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

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SOUND TRANSIT
NORTH LINK LIGHT RAIL

LINK CONTRACT N125
TUNNELS, PORTAL, AND STATION EXCAVATIONS
CONTRACT SPECIFICATIONS

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PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

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

1.02 WORK OF THIS CONTRACT

A. The Work of this Contract includes, but is not limited to, construction of:

1. Approximately 8080 foot long, 5530 foot long and 4825 foot long segmentally lined twin-bored running tunnels from the Maple Leaf Portal to Roosevelt Station, from Roosevelt Station to U District Station and from U District Station to University of Washington (UW) Station respectively, including cross passages excavated at intervals between the bored tunnels using sequential excavation methods, civil and structural work for the Maple Leaf Portal, Roosevelt Station and U District Station shaft excavations, TBM retrieval at the Roosevelt Station and UW Station, and completion of interfaces at the UW Station.

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

a. Mobilization of Roosevelt Station.

b. Procure Tunnel Boring Machine(s) TBM(s) for running tunnels.

c. Relocate, protect-in-place or cap Roosevelt site utilities.

d. Mobilization of Maple Leaf Portal.

e. Relocate, protect-in-place or cap Maple Leaf Portal site utilities.

f. Mobilization of U District Station.

g. Relocate, protect-in-place or cap U District site utilities.

h. Excavate and install excavation support system for Roosevelt Station.

i. Excavate Roosevelt Station box and install base slab.

j. Excavate and install excavation support system for Maple Leaf Portal.

k. Excavate Maple Leaf Portal box and install base slab.

l. Excavate and install excavation support system for U District Station.

m. Excavate U District Station box and install base slab.

n. Launch TBM’s from Roosevelt Station to U District Station.
o. Launch TBM from Maple Leaf Portal to Roosevelt Station.

p. Maintain TBM’s at the U District Station box.

q. Launch TBM’s from U District box to UW Station.

r. Prepare, excavate and complete cross passages between Roosevelt Station and U District Station.

s. Retrieve TBM cutterheads at UW Station site, leaving shields in place, dismantle and remove remaining TBM equipment and trailing gear through the tunnel to the U District Station or Roosevelt Station for removal.

t. Complete connection to the UW Station.

u. Prepare, excavate and complete cross passages between U District Station and UW Station.

v. Complete connection to Roosevelt Station.

w. Prepare, excavate and complete cross passages between Maple Leaf Portal and Roosevelt Station.

x. Place tunnel structures, invert, walkways, raceways and mechanical and electrical infrastructure.

y. Clean running tunnels and cross passages.

z. Demobilization of Maple Leaf Portal, Roosevelt Station and U District Station sites.

3. The work is scheduled for construction as follows:

a. Start Date: Third Quarter 2013.

b. Completion Date: First Quarter 2018

1.03 DAYS/HOURS OF WORK

A. The following maximum work hours have been established. The hours of work require all other Specifications to be met:

1. Maple Leaf Portal site:

a. All work at the site:

1) Monday through Saturday: 7 am to 10 pm.

2) Sunday: Restricted to maintenance operations only unless otherwise approved in writing by the Resident Engineer.

b. Tunnel excavation and muck handling and hauling:

1) Monday through Saturday: 24 hours per day.

2) Work at Maple Leaf Portal site, from 10 pm to 7 am and all day Sunday is limited to the work inside the tunnel and work that supports tunnel excavation activities and handling of tunnel spoils for off-site muck disposal.
2. Roosevelt Station site:
   a. All work at the site:
      1) Monday through Saturday: 7 am to 10 pm.
      2) Sunday: Restricted to maintenance operations only unless otherwise approved in writing by the Resident Engineer.
   b. Tunnel excavation and muck handling and hauling:
      1) Monday through Saturday: 24 hours per day.
      2) Work at Roosevelt Station site, from 10 pm to 7 am and all day Sunday is limited to the work inside the tunnel and work that supports tunnel excavation activities and handling of tunnel spoils for off-site muck disposal.

3. U District Station site
   a. All work at the site:
      1) Monday through Saturday: 7 am to 10 pm.
      2) Sunday: Restricted to maintenance operations only unless otherwise approved in writing by the Resident Engineer.
   b. Tunnel excavation support and muck handling through and within the station box:
      1) Monday through Saturday: 24 hours per day.
      2) Work at the U District Station site, from 10 pm to 7 am and all day Sunday is limited to the work inside the tunnel that supports tunnel excavation activities and handling of tunnel spoils through and within the station box.

4. UW Station TBM Removal Site
   a. All work for TBM Removal:
      1) Monday through Saturday: 7 am to 10 pm.
      2) Sunday: Restricted to maintenance operations only unless otherwise approved in writing by the Resident Engineer.

