Complete software documentation for all installed equipment.

1) Equipment Manufacturer is responsible for upgrades and/or revisions of software during the progress of the Work, warranty period and the term of the ongoing maintenance agreement between Sound Transit and the Contractor.

d. Lubricating instructions, including recommended grade of lubricants.

e. Parts Catalog: Three sets of complete parts catalogs listing all replaceable parts including Manufacturer's identifying numbers and ordering instructions.

f. Diagnostic equipment: Provide all diagnostic test devices complete with instructions, access codes, adjusters’ manuals and set-up manuals for adjustment, diagnosis and troubleshooting of elevator system, and performance of routine safety tests.

1) The elevator installation shall be a design that can be maintainable by any licensed elevator maintenance company employing journeymen mechanics, without the need to purchase or lease additional diagnostic devices, special tools, or instructions from the original equipment manufacturer.

a) Provide onsite capability to diagnose faults to the level of individual circuit boards and individual discreet components for the solid state elevator controller.

b) If the equipment for fault diagnosis is not completely self-contained within the controllers but requires a separate, detachable device, that device shall be furnished to Sound Transit as part of this installation. Such device shall be in possession of and become property of Sound Transit.
c) Installed equipment not meeting this requirement shall be removed and replaced with conforming equipment at no cost to Sound Transit.

d) Provide orientation and training to familiarize Sound Transit operations personnel with the features and operation of the elevator

g. Four sets of neatly tagged keys for all switches and control features properly tagged and marked.

1.05 QUALITY ASSURANCE

A. Comply with most stringent applicable provisions of the Code and/or Authority specified in Article 1.02, herein, including revisions and changes in effect on date of these Contract Specifications:

B. Compliance with Regulatory Agency: Comply with most stringent applicable provisions of following Code and/or Authority, including revisions and changes in effect on date of these Specifications:

1. Safety Code for Elevators and Escalators, ASME A17.1
2. Inspectors’ Manual, ASME A17.2.1
3. Elevator and Escalator Electrical Equipment, ASME A17.5
4. National Electrical Code, NFPA 70
5. Americans with Disabilities Act (ADA)
6. Local fire jurisdiction
7. Requirements of SBC with local municipality amendments and all other Codes, Ordinances and Laws within the governing jurisdiction
9. Washington Administrative Code (WAC)

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver material in Manufacturer’s original, unopened protective packaging.

B. Store material in original protective packaging. Prevent soiling, physical damage, or moisture damage.

C. Protect equipment and exposed finishes from damage and stains during transportation, erection, and construction.

1.07 WARRANTY:

A. Material and workmanship of the installation shall comply in every respect with Contract Documents. Correct defective material or workmanship that develops within 1 year from date of final acceptance of work to satisfaction of Resident Engineer at no additional cost, unless due to ordinary wear and tear, or improper use or care by Sound Transit. Perform maintenance in accordance with terms and conditions indicated in the Warranty Preventive Maintenance.
B. Defective is defined to include, but not to be limited to; operation or control system failures, performance below required minimum, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and similar unsatisfactory conditions.

C. Make modifications, adjustments, and improvements to meet performance requirements in Parts 2 and 3.

1.08 SYSTEM STARTUP

A. Obtain and pay for permit, license, and inspection fee necessary to complete the installation.

B. Provide personnel and equipment for test and final review by Sound Transit, as required in Part 3, Execution, Article 3.06, herein and as required for commissioning activities specified in Section 14 08 00.

C. Refer to Specification Section 14 08 00, Commissioning of Conveying Equipment for additional requirements.

1.09 MAINTENANCE

A. Interim:

1. When one or more elevators are near completion and ready for service, Sound Transit may accept elevators for interim use and place in service before entire installation of all elevators has been completed and accepted.

2. Temporary acceptance form must be acceptable to Sound Transit and signed prior to use.

3. Provide or pay for temporary hoistway and car enclosures; protect installed equipment and finishes; and pay for all cleaning, repairs, and replacement of materials necessary to restore elevator to as-new condition prior to final Acceptance by the Resident Engineer.

B. Warranty Maintenance:

1. Provide preventive maintenance and 24-hour emergency callback service for one year commencing on date of final Acceptance by Sound Transit. Systematically examine, adjust, clean, and lubricate equipment. Repair or replace defective parts using parts produced by the manufacturer of installed equipment. Maintain elevator machine room, hoistway, and pit in clean condition.

2. Contractor shall arrive at property within sixty minutes from time of notification of equipment problem or failure, and shall arrive at property in response to passenger entrapment calls within thirty minutes from time of notification by Sound Transit.

3. Removal of units from beneficial usage for maintenance purposes shall be coordinated with and approved by Sound Transit, unless removal is necessitated for emergency repair or adjustment. Normal preventive maintenance service shall be performed during off-peak operating hours.

4. At least semi-annually or more often if requested, provide summary and review of all callbacks and unit downtime with Sound Transit. The intent of this review is to minimize callbacks by developing consistent communication between the Contractor and Sound Transit relative to callback trends, unit downtime, and their causes.
5. All units shall be available for use an average of 98.7% of property hours of operation over each three-month period during warranty maintenance service. This includes allowance for equipment out of service time as the result of callbacks, scheduled preventive maintenance, and repairs. Contractor’s failure to meet this unit availability provision for two consecutive three-month periods for any single elevator or escalator, or group of units, shall trigger an automatic maintenance audit by Sound Transit. Contractor agrees to expeditiously take corrective action in regard to identified deficiencies. Further, Contractor acknowledges Sound Transit’s right to pass cost of said audit to Contractor.

6. Extend the warranty maintenance period specified in Article 1.10 B.1 above one month for each three-month period in which equipment related failures average more than 0.25 per unit per month.

7. Sound Transit retains the option to delete cost of warranty maintenance from new equipment contract and remit twelve equal installments directly to Contractor during period in which maintenance is being accomplished.

C. Preventive Maintenance Contract:

1. Quote monthly cost for five-year Preventive Maintenance Agreement commencing on completion of the one-year period in Article 1.10 B.1 above. Base quotation on present labor and material cost. Price adjustment will be made at Contract commencement date and thereafter as provided in Contract.

1.10 PERMIT, TEST AND INSPECTION

A. Obtain and pay for permit, license, and inspection fee necessary to complete the installation. Installation will be considered complete when the governing authority of Washington State Department of Labor and Industries has issued a permanent operating permit for each elevator.

B. Perform tests required by the elevator Section of the City of Seattle Department of Planning and Development as well as tests required by Washington State Department of Labor and Industries. Perform tests in accordance with procedures described in ASME A17.1 inspector’s manual for Electric Elevators and as required by the authorities having jurisdiction in the presence of the Resident Engineer.

C. Supply personnel and equipment for test and final review by Sound Transit, as required in Part 3, Execution, Article 3.06, herein.

D. Contractor is not relieved from furnishing and installing work shown or specified which may be beyond requirements of ordinances, laws, regulations or codes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Qualified Manufacturers: Alternate Manufacturers must receive approval of Sound Transit at least 10 days prior to bid date.

B. Approved Manufacturers:

1. Installers: Fujitec, KONE, Schindler, ThyssenKrupp.

2. Gearless Machines: Manufacturers standard
3. Control Manufacturers: Manufacturers standard controls, MCE, O. Thompson, and Swift/CEC.


2.02 MATERIALS

A. Steel:


B. Stainless Steel: Type 316 complying with ASTM A167, with standard tempers and hardness required for fabrication, strength and durability. Apply mechanical finish on fabricated work in the locations shown or specified (Federal Standard and NAAMM nomenclature) with texture and reflectivity required to match Resident Engineer’s sample. Protect with adhesive-paper covering.

1. Non-directional finish: 80 grit orbital sanding over standard mill plate or shapes to produce a uniform orbital non-directional satin finish with 90 percent of mill marks removed to match Resident Engineers visual sample.

C. Aluminum: Extrusions conforming to ASTM B221. Sheet and plate conforming to ASTM B209.

D. Paint: Clean exposed metal of oil, grease, scale, and other foreign matter and factory paint one shop coat of Manufacturer’s standard rust-resistant primer. After erection, provide one finish coat of industrial enamel paint. Galvanized metal need not be painted. See Section 09 96 00, High Performance Coatings.

E. Prime Finish: Clean all surfaces receiving a baked enamel paint finish of oil, grease, and scale. Apply one coat of rust-resistant mineral paint followed by a filler coat over uneven surfaces. Sand smooth and apply final coat of mineral paint.

F. Baked Enamel Finish: Prime finish in accordance with Article 2.02E above. Apply and bake two additional coats of enamel in the selected solid color.

G. Glass: Laminated safety glass, minimum 9/16 inch thick, conforming to ANSI Z97.1 and CPSC 16 CFR Part 1201 and Contract Specifications Section 08 80 00, Glazing, Article 2.01.

2.03 EQUIPMENT

A. Equipment shall be the same for all contracts except where specifically noted. Where variations occur, each contract shall be specified separately.

B. Passenger Elevator Features

1. Number:
a. N140: Elevators 1 and 2 as specified and as detailed on the Contract Drawings

b. N150: Elevators 1 and 2 as specified and as detailed on the Contract Drawings

c. N160: Elevators 1 and 2 as specified and as detailed on the Contract Drawings

2. Capacity:
   b. N150: Elevators 1 and 2: 4,500 pounds, Class A loading.
   c. N160: Elevators 1 and 2: 4,000 pounds, Class A loading.

3. Speed: 350 feet per minute (fpm)

4. Roping: Manufacturer’s standard roping configuration for machine-room-less traction application.

5. Supervisory Control: Selective collective, microprocessor based system, non-proprietary

6. Motor Control: SCR variable voltage, microprocessor based with digital closed loop feedback and automatic stopping

7. Power Characteristics: 480 volts, 3 phase, 60 hertz

8. Stops and Openings: As detailed on the Contract Drawings.


10. Travel: As detailed on the Contract Drawings

11. Platform Size:
   a. N140: Elevators 1 and 2: 6 feet 0 inches wide by 9 feet 4 ¾ inches deep; front and rear opening.
   b. N150: Elevators 1 and 2: 6 feet 0 inches wide by 9 feet 4 ¾ inches deep; front and rear opening.
   c. N160: Elevators 1 and 2: 6 feet 0 inches wide by 8 feet 4 inches deep; front opening.

12. Minimum Clear Inside Car:
   a. N140: Elevators 1 and 2: 5 feet 8 inches wide by 7 feet 11 inches deep.
   b. N150: Elevators 1 and 2: 5 feet 8 inches wide by 7 feet 11 inches deep.
   c. N160: Elevators 1 and 2: 5 feet 8 inches wide by 7 feet 4 inches deep.

13. Entrance Size: Elevators 1 and 2: 4 feet 0 inches wide by 7 feet high.

14. Entrance Type: Two speed, side opening.
15. Door Operation: High speed, heavy duty, door operator, minimum opening speed 2.5 feet per second (fps).