5. For planned work shifts outside the established work hours, the Contractor shall give the Resident Engineer 48 hours’ notice. The Contractor shall obtain all necessary permits and approvals to work outside of these hours.

B. The Contractor’s schedule shall comply with the additional construction constraints contained elsewhere in the Contract Documents

C. The Contractor may be liable for the costs of Sound Transit’s unscheduled overtime inspection outside of the specified work hours.

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

1.04 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 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.

1.05 PERMITS OBTAINED BY SOUND TRANSIT

A. Sound Transit has acquired, or will acquire the following permits:

1. City of Seattle, Department of Planning and Development (DPD)
   a. Master Use Permits (MUPs)
      1) Demolition
      2) Staging and Grading
   b. Construction Permits
      1) Demolition Permit
      2) Electrical/Utility Relocation Permits
      3) 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)
   a. Street Use Permit for long-term closure and heavy civil construction

3. Washington State Department of Ecology (DOE)
   a. Construction Stormwater Waste Discharge Permit
      1) National Pollutant Discharge Elimination System Permit. See Article 1.06D herein for Contractor responsibilities associated with this 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 Major Discharge Authorization to Sound Transit under certain and unique circumstances if certain conditions are met.

C. Memorandum of Agreement (MOA) with the University of Washington

D. Master Implementation Agreement (MIA) with the University of Washington

E. 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.

F. Copies of permits obtained by Sound Transit will be transmitted to the Contractor at the Preconstruction Meeting.

1.06 PERMITS OBTAINED BY CONTRACTOR

A. Be responsible for and obtain all permits and right of entry, including requirements for Sound Transit Permits and right of entries listed below, required for the performance of the Work that are not listed above.

B. City of Seattle, Department of Planning and Development (DPD)
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, per requirements in Section 01 55 00, Vehicular Access and Parking, and Section 01 57 13, Temporary Erosion and Sediment Control.

C. City of Seattle Department of Transportation (SDOT)
   1. Street Use Permits (as necessary for temporary closure of sidewalks and City right-of-way).
   2. Provide an Access and Haul Plan for review and approval by Seattle Department of Transportation per requirements in Section 01 55 00, Vehicular Access and Parking.

D. City of Seattle Park and Recreation
   1. Obtain required permits to complete low-point sump discharge connection to the combined sewer in NE Ravenna Boulevard.

E. 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.

F. 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 Article 1.05.

G. When required by the permit and during work progress covered by the permit, ensure the work be inspected by the issuing agency.

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 work sequence, Contract milestones and constraints.

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

1.02 WORK SEQUENCE

A. Construction is assumed to be completed in the following sequence. Descriptions are intended to be summaries of the work detailed in the Contract Documents.

1. Mobilization to the Maple Leaf Portal, Roosevelt Station and U District Station sites.

2. Installation of temporary construction fences, site grading, utility revisions and protections, and installation of new access routes for construction, emergency services including SFD and pedestrian traffic at the Maple Leaf Portal, Roosevelt Station and U District Station sites.

3. Installation of long-term construction walls, installation of support of excavation systems, and excavation of the Maple Leaf Portal as well as the Roosevelt Station and U District Station boxes.

4. Construction of running tunnels, cross passages, low-point sump, tunnel invert and structures, raceways, walkways, and tunnel utilities from the Maple Leaf Portal to UW Station.

5. Removal of TBM cutter heads and site restoration at the UW Station site.

6. Removal of TBM from the Roosevelt Station Site.

7. Dismantling and removal of TBM equipment and trailing gear from the tunnels at the U District Station Site or the Roosevelt Station Site.

8. Final cleaning of tunnel and Work Areas at Maple Leaf Portal, Roosevelt Station, U District Station and UW Station Sites.

9. Demobilization.

1.03 CONSTRUCTION STAGING

A. For the Maple Leaf Portal, Roosevelt Station, U District Station, and UW Station sites, construction activities and use of the property shall be in accordance with the milestones and constraints listed in Article 1.04 and Article 1.05 respectively, herein.

1. Exhibit 1(a) within this Section depicts the Seattle Fire Department (SFD) and Emergency Vehicle access lane defined as Area "H" at the U District Station.
2. Exhibit 1(b) within this Section depicts Temporary Construction Easement Area “J” at the UW Station site to be used during Tunnel Boring Machine (TBM) cutter head removal, herein after referred to as UWS TBM Removal.

B. Prepare a construction staging plan describing the work area boundaries and utilization of the space within the work area for the Maple Leaf Portal, Roosevelt, U District and UW Station sites during all phases of the Contract. Include expected start dates and end dates for each phase.

1.04 MILESTONES

A. Milestone One: Demobilization from Roosevelt Station site:

1. Complete all work at Roosevelt Station site no later than 1,232 Days after effective NTP.

2. Milestone One represents handover of complete Roosevelt Station site area for use by Contract N150.

3. Milestone One represents completion of construction work for twin-bored tunnels, tunnel inverts, raceways, walkways, tunnel utilities and cross passages from Roosevelt Station to U District Station, construction of the low point sump and low point sanitary drainage connection to combined sewer line in NE Ravenna Boulevard.