16. Door Protection: Infrared, full screen device, with differential timing and nudging and interrupted beam time.


19. Safety: Flexible guide clamp - Type B, car only.


26. Hall Lanterns: At all floors with volume adjustable electronic chime or tone. Sound twice for down direction. Vandal resistant

27. Emergency Telephone Communication System: Emcom Systems IP6000 Full Duplex VoIP hands free telephone with auxiliary remote keypad and digital display.

28. CCTV Camera: Provide 2 cameras for each elevator
   a. Imaging device: 1/3 inch color CCD
   b. 3-9 mm, vari-focal, auto iris lens
   c. Ability to control and monitor video over IP network
   d. Supported protocols: TCP/IP, UDP/IP (unicast, multicast IGMP), UPnP, DNS, DHCP, RTP, NTP
   e. Supported video resolutions: 4CIF, 2CIF, CIF, QCIF
   f. Digital compression: MJPEG, MPEG-4
   g. Web user interface with up to 5 simultaneous users

29. CCTV Camera Enclosure: Provide for each CCTV Camera.
   a. Mini-dome with integrated camera and lens
   b. Tamper resistant hardware
   c. Rugged, high-impact, puncture-proof, opaque (smoked) dome plastic
   d. NEMA 4X and IP 66
   e. Input voltage: 18 - 30VAC, 24 VAC nominal
   f. Above ceiling dimensions: 2” high x 3.5” wide, nominal
   g. Below ceiling dimensions: 2.5” high x 5.5” wide, nominal
   h. Dome diameter: 3.75”, nominal
   i. Cable: RJ45-10 connector for 100Base-TX Ethernet; 24 VAC input terminals

30. Access Card Reader: General Electric GE T500SW series

31. Radio Antenna: To be supplied by Systems contractor(s) for installation.
32. Car top inspection station
33. Guardrails at car top to meet code requirements for safety.
34. Firefighters' service, including alternate floor return feature
35. Standby power transfer (automatic to main floor) with manual override in fire control panel
36. Accessibility and emergency medical services access and signage
37. Hinged car return panels arranged for integral car operating panels
38. Hoistway access switches
39. Hoistway door unlocking device all floors with keyed escutcheon plugs
40. Independent service feature
41. Platform isolation
42. Load weighing device
43. Anti nuisance feature
44. Firefighters’ elevator control panel located in Fire Command Center Room and remote wiring.
45. Tamper resistant fasteners for signal fixture faceplates
46. Sill support angles
47. One year warranty maintenance with 24-hour call back service
48. PA speaker
49. PA amplifier
50. Machine, power conversion unit, and controller sound isolation
51. Seismic devices in accordance with ASME A17.1, Section 2400
52. Pad hooks and vinyl-covered pads
53. Individual floor lock-off switch at Basement level for Elevator 1
54. Selective door operation
55. Battery pack emergency car lighting. Provide separate constant pressure test button in car service compartment. Illuminate portion of normal car lighting
56. Signage engraving filled with black paint or approved etching process
57. No visible company name or logo on any equipment viewable by passengers
58. Wiring diagrams, operating instructions, and parts ordering information
59. System diagnostic means and instructions
60. Non-proprietary control system and diagnostics provisions
61. Remote electronic brake release to eliminate the need for an access panel for access to machine brakes from outside of hoistway shaft.


63. Firefighters' Key Box: Flush-mounted box with lockable hinged cover. Engrave instructions for use on cover in accordance with Local Fire Authority requirements.

C. Car, General

1. Car Speed: Plus or minus 3 percent of Contract speed under all loading conditions.

2. Car Capacity: Safely lower, stop and hold 125 percent of rated load.

3. Car Stopping Zone: Plus or minus 1/4 inch under all loading conditions.

4. Door Opening Time: Elevators 1 and 2: 2.7 seconds from start of opening to fully open.

5. Door Closing Time: Elevators 1 and 2: 4.5 seconds from start of closing to fully closed.

6. Car Ride Quality
   a. Horizontal acceleration within car during all riding and door operating conditions. Not more than 20 mg peak to peak in the 1-10 Hertz range.
   b. Acceleration and Deceleration: Smooth constant and not more than 5 feet/second/second second with an initial ramp between 0.5 and 0.75 second.
   c. Sustained Jerk: Not more than 8 feet/second/second/second

7. Airborne Noise: Measured noise level of elevator equipment during operation shall not exceed 50 decibels (dBA) in elevator lobbies. Noise Level in cab shall not exceed 55 dBA for continuous noise or 60 dBA for intermittent noise.
   a. Take all dBA readings 5 feet off the floor and 1 foot or more from wall.

D. Car Equipment

1. Frame: Welded or bolted, rolled or formed steel channel construction to meet load classification requirements.

2. Safety Device: Type B, flexible guide clamp.

3. Platform: Isolated type, constructed of steel, or steel and wood, which is fireproofed on the underside. Design and construct to accommodate load classification requirements. Minimum Class A construction for all passenger elevators.

4. Guide Shoes: Roller type with three or more spring-dampened, sound-deadening rollers per shoe. Minimum roller diameter 7 inches.

5. Finish Floor Covering: Nominal 1/8” rubber floor tile with matching 4” cove base and cold welded seams. Norament 925 Lago or approved equal. Color as selected by Resident Engineer from manufacturer’s standard.
6. Sills: One piece nickel silver extrusion with extruded extension between car entrance columns to face of car front return. Extruded extension to match finish of sill.

7. Toe Guard: Minimum 14-gauge stainless steel reinforced and braced to car platform, with flat black finish.

8. Doors: Provide as specified for hoistway entrance doors.

9. Door Hangers: Two-point hanger roller with neoprene roller surface and suspension with eccentric upthrust roller adjustment.

10. Door Track: Bar or formed, cold-drawn removable steel track with smooth roller contact surface.

11. Door Header: Construct of minimum 12-gauge steel, shape to provide stiffening flanges.

12. Door Electrical Contact: Prohibit car operation unless car door is closed within tolerance allowed by Code.

13. Door Clutch: Heavy-duty clutch, linkage arms, drive blocks, and pickup rollers or cams to provide positive, smooth, quiet door operation. Design clutch so car doors can be closed while hoistway doors remain open.

14. Restricted Opening Device: Restrict opening of car doors outside the unlocking zone.

15. Door Operator: High speed, heavy-duty master door operator capable of opening doors at no less than 2.5 fps. Accomplish reversal in no more than 2 and 1/2 inches of door movement. Open doors automatically when car arrives at a floor. Provide solid state door control with closed loop circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. Maintain consistent, quiet, and smooth door operation at all floors regardless of door weight or varying air pressure.

16. Door Control Device:
   a. Infrared Reopening Device: Black, fully enclosed device. Full screen infrared matrix or multiple beams extending vertically along edge of each leading door panel to minimum height of 7 feet above finished floor. Device shall prevent doors from closing and reverse doors at normal opening speed if beams are obstructed while doors are closing, except during nudging operation. If device fails, provide for automatic shutdown of car at floor level with doors open.
   b. Nudging Operation: After beams of door control device are obstructed for a predetermined time interval (minimum 20.0 to 25.0 seconds), warning signal shall sound and doors shall attempt to close with a maximum of 2.5 foot-pounds kinetic energy. Activation of the door open button shall override the nudging operation and re-open the doors.
   c. Interrupted Beam Time: When beams are interrupted during initial door opening, hold door open a minimum of 3.0 seconds. When beams are interrupted after the initial 3.0-second hold open time, reduce time doors remain open to an adjustable time of approximately 1.0 to 1.5 seconds after beams are reestablished.
d. **Differential Door Time**: Provide separately adjustable timers to vary time that doors remain open after stopping in response to calls.

1) **Car Call**: Hold open time adjustable between 3.0 and 5.0 seconds.

2) **Hall Call**: Hold open time adjustable between 5.0 and 8.0 seconds. Use extended hall call time when car responds to coincidental calls.

17. **Car Operating Panel**:

a. One car operating panel at each entrance without faceplates, consisting of a metal box containing vandal resistant operating fixtures mounted behind the car enclosure swing return panels.

b. Suitably identify vandal resistant assemblies including floor buttons, alarm button, door open button, door close button, and emergency stop switch with SCS, Visionmark or Entrada Cast tactile symbols rear mounted. Provide plates in accordance with Local Accessibility Standards including Braille. Locate operating controls no higher than 48 inches above the car floor; no lower than 35 inches for stop device and alarm button.

c. Provide minimum 3/4-inch diameter raised 1/8 inch with square shoulders or flush floor pushbuttons, which illuminate to indicate call registration. Include 5/8-inch high designation of the floors served on face of pushbutton. Provide keyswitches to activate floor pushbuttons at intermediate levels. Platform and surface levels to have pushbutton only.

d. Provide alarm button at bottom of car operating panel to ring bell located on car, and sound distress signal at control panel. Illuminate button when activated.

e. Provide keyed stop switch with markings to show run and stop located in locked car service compartment.

f. Provide door open button to stop and reopen closing doors or hold doors in open position. Button operable only while car is stopped at floor regardless of special operational features, except firefighters’ service.

g. Provide door close button to activate door close cycle. Cycle shall not begin until normal door dwell time for a car call has expired except firefighters’ service.

h. Provide firefighters’ Phase II keyswitch with engraved instructions in accordance with Code requirement. Include light jewel, buzzer, and call cancel button.

i. Provide seismic indicator jewel.

j. Provide lockable service compartment with recessed flush door. Door material and finish shall match car return panel or car operating panel faceplate. Door shall contain an integral flush window for displaying the elevator-operating certificate. Inside surface of door shall accommodate mounting provisions for certificate. Engrave service cabinet door with “ETEL” in ¾” tall letters.
1) Include the following controls in lockable service cabinet with function and operating positions identified by engraved letters painted black.
   a) Inspection switch.
   b) Light switch.
   c) 3-speed exhaust blower switch.
   d) Independent service switch.
   e) Constant pressure test button for battery pack emergency lighting.
   f) 120-volt, AC, GFCI protected electrical convenience outlet.
   g) Card reader override switch.
   h) Stop switch.
   i) Emergency Telephone keypad and digital display. Keypad to be wired to hands-free emergency telephone.

k. Provide black paint filled, engraved or approved etched signage with size and style approved by the Resident Engineer as follows:
   1) Phase II firefighters' operating instructions on main operating panel above corresponding keyswitch, with text in accordance with ASME A17.1 211.7(b).
   2) Elevator car number over main car operating panel.
   3) NO SMOKING over main car operating panel.
   4) Car capacity in pounds on service compartment door.
   5) Washington State Department of Labor and Industries conveyance number in ½” tall letters.

l. Access Card Reader:
   1) Install access card reader and connect device to Interface Terminal Cabinet in machine room.

m. Emergency Telephone Communication System:
   1) Install VoIP hands-free telephone. Connect data and power cabling from phone to Interface Terminal Cabinet. Install keypad and digital display in adjacent service cabinet and wire to hands-free telephone.
   2) Incorporate VoIP hands-free phone faceplate flush into car operating panel at height compliant with Code.

n. PA Speakers:
1) Install PA speakers in car canopy and connect to PA amplifier in elevator machine room. The PA amplifier receives audio input from the Interface Terminal Cabinet. Messages from the communications system shall take priority over those messages generated by the elevator system. Messages from the elevator system shall be delayed to accommodate the communications messages, but not cancelled.

18. Car Top Control Station: In accordance with Code. Mount to provide utilization while standing in an upright position.


20. CCTV System:
   a. Install CCTV cameras with protective housings and connect power and data cabling from camera to Interface Terminal Cabinet in machine room.

E. Car Enclosure

1. Passenger Elevator: Provide complete car enclosure as specified herein and detailed on the Contract Drawings. Provide the following features.
   b. Canopy: Reinforced 14-gauge furniture steel with lockable, hinged emergency exit. Interior finish white reflective baked enamel.
   c. Front and Rear Return Panels and Integral Entrance Columns: Reinforced 14-gauge non-directional finish stainless steel. Swing entire unit on substantial pivot points (minimum three) for service access to car operating panel(s). Locate pivot points to provide full swing of front return panel without interference with sidewall finish or handrail. Secure in closed position with concealed three-point latching. Provide service compartment with recessed flush cover and cutouts for operating switches.
   d. Transom: Reinforced 14-gauge non-directional finish stainless steel full width of enclosure.
   e. Car Door Panels: Minimum reinforced 16-gauge non-directional stainless steel. Same construction as hoistway door panels.
   f. Base: Non-directional stainless steel with concealed ventilation cutouts. Cutouts to be protected from penetration by debris or liquids.
   g. Interior Wall Finish: Non-directional finish stainless steel on aluminum honeycomb panels. As specified and as indicated. Refer to architectural drawings for details of elevator cab interiors including metal and glass panel installations.
   h. Ventilation: Two-speed exhaust blower mounted to car canopy on isolated rubber grommets. Morrison Products, Model AA with diffuser and grille, or approved equal.
i. **Lighting:** Provide minimum average 15 footcandle illumination at car floor utilizing high output T5 fluorescent lamps. Provide battery standby power for operation. Provide fluorescent fixtures with wiring and hookup. Coordinate with emergency lighting requirements. Provide emergency lighting integral with portion of normal car lighting system. Include required transformer.

j. **Suspended Ceiling:** Special design as shown in the Contract Drawings.

k. **Handrails:** 1 and ½ inch diameter non-directional finish stainless steel tubes.

F. **Elevator Machine Equipment**

1. Arrange equipment in spaces shown on Contract Drawings.

2. **Gearless Traction Hoist Machine:**
   a. Elevators 1 and 2: AC induction or PMSM AC Variable Voltage Variable Frequency gearless traction type motor with brake, drive sheave, and deflector sheave mounted in proper alignment on a common isolated machine support frame.
   b. Provide hoist machine mounted direct drive, digital, closed-loop velocity encoder.
   c. Provide machine bedplate mounted deflector sheave A-frame or supporting steel beams and fastenings to mount deflector sheaves to building structure. Provide minimum 16 gage easily removable sound insulated sheet metal closures in hoistway wall opening around machine.
   d. For equipment and machinery within the hoistway with low temperature requirements, provide an integral heating unit which maintains the equipment and machinery above the manufacturer's low temperature requirements and preserves the Owner's warranty. Heater unit shall be integrated into the machinery and powered through the elevator power supply. Ventilation for equipment and machinery cooling will be provided under other sections per Paragraph 1.01 C.1.o.

3. **Solid State Power Conversion and Regulation Unit:**
   a. Design unit to limit current, suppress noise, and prevent transient voltage feedback into building power supply. Provide internal heat sink cooling fans for the power drive portion of the converter panels. Conform to recommended practice for Emergency and Standby Power Systems for Industrial and Commercial Applications for line harmonics and switching noise.
   b. Isolate unit to minimize noise and vibration transmission. Provide isolation transformers, filter networks, and choke inductors.
   c. Suppress solid-state converter noises, radio frequency interference, and eliminate regenerative voltage transients induced into the mainline feeders or the building standby power generator.

4. **Encoder:** Direct drive, solid-state, optical, digital type. Update car position at each floor and automatically restore after power loss.
   a. Compartment: Securely mount all assemblies, power supplies, chassis switches, and relays, on a substantial, self-supporting steel frame. Completely enclose equipment with covers.
   b. Relay Design: Magnet operated with contacts of design and material to ensure maximum conductivity, long life and reliable operation without overheating or excessive wear. Provide wiping action and means to prevent sticking due to fusion. Contacts carrying high inductive currents shall be provided with arc deflectors or suppressors.
   c. Microprocessor-Related Hardware:
      1) Provide built-in noise suppression devices, which provide a high level of noise immunity on all solid-state hardware and devices.
      2) Provide power supplies with noise suppression devices.
      3) Isolate inputs from external devices (such as pushbuttons) with isolation modules.
      4) Design control circuits so that one side of power supply is grounded.
      5) Safety circuits shall not be affected by accidental grounding of any part of the system.
      6) System shall automatically restart when power is restored.
      7) System memory shall be retained in the event of power failure or disturbance.
      8) Equipment shall operate properly with a 500 Kilohertz to 1300 Megahertz radio frequency signal, transmitted at a power level of not less than 100 watts Effective Radiated Power (ERP) at a distance of 3 feet.
      9) Provide equipment with Electro Magnetic Interference (EMI) shielding within FCC guidelines.
   d. Wiring: CSA labeled copper for factory wiring. Neatly route all wiring interconnections and securely attach wiring connections to studs or terminals.
   e. Permanently mark components (relays, fuses, and PC boards) with symbols shown on wiring diagrams.
   f. Provide controller or machine mounted auxiliary, lockable off, disconnect if mainline disconnect not in sight of controller and machine.

6. Sleeves and Guards: 4-inch steel angle guards around cable or duct slots through floor slabs or grating. Provide rope and smoke guards for sheaves, cables, and cable slots in machine room and secondary levels. Provide wire mesh infill barrier between hoistway and machine room openings.
   a. Provide bearing plates, anchors, shelf angles, blocking, and embedments for support and fastening of machine beams or equipment to the building structure.
   b. Isolate machine and overhead sheave beams to eliminate noise and vibration transmission to building structure.
   c. Provide ladders and platforms with handrails and toeboards for overhead sheave access.

8. Governor: Centrifugal-type, car and counterweight driven, with pull-through jaws and bi-directional electrical shutdown switches. Provide required auxiliary supports for attachment to building structure.

9. Vibration Isolation: All elevator equipment provided under this Contract, including power conversion unit, controller and their support, shall be mechanically isolated from the building structure and from electrically induced vibration to minimize the possibility of objectionable noise and vibrations being transmitted to the car, building structure, or occupied areas of building.

10. Sound Isolation:
   1) Noise level relating to elevator equipment and its operation shall not exceed 55 dBA for continuous noise or 60 dBA for intermittent noise in the hoistway and control room. Take all dBA readings 3 feet off the floor and 3 feet from the equipment.

11. Connection to Remote Monitoring Interface Terminal Cabinet: Provide conduit and wiring between the elevator controller and the interface terminal cabinet for remote monitoring and control of each car by the Building Management System.
   a. Receive the following dry contact inputs to effect the following control actions for each car.
      1) Phase 1 Recall - Primary.
      2) Phase 1 Recall – Alternate
      3) Access control permissive.
   b. Provide normally open dry contacts for each of the following status items for each car:
      1) Elevator Warning Alarm
      2) Passenger Alarm Pushbutton
      3) Phase 1 Fire Operation
      4) Phase 2 Fire Operation
      5) Elevator door closed.
      6) Independent Service
7) Seismic Operation

8) Elevator at floor (one contact per floor)

9) Standby Power Operation

G. Hoistway Equipment

1. Guide Rails: Minimum 15 pounds per foot or heavier, planed steel T-sections of suitable size and weight for the application, structural support spacing, car weight, counterweight, and seismic reactions, with brackets for attachment to building structure. Provide car rail backing and intermediate counterweight tie brackets to meet Code requirements.

2. Buffers, Car, and Counterweight: Oil type with blocking and support channels. Provide switch on buffer to limit car speed if buffer is compressed. Provide buffer access ladder and platform.

3. Sheaves: Machined grooves with sealed bearings. Provide mounting means to machine beams, machine bedplate, and car and counterweight structural members.

4. Counterweight: Steel frame with metal filler weights, guided by 5-inch roller guide shoes.

5. Counterweight Guard: Metal guard in pit.

6. Governor Rope and Encoder Pit-Tensioning Sheave: Mount sheave and frame on pit floor support frame or guide rail. Provide with guides or pivot point to enable free vertical movement and proper tension of cable/tape.

7. Hoist and Governor Ropes:
   a. 8 by 19 or 8 by 25 Seale construction, traction steel type. Fasten with staggered length, adjustable, spring isolated shackles.
   b. Governor rope to suit manufacturer’s specification.

8. Terminal Stopping: Provide normal, final and emergency terminal speed limiting devices. Provide ability to bypass final limit while in inspection mode on car to properly access and maintain the overhead sheaves, beams and governor for Elevator No 1. There will be no secondary platforms or access panels provided for service to the overhead area.

9. Electrical Wiring and Wiring Connections:
   a. Conductors and Connections: Copper throughout with individual wires coded and connections on identified studs or terminal blocks. Use no splices or similar connections in wiring except at terminal blocks, control compartments, junction boxes, or condulets. Provide 10 percent spare conductors throughout. Run spare wires from car connection points to individual elevator controllers in the machine room. Provide four pairs of spare shielded communication wires in addition to those required to connect specified items. Tag spares in machine room.
   b. Conduit: Painted or galvanized steel conduit and duct. Conduit size, 1/2 inch minimum. Flexible conduit not to exceed 36 inches in length. Flexible heavy-duty service cord may be used between fixed car wiring and car door switches for door protective devices.
1) All raceways and wiring mounted on the top of the elevator shall be suitable for wet locations. The routing of the raceways or conduit shall be routed to preclude damage from being stepped on during maintenance. If this is not possible provide steps or other additional protection.

c. Traveling Cables: Type ET flame and moisture-resistant outer cover. Prevent traveling cable from rubbing or chafing against hoistway or equipment within hoistway.

d. Communications System Wiring: Include Communications Systems wiring within traveling cable from car device through elevator controller cabinet to Communications Interface Terminal Cabinet located in Machine Rooms. Land wiring on terminal blocks, and coax connectors. Coil fiber cable for future use. Provide and install conduit between elevator controller and Interface Terminal Cabinet. Wiring to be as follows:

1) CCTV Data: One stranded Cat 6.
2) CCTV Power: Two #18 AWG.
3) Access Card Reader: Four - No. 18 twisted shielded pairs.
4) Emergency Telephone Power: Two #18 AWG.
5) Emergency Telephone Data: One stranded Cat 6.
6) Radio Antenna: One super flex 75-ohm coaxial cable
7) Spares:
   a) Two RG-6 coaxial cables.
   b) Four single mode fiber optic cables.
   c) Two stranded Cat 6.
   d) Six #18 AWG.

e. Auxiliary Wiring: Connect in each car controller in machine room, route to and terminate to devices.

1) Paging speaker: one pair 16 AWG

10. Entrance Equipment:

a. Door Hangers: Two-point hanger roller with neoprene roller surface and suspension with eccentric upthrust roller adjustment.

b. Door Tracks: Bar or formed, cold-drawn removable steel tracks with smooth roller contact surface.

c. Door Interlocks: Operable without retiring cam. Paint interlocks flat black.

d. Door Closers: Spring, spirator, or jamb/strut mounted counterweight type. Design and adjust to ensure the smooth quiet mechanical close of doors.
e. Floor Numbers: Stencil paint 4-inch high floor designations in contrasting color on inside face of hoistway doors at each landing and adjacent to the leading edge of the door.

H. Equipment furnished by Sound Transit, installed under this Section:

1. Radio antennas

I. Seismic Operations and Equipment

1. Provide design, components and operation in accordance with governing code. Provide dual counterweight derailment sensing wires vertically each side of counterweight the entire height of travel. The counterweight frame shall be equipped with four derailment rings. A dual axis seismic switch shall be provided that will activate at no less than 0.15 times gravity in the vertical or horizontal directions. A minimum of one seismic switch shall be provided per single or group of elevators. Counterweight retainer plates shall be bolted; welded plates are not acceptable.

2.04 COMPONENTS

A. Hoistway Entrances

1. Complete entrances bearing UL fire labels.

2. Frames: Non-directional finish stainless steel at all floors. Standard bolted head to jamb connection assemblies fabricated from not less than 14-gauge material. Permanently attach rear mounted Arabic floor designation plates, centerline at 60 inches above finished floor, on both sides of jambs existing. Provide main egress landing plates with Star designation. Braille indications shall be below Arabic floor designation.

3. Door Panels: 16-gauge non-directional finish stainless steel, sandwich construction without binder angles. Provide leading edge of side-opening doors with rubber astragals. Provide a minimum of two gibs per panel; one at leading and one at trailing edge with gibs in the sill groove entire length of travel. Provide 9/16-inch thick laminated tempered glass approximately 1 foot by 5 feet in each panel.

4. Sight Guards: 14-gauge, same material and finish as hoistway entrance door panels. Construct without sharp edges.


6. Sill Supports: Structural or formed steel designed to support door sill based upon car loading classification. Grout under the sill. Five-inch by 5-inch by 1/2-inch cold-rolled structural steel angle, extend full width of hoistway. Fasten to building structure at maximum 18 inches on center. Refer to Contract Drawings for additional details.


8. Struts and Headers: Provide for vertical support of entrances and related material.

9. Provide door open bumpers on entrances equipped with vertical struts.

B. Hall Control Stations
1. **Pushbuttons**: Provide one riser with flush-mounted faceplates. Include pushbuttons for each direction of travel, which illuminate to indicate call registration. Include approved engraved message and pictorial representation prohibiting use of elevator during fire or other emergency situation as part of faceplate. Pushbutton design shall match car operating panel pushbuttons. Provide vandal resistant pushbutton and light assemblies.

2. **Hoistway Door Unlocking Device**: Provide unlocking device with locking escutcheon plug in door panel at all floors with finish to match adjacent surface.

3. **Hoistway Access Switches**: Mount in entrance frame side jamb at top and bottom floors. Provide fixture with faceplate.

4. **Faceplate Material and Finish**:  
   a. **Hall Pushbutton Station**: Satin finish stainless steel.  
   b. **Hoistway Access Switch**: Satin finish stainless steel.

**C. Signals**

1. **Hall Lantern**: Provide at each entrance to indicate travel direction of arriving car. Locate as detailed on Contract Drawings. Illuminate up or down lights and sound tone twice for down direction travel prior to car arrival at floor. Sound level to be adjustable from 20 to 80 dBA measured at 5 feet in front of hall pushbutton and 3 feet off floor. Illuminate light until the car doors start to close. Provide advanced hall lantern notification to comply with ADA hall call notification time. Minimum 2 and 1/2 inches in the smallest dimension, arrow lenses with faceplates. Provide vandal resistant lantern and light assemblies consisting of series of dots or lines for maximum visibility.

2. **Car Position Indicator**: Alpha-numeric digital indicator containing floor designations and direction arrows a minimum of 1/2 inch high to indicate floor served and direction of car travel. Locate fixture in each car operating panel. When a car leaves or passes a floor, illuminate indication representing position of car in hoistway. Illuminate proper direction arrow to indicate direction of travel. Provide vandal resistant indicator and light assemblies.

3. **Lobby Position Indicator**: Alpha-numeric digital indicator containing floor designations and direction arrows a minimum of 1/2 inch high to indicate floor served and direction of car travel. Locate fixture integral with hall lanterns at Plaza level. When a car leaves or passes a floor, illuminate indication representing position of car in hoistway. Illuminate proper direction arrow to indicate direction of travel. Provide vandal resistant indicator and light assemblies.

4. **Faceplate Material and Finish**:  
   a. **Hall Lantern**: Satin finish stainless steel.  
   b. **Car Position Indicator**: Satin finish stainless steel.  
   c. **Lobby Position Indicator**: Satin finish stainless steel.

5. **Floor Passing Tone**: Provide an audible tone of no less than 20 dbA and frequency of no higher than 1500 Hertz, to sound as the car passes or stops at a floor served.

6. **Voice Synthesizer**: Provide electronic device with easily re-programmable message and voice to announce car direction, floor, and emergency exiting instructions.
7. Card reader override: Provide conduit and wiring to control panel. Fixtures shall be located as directed by the Resident Engineer. Coordinate size and location.

8. Fire Fighters' Control Panel: Locate in the station's Fire Command Center Room. Furnish and install panel and all applicable wiring from each elevator to the fire panel. Fixture faceplate, No. 4 brushed finish stainless steel, including the following features:
   a. Car position and direction indicator (digital-readout or color SVGA display type). Identify position indicator with car number.
   b. Indicator showing operating status of car.
   c. Wiring to panel. Conduit from closest elevator hoistway of each group by others.
   d. Manual car standby power selection switch and power status indicator.
   e. Two position fire fighter's emergency return switches and indicators with engraved instructions filled with red epoxy paint.

9. Machine Room Display Unit: Provide groups of elevators with a machine room color SVGA monitor. As a minimum, SVGA monitor shall display the following functions:
   a. On/off means to place car in or out of service. When placed in off position, return car nonstop to designated floor and park with doors open.
   b. Car operating in normal/standby power.
   c. Car position and direction of travel.
   d. Car calls.
   e. Hall calls.
   f. Operating mode.
   g. Door status.
   h. Delayed car.
   i. Load weigh and by-pass.
   j. Car to lobby feature.
   k. Car in/out of service.
   l. Seismic operation.
   m. Secured floor control and code entry.
   n. Distress signal.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Before installing equipment, examine hoistway and machine room areas. Verify that no irregularities exist that affect execution of work specified.

B. Do not proceed with installation until work in place conforms to Contract requirements.

3.02 INSTALLATION

A. Install all equipment in accordance with Manufacturer’s instructions, referenced Codes, these Contract Specifications and approved submittals.

B. Install machine room equipment with clearances in accordance with referenced Codes and these Contract Specifications.

C. Install all equipment so it may be easily removed for maintenance and repair.

D. Install all equipment for ease of maintenance.

E. Install all equipment to afford maximum accessibility, safety, and continuity of operation.

F. Remove oil, grease, scale, and other foreign matter from the following equipment and apply one coat of field-applied machinery enamel.
   1. All exposed equipment and metal work installed as part of this work that does not have architectural finish.
   3. Neatly touch up damaged factory-painted surfaces with original paint and color. Protect machine-finish surfaces against corrosion.

G. Operation

1. Simplex Automatic:
   a. Approved microprocessor-based car and motion control systems as follows including, as a minimum, the features described hereafter:
      1) Fujitec Millennium II
      2) KONE KCM831
      3) MCE IMC
      4) Schindler Miconic VX
      5) Swift Futura
      6) Thompson Microflite Ultra
      7) Thyssen TAC 50
   b. Register service calls on cars from pushbuttons located at each floor and in each car. Slow down, and automatically stop cars at landings
corresponding to registered calls. Make stops at successive floors for each
direction of travel irrespective of order in which calls are registered.

c. Use easily re-programmable system software.

d. Required Features:

1) Position Sensing: Reset car position when passing or stopping
   at each landing.

2) Hall Pushbutton Failure: Multiple power sources and separate
   fusing for pushbutton risers.

3) Duplicate communication link; All individual car computers.

2. Other Items:

a. Load Weighing: Provide means for weighing car passenger load. Design
   control system to provide dispatching at main floor in advance of normal
   intervals when car fills to capacity. Provide hall call by-pass when the car is
   filled to preset percentage of rated capacity and traveling in down direction.
   (Field adjustment range: 10 percent to 100 percent.)

b. Anti-Nuisance Feature: If car loading relative to weight is not commensurate
   with registered car calls, cancel car calls. Systems employing either load
   weighing or door protective device for activation of this feature are
   acceptable.

c. Independent Service: Provide controls for operation of each car from its
   pushbuttons only. Close doors by constant pressure on desired destination
   floor button or door close button. Open doors automatically upon arrival at
   selected floor.

d. Car-to-Street or Lobby Feature: Provide the means for automatic return to
   the Street or Lobby level. Return car nonstop after answering pre-registered
   car calls, and park with doors open until the car is returned to normal
   operation.

e. Firefighters' Service: Provide equipment and operation in accordance with
   Code requirements.

f. Automatic Car Stopping Zone: Stop car within 1/4 inch above or below the
   landing sill. Avoid overtravel or undertravel, and maintain stopping accuracy
   regardless of load in car, direction of travel, distance between landings, and
   rope slippage or stretch.

g. Motion Control: Microprocessor based AC variable-voltage, variable
   frequency with digitally encoded closed-loop velocity feedback suitable for
   operation specified and capable of providing smooth, comfortable car
   acceleration, retardation, and dynamic braking. Limit the difference in car
   speed between full load and no load to not more than plus or minus 3
   percent of the Contract speed.

h. Door Operation: Automatically open doors when car arrives at main floor
   whether car call has been registered or not.

i. Standby Lighting and Alarm: Car mounted battery unit with solid-state
   charger to operate alarm bell and car emergency lighting. Battery to be
rechargeable with minimum five-year life expectancy. Coordinate location of light fixture with the Resident Engineer. Provide constant-pressure test button in service compartment of car operating panel.

j. Standby Power Transfer: Upon loss of normal power, adequate standby power shall be supplied via the normal electrical feeders to simultaneously start and run all single cars at rated car speed and load.

1) Automatically return cars nonstop to designated floor, open doors for approximately 3.0 seconds, close doors, and park out-of-service. During return operation, car and hall call pushbuttons shall be rendered inoperative. When all cars have returned to the designated floor, all cars shall be designated for automatic operation.

2) Provide separate key-operated selector switch in the firefighters' control panel.

3) Switch labeled STANDBY POWER OVERRIDE with positions marked AUTO and appropriate car numbers. Key shall be same as that used for firefighters' Phase I and II switch, key removable in AUTO position only.

4) Switch shall override automatic return and automatic selection functions, and shall cause the manually selected car to operate. Manual selection shall cause car to start and proceed to designated floor and open and close its doors before stand-by power is transferred to the next selected car.

5) Provide STANDBY POWER indicator lights (one per car) in firefighters’ control panel. Indicator light illuminates only when corresponding car is selected to automatically or manually operate on standby power.

3.03 COMMISSIONING

A. See Section 14 08 00, Commissioning of Electric Traction Elevators for commissioning requirements pertaining to the work of this Section.

3.04 FIELD QUALITY CONTROL

A. Work at jobsite will be checked during course of installation. Full cooperation with reviewing personnel is mandatory. Accomplish corrective work required prior to performing further installation.

B. Have Code Authority acceptance inspection performed and complete corrective work.

3.05 ADJUSTING

A. Install rails plumb and align vertically with tolerance of 1/16 inch in 100 feet. Secure joints without gaps and file any irregularities to a smooth surface.

B. Static balance car to equalize pressure of guide shoes on guide rails.

C. Lubricate all equipment in accordance with Manufacturer’s instructions.
D. Adjust motors, power conversion unit, brake, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks, and safety devices to achieve required performance levels.

3.06 CLEANING

A. Keep work areas orderly and free from debris during progress of Contract. Remove packaging materials on a daily basis.

B. Remove all loose materials and filings resulting from work.

C. Clean machine room equipment and floor.

D. Clean hoistways, car, car enclosure, entrances, and operating and signal fixtures.

3.07 DEMONSTRATION

A. General: Furnish labor, materials, and equipment necessary for tests. Notify the Resident Engineer five days in advance when ready for final review of unit or group. Final acceptance of installation will be made only after all field-quality control reviews have been completed, identified deficiencies have been corrected, all Sound Transit's information and certificates have been received, and the following items have been completed to satisfaction of Sound Transit:

1. Workmanship and equipment comply with these Contract Specifications.

2. Contract speed, capacity, floor-to-floor, and door performance comply with these Contract Specifications.

3. Performance of following are satisfactory:
   a. Starting, accelerating, running
   b. Decelerating, stopping accuracy
   c. Door operation and closing force
   d. Equipment noise levels
   e. Lighting levels
   f. Signal fixture utility
   g. Overall ride quality
   h. Performance of door control devices
   i. Operations of special security operation and floor lock-off provisions.
   j. Demonstrate CCTV Camera image on computer connected to data cable to Interface Terminal Cabinet
   k. Demonstrate phone installation by IP address pinging over Ethernet cable at Interface Terminal Cabinet.
   l. Demonstrate each monitoring and control signal to Building Management System at interface Terminal Cabinet.

4. Test Results:
a. In all test conditions, obtain specified speed, performance times, stopping accuracy without re-leveling, and ride quality to satisfaction of the Resident Engineer,

b. Temperature rise in motor windings limited to 120 degrees F above ambient. A full-capacity, 1-hour running test, stopping at each floor for 10 seconds in up and down directions, may be required.

B. Performance Guarantee: Should tests reveal defects, poor workmanship, variance or noncompliance with requirements of specified Codes and/or ordinances, or variance or noncompliance with the requirements of these Contract Specifications, complete corrective work to satisfaction of the Resident Engineer at no cost:

1. Replace equipment that does not meet Code or these Contract Specifications requirements.

2. Perform work and furnish labor, materials, and equipment necessary to meet specified operation and performance.

3. Perform and assume cost for retesting required by the Washington State Department of Labor or the Elevator Section of the City of Seattle Department of Planning and Development, or the Resident Engineer to verify specified operation and/or performance.

C. Field Review Scheduling: Schedule progress and final equipment reviews with the Resident Engineer. Reply promptly, in writing, to corrective work indicated on the Resident Engineer's progress and/or final review reports, indicating status, schedule for completion, and questions.

END OF SECTION
CONTRACT SPECIFICATIONS

SECTION 14 31 00
ESCALATORS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for furnishing and installing escalators as specified and as detailed on the Contract Drawings, including preventive maintenance as described herein.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 01 91 13, General Commissioning Requirements
2. Section 05 05 23, Metal Fastenings
3. Section 14 08 00, Commissioning of Conveying Equipment
4. Section 26 05 33, Raceways and Boxes for Electrical Systems

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Society of Mechanical Engineers (ASME):
   a. ASME A17.1 Safety Code for Elevators and Escalators
   b. ASME A17.2.3 Guide for Inspection of Elevators, Escalators and Moving Walks
   c. ASME A17.5 Elevator and Escalator Electrical Equipment

   a. ASTM A36 Standard Specification for Carbon Structural Steel
   c. ASTM A568 Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements
   d. ASTM A1008 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
   e. ASTM A1011 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy with Improved Formability
f. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

g. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes

a. NFPA 70 National Electrical Code
c. NFPA 130 Standard for Fixed Guideway Transit and Passenger Rail Systems

4. National Electrical Manufacturers Association (NEMA)

5. Seattle Building Code (SBC)

a. ANSI/AWS D1.1 Structural Welding Code-Steel
b. ANSI/AWS A2.4 Standard Symbols for Welding, Brazing, and Nondestructive Examination

7. Occupational Safety & Health Administration (OSHA)
a. 29 CFR Part 1926, Safety and Health Regulations for Construction

8. Americans with Disabilities Act of 1990 (ADA)
a. 28 CFR Part 36. ADA Standards for Accessible Design

a. AMP 555-92. Code of Standard Practice For the Architectural Metal Industry

1.03 DEFINITIONS

A. Terms used are defined in the latest edition of ASME A17.1, Safety Code for Elevators and Escalators.

B. Reference to a single device or part of the equipment applies to the full number of devices or parts required to complete the installation as specified.

1.04 SYSTEM DESCRIPTION

A. Related Work Specified Elsewhere:

1. Wellway and Pit:
   a. Clear, plumb, wellway with variations not to exceed 1 inch at any point.
b. Floor pockets and/or structural beams for support of escalator truss at each end and at intermediate locations as shown on the Contract Drawings. Support beam deflection shall not exceed 1/1666 of span under static load.

c. Fire resistive enclosure of escalator truss including ends, sides, and bottom in ceiling plenum.

d. Patching and finishing around escalator landing plates after installation.

e. Cladding and finishing of exposed truss surfaces.

f. Waterproof pit. All escalator pits shall be provided with indirect drains to prevent accumulation of water.

g. Protect open wellways during construction in accordance with OSHA regulations.

h. Protect escalator truss, steps, landing plates, balustrades, handrails, and special metal finishes from damage.

i. Venting or other means to prevent accumulation of smoke and gas in escalator truss as required by Local Building Code.

j. Fire sprinklers in accordance with local Code requirements with protective guards.

2. Electrical Service, Conductors, and Devices: (Coordination with Electrical Engineer)

a. Light with guard and Ground Fault Circuit Interrupter (GFCI) convenience outlet in each pit and machine room space.

b. Three-phase mainline copper power feeder to terminals of each escalator controller in the machine room space with protected, lockable OFF, disconnect switch.

c. Temporary power and illumination to install, test, and adjust escalator equipment.

d. Single phase copper power feeder to each lower end escalator pit for truss heater with individual protected, lockable OFF, disconnect switch located in machine room space.

e. Single phase copper power feeder to each lower end and upper end escalator pit for under handrail lighting with individual protected, lockable OFF, disconnect switch located in machine room space.

B. Review all Contract Drawings. Comply with all provisions of Contract Documents. Sound Transit will not pay for changes to structural, mechanical, electrical, or other systems to accommodate Manufacturer’s equipment.

1.05 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.
1. Within 60 Days of Notice to Proceed and before beginning equipment fabrication, submit shop drawings and required material for review as outlined in Section 01 33 00, Submittal Procedures. Allow 30 days for response to initial Submittal.

B. Fully Dimensioned Layout: Plan of pit, wellway, indicating equipment arrangement and elevation section of wellway.

C. Design Information: Indicate equipment lists, reactions, and design information on layouts.

D. Power Confirmation Sheets: Include motor horsepower, code letter, starting current, full-load running current, and demand factor for applicable motors.

E. Finish Material: Submit 3-inch by 12-inch samples or 12-inch lengths of actual finished material for review of color, pattern and texture by Resident Engineer. Compliance with other requirements is the exclusive responsibility of the Contractor.

F. Manufacturer’s specifications and installation instructions for complete system, and for each component part of product used in system. Include listing and description of performance and operating characteristics, indicating how actual escalator will be modified from requirements and how differences exceed minimum requirements. Include maximum dynamic and static loads imposed on building structure at points of support for Work and maximum and minimum power demands.

G. Manufacturer’s literature including configuration drawings to be used to cross reference, locate, and identify hardware, components, and systems submitted. Submit drawings that affect work by others within 30 Days after Notice to Proceed (NTP). Indicate manufacturer’s unit assembly number or components part number as it appears in submitted literature. If component or subsystem is furnished by Sub-contractor, indicate name of Sub-contractor and Sub-contractor’s part number, component, or subsystem identification number. Configuration drawings include:

   1. Truss drawings: Facsimile outline of escalator truss in plan and profile.
   3. Balustrade Section: Vertical section taken completely through balustrade and truss midway between working points.
   4. Escalator cladding: Vertical section taken completely through escalator cladding, handrail, and decking at mid-flight at upper and lower deck where handrail and decking are level or parallel to floor.
   5. Manufacturer’s requirements for supports, cladding, connections, and tolerances.
   6. Modifications to adjacent finishes affected by manufacturer’s configuration including interface at landing plates.
   7. Escalator seismic support details.

H. Manufacturer’s literature and configuration drawings indicating sufficient information to determine compliance with applicable codes.

I. Shop drawings including information and dimensions to manufacture and install escalators; to scale and include:

   1. Location of lower and upper working points, proposed attachment for escalator truss to entrance structure, intermediate support details, thermal expansion joint,
load reactions, rated capacity and speed, handrail details, and machine room space and access.

2. Location of major mechanical and electrical components within truss, electric interface connections, and drainage connections.

3. Electrical layouts showing location of truss lighting, light switches, light fixtures, maintenance receptacles, and safety devices.

4. Schematic and electrical wiring diagrams of power distribution and control systems, including wiring of safety devices and interface connections for remote surveillance for each typical escalator, or group of escalators.

5. Location of operating panel in upper and lower-end balustrades - Show following items:
   1) Stop button; and
   2) Start and direction selection switch.

6. Show location of following items:
   1) Hand and finger guards;
   2) Guards at ceiling and intersections;
   3) Passenger instruction signs;
   4) Emergency stop buttons;
   5) Certificate holder;
   6) Engraved conveyance number; and
   7) Direction selection switches.

7. Relationship to adjacent work including modifications of details, dimensions, and configuration for elements to accommodate selected products for Work of this Section.

8. Use AWS symbols for defining type, size, and length of welds. Indicate which welds are to be performed in shop and which welds are to be performed in field.

9. Samples: Provide precise article proposed for following items:
   1) Handrail section including inserts;
   2) Balustrade deck cover section;
   3) Interior panel section;
   4) Skirt panel section;
   5) Landing plate and landing plate extension material and finish;
   6) Step tread material and finish;
   7) Combplate;
8) Step wheel;
9) Type 316 stainless steel, Non-directional finish;
10) Key-operated switch including master key configuration;
11) Lighting fixtures;
12) Skirt deflector device including attachment means; and
13) ASME A17.1 caution signs.

10. Test Procedures.

11. Certificates and Test Reports - Written certified reports for required tests, recording dates performed, test method, test results, interpretation of results, and recommended action. Include Certificate and Test Reports for following:
   1) Manufacturer’s certificate of rated load test;
   2) Contractor’s standard field test and data report;
   3) Certificate of inspection by the Washington State Department of Labor and Industries and City of Seattle;
   4) Operating permit issued by the Washington State Department of Labor and Industries and City of Seattle; and
   5) Manufacturer’s product data.

12. Maintenance Program - Detailed maintenance program, showing functions to be performed and schedule of frequency, not less than 90 Days before acceptance tests and Final Acceptance.

13. Welder certifications and qualified welding procedures and necessary documentation, as required in Section 05 50 00, Metal Fabrications for review and acceptance.

J. Acknowledge and/or respond to drawing comments within 15 days of return; promptly incorporate required changes due to inaccurate data or incomplete definition so that delivery and installation schedules are not affected. Revision response time is not justification for equipment delivery or installation delay.

K. Closeout Submittals: Operations and Maintenance Manuals

1. Provide three sets of neatly bound written information necessary for proper maintenance and adjustment of equipment within 30 Days following Final Acceptance. Final retention will be withheld until data is received by Sound Transit and reviewed by the Resident Engineer. Include the following as minimums:
   a. Straight-line wiring diagram of as-installed escalator circuits, with index of location and function of components. Provide one set reproducible master. Mount installation wiring diagrams on panels, racked, or similarly protected, in escalator machine room space. Provide remaining set rolled and in a protective drawing tube. Maintain with addition of all subsequent changes. These diagrams are Sound Transit’s property.
b. Lubrication instructions, including recommended grade of lubricants.

c. Parts catalogs for all replaceable parts including ordering forms and instructions.

d. 4 sets of keys for all switches and control features.

2. Diagnostic test device complete with access codes, adjusters manuals, and setup manuals for adjustment

1.06 QUALITY ASSURANCE

A. Compliance with Regulatory Agency: Comply with most-stringent applicable provisions of the Code and/or Authority outlined in Section 1.02, including revisions and changes in effect on date of these Contract Specifications.

1.07 DELIVERY, STORAGE, AND HANDLING

A. When escalator manufacturing process is complete and facility access is complete, deliver escalators and equipment to Work site in manufacturer’s unopened protective packaging.

B. Transport, handle, and store materials in manner to ensure preservation of material quality and fitness for incorporation in Work. Store material in a manner to facilitate inspection and prevent damage.

C. Erection equipment is subject to review and acceptance by the Resident Engineer upon delivery to Work site. If equipment is deemed by the Resident Engineer to be unacceptable or hazardous to personnel and property, promptly bring to acceptable condition, or remove from Work site. Obtain approval from the Resident Engineer for use of heavy moving and erection equipment supported by station structures prior to use.

D. Protect equipment and exposed finishes during transportation, erection, and construction.

1.08 WARRANTY

A. Material and workmanship of the installation shall comply in every respect with Contract Documents. Correct defective material or workmanship that develops within one year from date of final acceptance of work to the satisfaction of the Resident Engineer at no additional cost, unless due to ordinary wear and tear, or improper use or care by Sound Transit. Perform maintenance in accordance with terms and conditions indicated in Warranty Preventive Maintenance.

B. Defective is defined to include, but not limited to; operation or control system failures, performance below required minimum, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and similar unsatisfactory conditions.

C. Make modifications, adjustments, and improvements to meet performance requirements specified in Parts 2 and 3, herein.

1.09 SYSTEM STARTUP

A. Obtain and pay for permit, license, and inspection fee necessary to complete the installation. Installation will be considered complete when the governing authority of Washington State Department of Labor and Industries has issued permanent operating permit for each escalator.
B. Perform test required by Governing Authority in accordance with procedure described in ASME A17.2.3 Guide for Inspection of Elevators, Escalators, and Moving Walks in the presence of the Resident Engineer.

C. Supply personnel and equipment for test and final review required by the Resident Engineer, as specified in Part 3, herein.

D. Refer to Specification Section 14 08 00, Commissioning of Conveying Equipment for additional requirements.

1.10 MAINTENANCE

A. Interim:

1. When one or more escalators are near completion and declared ready for service, Sound Transit may accept escalators for interim use and place in service before entire installation of all escalators has been completed and accepted.

2. During this period, Sound Transit may pay a mutually agreed amount per escalator for preventive maintenance.

3. Temporary acceptance form must be acceptable to Sound Transit and signed by the Resident Engineer prior to use of escalators.

4. Protect installed equipment and finishes; and perform or arrange to pay for all cleaning, repairs, and replacement of materials necessary to restore escalator to as-new condition prior to Final Acceptance by Sound Transit.

B. Warranty Maintenance:

1. Provide preventive maintenance and 24-hour emergency call-back service for one year commencing on date of final Acceptance by Sound Transit. Systematically examine, adjust, clean, and lubricate all equipment. Repair or replace defective parts using parts produced by the manufacturer of installed equipment. Maintain machine room space, wellway, and pit in clean condition.

2. Perform escalator test required in ANSI A17.1 Rule 1008.1 or A17.1.8.6.8.13 prior to the termination of the one year preventative maintenance period as required by the Washington State Department of Labor & Industries. Correct all deficiencies from these tests and from the State’s inspections for the escalator’s annual recertification.

3. Use competent personnel acceptable to the Resident Engineer.

4. Contractor shall arrive at property within sixty minutes from time of notification of equipment problem or failure.

5. Removal of units from beneficial usage for maintenance purposes shall be coordinated with and approved by Sound Transit, unless removal is necessitated for emergency repair or adjustment. Normal preventive maintenance service shall be performed during off-peak operating hours.

6. At least semi-annually or more often if requested, provide summary and review of all callbacks and unit downtime with Sound Transit. The intent of this review is to minimize callbacks by developing consistent communication between the Contractor and Sound Transit relative to callback trends, unit downtime, and their causes.
7. All units shall be available for use an average of 98.7% of property hours of operation over each three-month period during warranty maintenance service. This includes allowance for equipment out of service time as the result of callbacks, scheduled preventive maintenance, and repairs. Contractor's failure to meet this unit availability provision for two consecutive three-month periods for any single escalator, or group of units, shall trigger an automatic maintenance audit by Sound Transit. Contractor agrees to expeditiously take corrective action in regard to identified deficiencies. Further, Contractor acknowledges Sound Transit's right to pass cost of said audit to Contractor.

8. Sound Transit retains the option to delete cost of warranty maintenance from new equipment contract and remit twelve equal installments directly to Contractor during period in which maintenance work is being accomplished.

C. Preventive Maintenance Contract: Quote monthly cost for five-year preventive maintenance contract commencing on completion of the one year period in Article 1.09B above. Submit quote based upon terms and conditions of the preventive maintenance contract furnished with these Contract Specifications. Base on present value. Price adjustment will be made at Contract commencement date and thereafter as provided in Contract.

1.11 PERMIT, TEST AND INSPECTION

A. Obtain and pay for permit, license, and inspection fee necessary to complete the installation. Installation will be considered complete when the governing authority of Washington State Department of Labor and Industries has issued a permanent operating permit for each escalator.

B. Perform tests required by the Elevator Section of the City of Seattle Department of Planning and Development as well as tests required by Washington State Department of Labor and Industries. Perform tests in accordance with procedures described in ASME A17.1 Inspector's manual for Electric Elevators and Escalators and as required by the authorities having jurisdiction in the presence of the Resident Engineer.

C. Supply personnel and equipment for test and final review by Sound Transit, as required in Part 3, Execution, Article 3.06, herein.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Qualified Manufacturers: Alternate Manufacturers must receive approval of Sound Transit at least five days prior to bid date.

B. Approved Manufacturers:

1. Fujitec
2. KONE
3. Schindler
4. Thyssen Krupp
2.02 MATERIALS

A. Steel:

B. Stainless Steel: Type 316 complying with ASTM A167, with standard tempers and hardness required for fabrication, strength and durability. Apply mechanical finish on fabricated work in the locations shown or specified, (Federal Standard and NAAMM nomenclature), with texture and reflectivity required to match Resident Engineer’s sample. Protect with adhesive-paper covering.
   1. Non-directional finish: 80 grit orbital sanding over standard mill plate or shapes to produce a uniform orbital non-directional satin finish with 90 percent of mill marks removed to match Resident Engineers visual sample.

C. Aluminum: Extrusions conforming to ASTM B221; sheet and plate conforming to ASTM B209.

D. Paint: Clean exposed metal of oil, grease, scale, and other foreign matter and factory paint one shop coat of manufacturer’s standard rust-resistant primer. After erection, provide one finish coat of industrial enamel paint. Galvanized metal need not be painted.

E. Prime Finish: Clean all surfaces receiving a baked enamel finish of oil, grease, scale, and other foreign matter. Apply one coat of rust-resistant mineral paint followed by a filler coat over uneven surfaces. Sand smooth and apply final coat of mineral paint.

F. Baked Enamel: Prime in accordance with Article 2.02E above. Apply and bake three additional coats of enamel in the selected solid color.

G. All equipment and metalwork installed as a part of this Work, which does not have special architectural finish and which is exposed in the wellway, shall be thoroughly cleaned of oil, grease, scale, and other foreign matter and given one coat of field-applied machinery enamel. Damaged factory-painted surfaces shall be neatly touched up with original paint and color.

H. All natural metals shall be stretcher-leveled, re-squared sheets. All surfaces shall be smooth and without waves.

2.03 EQUIPMENT

A. Escalator Features
   1. Number:
      a. N140: Escalators 1-8: As specified and detailed on the Contract Drawings
      b. N150: Escalators 1-8: As specified and detailed on the Contract Drawings
c. N160: Escalators 1-5: As specified and detailed on the Contract Drawings

2. Size: 48 inches wide (40 inch step)
3. Speed: 100 feet per minute (fpm)
5. Floors Served: As specified and detailed on the Contract Drawings
6. Angle of Inclination: 30 Degrees
7. Operation: Reversible
8. Drive Motor Gear Box: worm helical
10. Deck Configuration: High
11. Deck Finish: Satin finish Stainless steel
12. Molding and Trim: Match deck finish
13. Skirt Panels: Satin finish Stainless steel
14. Handrail Color: Black with white inserts
15. Step Tread and Riser: Cleated and meshed with adjacent step with tread demarcation inserts, tread sides and nosing
16. Demarcation Color: Yellow
17. Power Supply: 480 Volts, 3 phase, 60 hertz
18. Additional Features:
   a. Step demarcation lighting
   b. Emergency stop buttons
   c. Caution signs at each landing
   d. Floor intersection guards
   e. Truss extensions
   f. Floor Landing Plates and Landing Plate Extensions as required at adjacent escalators.
   g. Truss and combplate heater
   h. Combplate lighting
   i. Fault finder mounted in inner deck or at stop switch location
   j. Intermediate supports located as detailed
   k. Balustrade mounted passenger detection sensor
l. Oil Water Separator.

m. Power supply provided as detailed in the Contract Drawings. Provide a junction box and conduit as needed based on a power supply located at the lower end of the escalator.

n. Anti-slide devices on decks when the outer edge of the deck is 8 inches or greater from the edge of the handrail, or on adjacent escalators when the unobstructed distance between the edge of facing handrails is 12 inches or greater. Anti-slide devices to be a minimum 2 inches diameter by 1 inch height stainless steel with concealed mounting.

o. Stainless steel frame with polycarbonate glazing for mounting escalator operating permit. One per escalator.

19. Performance

a. Step Speed: Unit shall be capable of operating at Contract speed under all loading conditions in either direction of travel.

b. Handrail Speed: Consistent with step speed.

c. Provide sleep mode functionality.

d. Provide variable voltage/variable frequency (VVVF) drives.

20. Operation

a. Each unit shall be capable of operating smoothly and quietly at rated speed with synchronized step and handrail operation and speed in either direction of travel.

b. Each unit shall be provided with all controls, programming and equipment necessary to meet the following sleep sequence of operations (sleep mode pending approval in WA):

1) Detection sensors at each landing shall continually monitor for passengers boarding and leaving the escalator.

   a) Detection of approaching passengers shall occur sufficiently in advance of boarding to allow the escalator to reach full operating speed prior to a passenger walking at normal speed (270 ft/min) reaches the combplate.

2) If no passenger is detected for greater than 3 times the amount of time necessary to transfer a passenger between landings (adjustable), the escalator shall enter a sleep mode.

   a) Sleep: VVVF ramps escalator speed down to a minimum speed not less than 10 ft/min

      i) The deceleration rate shall not exceed 1.0 ft/sec/sec.

3) Upon detection of a boarding passenger the VVVF ramps the escalator speed up 100 ft/min.
a) The acceleration rate shall not exceed 1.0 ft/sec/sec.
b) The rated speed shall not be exceeded.

4) If a passenger is detected approaching against the direction of escalator travel at the egress landing, the VVVF shall ramp the escalator up to rated speed and sound the alarm at the approaching landing before the passenger reaches the combplate.

5) Upon failure of the passenger detection sensor the escalator shall default to continuous operation at rated speed.

21. Seismic Features
   a. Provide slip joints pinned and as designed by a Structural Engineer registered in the State of Washington. Provide sliding assembly based on manufacturers’ standard and approved by Sound Transit.
   b. Provide seismic switch to disable escalator if a seismic event occurs. Locate beneath soffit at lower end, or other approved remote location, outside of truss.

22. Remote Stop Features
   a. Provide remote stop audible alarm, delay and controlled deceleration as prescribed in NFPA 130 Sections 5.5.2.1.

B. Machine Room Equipment
   1. Driving Machine: Worm geared or helical spur gear reduction unit coupled directly to drive motor.
   2. Fault Finder: Provide fault-locating instrumentation to monitor supply voltage, drive unit, wheels, drive chains, step chains, safety circuits, emergency brake lubrication oil, up thrust switch, handrail entry, broken handrail, skirt switch, top and bottom step chain, or step-link switch, combplate, under/over speed switch, low lubricant level indication, and emergency stop switch. Permanently install fault-finding equipment at each escalator. Provide display to indicate trouble code in outer deck at readily visible location. Design to resist vandalism.
   4. Brake Operation: Safely decelerate, stop, and hold rated load in accordance with Code requirements. Brakes: Not to stop escalator operating in the down direction at a rate not greater than 3 feet/second/second.
   5. Controller: Wire to identify terminal block studs. Identifying symbols or letters identical to those on wiring diagrams permanently marked adjacent to each component on the controller. Enclose all components in steel cabinet removable from machine room for ease of access to switches and wiring. Provide mainline circuit breaker and means to protect against overload and single phasing. Provide Washington State Department of Labor & Industries conveyance number and escalator number on controller cover.
6. Step Drive Assembly: Direct or indirect drive. Machine sprockets at each side over which step chains or step chain rollers: pass and transmit motion from machine to steps. If indirect chain drive is used between machine and drive sprocket, provide emergency brake on drive assembly to automatically set if drive chain fails. Provide roller-type sealed bearings.

7. Stop Switch: Conform to Code

   b. Terminal blocks: Accept No.14 AWG.
   c. Receive the following dry contact inputs to effect the following control actions for each escalator:
      1) Remote Stop.
   d. Provide normally open dry contacts for each of the following status items for each escalator:
      1) Escalator Running/Off
      2) Escalator Traveling Up/Down
      3) Escalator Fail
      4) Escalator Emergency Stop Button
      5) Seismic operation
      6) Truss heater
      7) Pit high water level
      8) Sleep Mode Fault
   e. Remote monitoring Interface Terminal Cabinet Diagram

![Remote monitoring Interface Terminal Cabinet Diagram]
### Interface Terminal Cabinet - Terminal Strip

<table>
<thead>
<tr>
<th>Term Block</th>
<th>Type</th>
<th>Operation</th>
<th>Dry Contact Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label</td>
<td>Status</td>
<td>Maintained</td>
<td></td>
</tr>
<tr>
<td>S1A</td>
<td></td>
<td>Not Running</td>
<td>Running</td>
</tr>
<tr>
<td>S1B</td>
<td></td>
<td>Traveling Up</td>
<td>Traveling Down</td>
</tr>
<tr>
<td>S2A</td>
<td></td>
<td>Maintained</td>
<td></td>
</tr>
<tr>
<td>S2B</td>
<td></td>
<td>Failed</td>
<td>Not Failed</td>
</tr>
<tr>
<td>S3A</td>
<td></td>
<td>OK</td>
<td>Seismic Operation</td>
</tr>
<tr>
<td>S3B</td>
<td></td>
<td>Not Running</td>
<td></td>
</tr>
<tr>
<td>S4A</td>
<td></td>
<td>OK</td>
<td></td>
</tr>
<tr>
<td>S4B</td>
<td></td>
<td>Traveling Up</td>
<td>Traveling Down</td>
</tr>
<tr>
<td>S5A</td>
<td></td>
<td>Maintained</td>
<td></td>
</tr>
<tr>
<td>S5B</td>
<td></td>
<td>Truss Heater</td>
<td>OK</td>
</tr>
<tr>
<td>S6A</td>
<td></td>
<td>Maintained</td>
<td></td>
</tr>
<tr>
<td>S6B</td>
<td></td>
<td>Pit High Water Level</td>
<td>OK</td>
</tr>
<tr>
<td>S7A</td>
<td></td>
<td>Maintained</td>
<td></td>
</tr>
<tr>
<td>S7B</td>
<td></td>
<td>Emergency Stop Button</td>
<td>OK</td>
</tr>
<tr>
<td>C1A</td>
<td>Control</td>
<td>1 Second Closure</td>
<td>No Operation</td>
</tr>
<tr>
<td>C1B</td>
<td></td>
<td>Remote Stop</td>
<td></td>
</tr>
</tbody>
</table>

### C. Wellway Equipment

1. **Truss**: Steel truss to safely carry entire load of escalator, including all components, all cladding, full-capacity live load and weight of exterior truss with a factor of safety according to Code. Engineer truss to carry the exterior cladding material according to design assuming a dead load of 10 psf. Provide clearly identified exterior cladding support attachment locations on exposed sides and bottom of the entire length of truss. Provide fire resistant galvanized sheet metal exterior cladding at manufacturer’s factory.

2. In addition, design truss to carry the weight of Sound Transit provided signs and their associated structural support at located as shown on the contract documents. Assume a dead load of 250 pounds for each sign located as shown on the contract documents.

3. **Truss Extensions**: Provide truss extensions at upper and/or lower landings as required and/or as shown in Contract Drawings. End support locations will not be adjusted to accommodate installer’s equipment.

4. **Noise and Vibration Control**: Provide sound isolation within truss as required to limit noise levels relating to escalator equipment and its operation to no more than 55 Decibels (dBA), measured 3 feet above escalator at any point of its length.

5. **Drip Pans**: Minimum 14-gauge galvanized metal drip pans of oil-tight construction beneath pit, machine room, and trusses. Ensure drip pan is of sufficient strength to withstand the weight of maintenance personnel. Ensure pan extends full inside length and it’s wide enough to collect oil drips and dirt droppings; slope to drain. Provide suitable drains with grease trap at base of each oil pan with removable access plate to sump and pump.

6. **Oil Water Separator**: For all outdoor or partially outdoor escalators, provide wellway with an oil water separator located at the lower pit.
7. **Step Tracks:** Construct from steel. Bolt sections of track, including transitions, to facilitate maintenance and replacement if required. Factory install and align track sections, including transitions, to ensure smooth, quiet operation of running gear under all conditions. Form a fully independent assembly consisting of the individual track section, together with transition section, step chain tension carriage, main drive shaft and handrail drive shaft.

8. **Electrical Wiring:**
   - **Conductors:** Copper throughout with individual wires coded and all connections identified on studs or terminal blocks. Type SO cable may be utilized for wiring conducting 30 Volts or less, in accordance with NEC 620-621.
   - **Conductors:** 31 Volts rms or greater. Provide conduit, junction boxes, connections, and mounting means in accordance with requirements of Section 26 05 33, Raceways and Boxes for Electrical Systems. Provide painted or galvanized steel or aluminum conduit. Conduit size minimum 3/8 inch. Do not use flexible conduit exceeding 18 inches in length.

9. **Step Chains:** Steel links with hardened pins connecting adjacent steps and engaging drive sprockets. Provide synthetic composition roller assemblies with sealed bearings. Provide escalator design that permits chain inspection and operation while unit is running with steps removed.

10. **Step Chain Tension Carriage:** Spring tensioning device to take up chain slack and maintain constant tension.

11. **Step Assembly:** Single piece die-cast aluminum, fastened to the step chain axles. Ensure step rollers have sealed bearings and are tired with synthetic composition material. Provide cleated treads and risers. Cover the underside of Steps with sound-deadening material. Ensure steps are removable from unit without disassembly of balustrade or decking. Provide renewable yellow step demarcation inserts on trailing edge of each step tread and both sides of each step tread.

12. **Safety Devices:** Provide step, skirt, handrail, and other safety devices to function according to Code.
   - **Broken step chain;**
   - **Broken drive chain;**
   - **Skirt obstruction;**
   - **Reversal stop;**
   - **Step up-thrust;**
   - **Handrail speed;**
   - **Missing step;**
   - **Step level;**
   - **Handrail entry;**
   - **Combplate impact; and**
k. Step demarcation lights.

2.04 COMPONENTS

A. Handrails

1. Design handrails for outdoor use. Construct handrails of moisture-resistant laminated non-wicking synthetic fabric with molded rubber or neoprene cover properly vulcanized to ensure strong, smooth splice, and operate on formed guides except when in contact with driving sheaves. Reinforce handrail with full width stainless steel tape not less than 1.75 inches by 0.02 inch thick, or stainless steel wire tension member 1.75 inches wide by 0.02 inch thick. Color of handrails: black with white dots.

2. Provide handrail drive of traction type having tension device; apply one coat of zinc chromate primer and one coat of aluminum enamel. Drive handrails from main drive of each escalator connected to escalator so handrail will operate at same speed as escalator steps. Provide handrail wheels of ball or roller bearings with ample means for lubrication.

B. Balustrade


3. Deck Boards: Reinforced 14-gauge stainless steel. Abut all deck section to one another to provide a smooth surface-to-surface connection with butt joint transition, top and bottom, and horizontal to inclined sections.

4. Finishes:
   a. Interior Panels; Non-directional satin finish stainless steel reinforced vertical panels with section joints vertical to escalator incline, flush inclined panel from skirt to handrail guide above.

5. Trim and Moldings: manufacturer’s standard finish.

6. Floor Intersection Guards: Provide clear plexiglass intersection guards at floor penetrations as required according to Code.

7. Extended Newels: Align newels of adjacent escalators at upper and lower landings.

C. Landings

1. Flat Steps: Provide upper and lower landings with three flat steps.
2. Combplates: Aluminum or other alloy provided with non-slip surface. Provide removable comb sections. Apply yellow powder coat finish. Provide combplate lighting in skirt panel on both sides of units at both upper and lower landings.

3. Landing Plates: Aluminum or other alloy with non-slip surface. Extend plates from combplates to equipment access plates at upper and lower ends. Extend plates full width of truss. At locations where two escalators are adjacent, provide landing plates that span full length of both trusses including intermediate gaps.

4. Equipment Access Plates: Aluminum or other alloy with non-slip surface. Provide removable access plates to provide for entry into equipment spaces at upper and lower ends. Cover entire truss openings with plates. Match access plate to material and finish of adjacent landing plates. Provide landing plate and access floor plate without visible manufacturers name or logo.

D. Signal and Control Fixtures

1. Provide upper and lower newel or stanchion-mounted operating stations. Mount on right side when facing unit. Match deck finish. Identify Function and operating positions of switches and buttons with engraved characters that are readily visible from a standing position. Include the following at each station:

   a. Red emergency stop button. Cover the button with a transparent cover that can be readily lifted or pushed aside. When the cover is moved, ensure an audible warning signal is activated. Ensure the signal has a minimum sound intensity of 80 dBA at the button location. Engrave the cover EMERGENCY STOP; MOVE COVER or equivalent legend (for example LIFT COVER); and PUSH BUTTON. EMERGENCY STOP in letters not less than 1/2 inch high. Engrave other required wording in letters not less than 3/16 inch high. Ensure the cover is self-resetting.

   b. Key switch to start unit.

   c. Key directional control switch.

   d. Engraved Washington State Department of Labor & Industries conveyance number and escalator number.

2.05 ACCESSORIES

A. Signs

1. Landing Signs: Provide caution signs at top and bottom landings according to Code, engraved plate with material and finish to match decking.

B. Key box

1. Provide a keybox with hooks suitable for storing all escalator keys. Locate within Fire Command Center room.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions
1. Prior to beginning the installation of equipment, examine wellway and pit areas. Verify that no irregularities exist that would affect quality of execution of work specified.

2. Do not proceed with installation until work in place conforms to Contract requirements.

3.02 INSTALLATION

A. Install all equipment in accordance with Manufacturer's instructions, referenced codes, Contract Specifications, and approved Submittals.

B. Install all equipment for ease of maintenance.

C. Install all equipment to afford maximum accessibility, safety, and continuity of operation.

D. Replace or refurbish all material to meet performance requirements outlined in these Contract Specifications prior to station turnover for normal operation. There will be an extended period of time from the point that the escalators are installed to the final acceptance and station revenue service operation.

E. Remove oil, grease scale, and other foreign matter from the following equipment and apply one coat of field-applied machinery enamel.
   1. All exposed equipment and metal work installed as part of this work that does not have architectural finish.
   3. Neatly touch up damaged factory-painted surfaces with original paint and color. Protect machine-finish surfaces against corrosion.

F. Coordinate access and escalator work with work of other trades for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by Contractor to ensure dimensional coordination of Work.

G. Warp finish floor to level with the escalator floor plates but do not lay floor around escalator openings until escalator has been installed. Coordinate as required for installation.

H. The rough opening provided in the Contract Drawings is designed to accommodate variances in dimensions, support locations, and details that may vary by manufacturer. It is the responsibility of the Contractor to coordinate the final design and engineering of the selected escalators to fit the rough opening and to adjust the extent of adjacent finishes, at no additional cost to Sound Transit. Obtain approval for adjustments to details and finishes from the Resident Engineer.

I. Inspect site and verify embedded items are provided and correctly installed.

J. In event of notice of delay for access to Work, site storage at Contractor's facility will be required.

3.03 COMMISSIONING

A. See Section 14 08 00, Commissioning of Escalators, for commissioning requirements pertaining to the work of this Section.
3.04 FIELD QUALITY CONTROL

A. Work at the jobsite will be checked during the course of installation. Full cooperation with reviewing personnel is mandatory. Accomplish corrective work required prior to performing further installation.

B. Have Code Authority acceptance inspection performed and complete corrective work.

3.05 ADJUSTING

A. Track alignment: Re-align factory installed tracks if required to ensure continuous four-point contact with step and chain rollers. Secure joints without gaps and file irregularities to a smooth surface.

B. Lubricate all equipment in accordance with Manufacturer's instructions.

C. Adjust motors, brakes, controllers, stopping switches, and safety devices to achieve required performance levels.

D. Adjust brakes and controlled descent devices to stop escalator with variable load without toppling passengers. Drive machine brakes shall stop the down running escalator at a rate no greater than 3 feet/second/second.

E. Adjust handrail speed to coincide with step speed.

3.06 CLEANING

A. Keep work areas orderly and free from debris during progress of Contract. Remove packaging materials on a daily basis.

B. Remove all loose materials and filings resulting from work.

C. Clean machine room equipment, truss interior, and pit.

D. Clean balustrades, deck boards, skirt panels, operating and signal fixtures, and trim.

E. Before Substantial Completion, remove all protective coverings and wrapping.

3.07 DEMONSTRATION

A. General: Furnish labor, materials, and equipment necessary for tests. Notify Resident Engineer five days in advance when ready for final review of each escalator unit or group. Final Acceptance of installation will be made only after all field quality control reviews have been completed, identified deficiencies have been corrected, all Sound Transit’s information and certificates have been received, and the following items have been completed to satisfaction of the Resident Engineer.

1. Workmanship and equipment: comply with these Contract Specifications.

2. Contract speed and performance comply with these Contract Specifications.

3. Performance of following is satisfactory:

   a. Starting and running
   b. Controlled descent
   c. Stopping
d. Equipment noise levels

e. Signal and operating devices

f. Overall ride quality

g. Handrail speed

h. Safety devices

4. Test Results:

a. In all test conditions, obtain specified speed, handrail speed, controlled descent performance, stopping, ride quality, and operation noise levels to satisfaction of the Resident Engineer.

b. Temperature rise in windings limited to 50 degrees C above ambient.

B. Personnel, Equipment, and Instruments: Furnish personnel, equipment, and instruments to perform required tests. The following instruments may be necessary to complete the tests:

1. Multi-meter.

2. 500-volt Megger.

3. Alternating current voltmeter and ammeter.

4. Celsius-calibrated thermometers (two minimum).

5. Precision tachometer.


7. Test weights for brake test.

C. Operating Tests:

1. Overspeed Protection Device: Test by operating at rated speed, tripping overspeed device manually.


3. Broken Drive Chain Devices: Test by operating at rated speed, tripping broken chain device manually.


5. Running Test: Submit certified copy of type test based on Item 320.6 of ASME A17.2.3 - Guide for Inspection of Elevators, Escalators and Moving Walks.

6. Demonstrate functionality of all remote monitoring and control terminations at ITC.

7. Sleep Mode: Test by verifying that the escalator meets the specified sequence of operations.
D. Performance Guarantee: Should these tests reveal defects, poor workmanship, variance, or noncompliance with requirements of specified Codes and/or ordinances, or variance or noncompliance with the requirements of these Contract Specifications, complete corrections to satisfaction of the Resident Engineer at no cost:

1. Replace all equipment that does not meet Code or the requirements of these Contract Specifications.

2. Perform work and furnish labor, materials, and equipment necessary to meet specified operation and performance.

3. Perform and assume cost for retesting required by The Elevator Section of the City of Seattle Department of Planning and Development and Washington State Department of Labor and Industries and Sound Transit to verify specified operation and/or performance.

E. Field Review Scheduling: Schedule progress and final equipment reviews with the Resident Engineer. Reply promptly, in writing, to corrective work indicated on the Resident Engineer’s progress and/or final review reports, indicating status, schedule for completion, and questions, diagnosis, and troubleshooting of escalator system.

END OF SECTION