4. Milestone One represents completion of final cleanup of the Roosevelt Station site and tunnels and cross passages from Roosevelt Station and U District Station.

B. Milestone Two: Completion of tunnel excavation under UW Property:

1. Complete tunnel excavation, TBM removal and site restoration at the UW Station, dismantle and remove TBM equipment and trailing gear from the tunnel, and demobilize from the UW Station Site within 305 days of the first TBM advancing on to UW Property; the UW Property line defined as Station NB 1246+98 on the Northbound tunnel and Station SB 1246+90 on the Southbound tunnel.

C. Milestone Three: Demobilization from U District Station site:

1. Complete all work at U District Station site no later than 1,341 Days after effective NTP.

2. Milestone Three represents handover of complete U District Station site area for use by Contracts N180 and N140.

3. Milestone Three represents completion of construction work for tunnel inverts, raceways, walkways, tunnel utilities and cross passages from U District Station to UW Station.

4. Milestone Three represents completion of final cleanup of the U District Station site and tunnels and cross passages from U District Station to UW Station.

D. Milestone Four: Completion of tunnel excavation at Maple Leaf Portal site:

1. Complete all tunnel excavation work at Maple Leaf Portal site no later than 1,367 Days after effective NTP. Completed work to include:

   a. Completion of twin-bored tunnels from Maple Leaf Portal to Roosevelt Station.
2. Milestone Four represents handover of partial site area for use by Contract N160.

E. Milestone Five: Demobilization from Maple Leaf Portal site:

1. Complete all work at Maple Leaf Portal site no later than 1,669 Days after effective NTP.

2. Milestone Five represents final cleanup and handover of complete Maple Leaf Portal site area for use by Contract N160.

3. Milestone Five represents handover of complete tunnels and cross passages from the Maple Leaf Portal to Roosevelt Station for use by Contract N180.

F. Milestone Six: Substantial completion of all Work no later than 1,669 Days after effective date of NTP.

1.05 CONSTRAINTS

A. Maple Leaf Portal Site

1. Maintain general purpose traffic and pedestrian traffic in accordance with Section 01 55 00, Vehicular Access and Parking, and Section 01 55 26, Traffic Control.

2. For the duration of the Contract provide emergency vehicles, including Seattle Fire Department (SFD), access to the site along 1st Ave.

B. Roosevelt Station Site

1. For the duration of the Contract provide local access, temporary pedestrian access and emergency vehicle access along NE 66th Street and NE 67th Street. Maintain general purpose traffic and pedestrian traffic in accordance with Section 01 55 00, Vehicular Access and Parking, and Section 01 55 26, Traffic Control.

2. For the duration of the Contract provide emergency vehicles, including SFD, access through the site.

C. U District Station Site

1. For the duration of the Contract provide emergency vehicles, including SFD, with an access lane to the University of Washington Tower along Brooklyn Avenue NE at Areas "H", refer to Exhibit 1(a) of this Section for depiction of the access lane at the U District Station Site.

2. For the duration of the Contract provide emergency vehicle and pedestrian access to the UW Tower and University Manor Apartment buildings. Provide and maintain temporary emergency vehicle and pedestrian access in accordance with Section 01 55 00, Vehicular Access and Parking, and Section 01 55 26, Traffic Control.

3. For the duration of the Contract provide and maintain a clear emergency egress route from the Neptune Theater emergency exit door along Brooklyn Avenue.

4. Protect existing buried fiber optic duct banks along Brooklyn Avenue NE and NE 43rd Street. For maintenance, support, and protection of existing underground utilities refer to Section 33 01 00, Operation and Maintenance of Utilities, and the Contract Drawings.

5. For the duration of the Contract provide one-way, northbound access to the alley east of Brooklyn Avenue NE between NE 43rd Street and NE 45th Street.
6. For the duration of the Contract provide pedestrian walkway access along the south and west edge of the Koh Property, refer to Exhibit 1(a) of this Section for depiction of the pedestrian walkway at the U District Station Site. For operation, maintenance and securing of the pedestrian walkway refer to Section 01 50 00, Temporary Facilities and Controls.

D. Tunnel Excavation

1. Excavation of the Maple Leaf Portal to Roosevelt tunnels shall be executed from the Maple Leaf Portal site.

2. Excavation of the Roosevelt to UW Station tunnels shall be executed from the either the Roosevelt Station or Maple Leaf Portal sites.

3. Complete tunneling underneath UW Campus (15th Ave NE to UW Station) including all retrieval work via UW Station, for both the NB and SB bores within 305 days of first TBM advancing past either NB Sta. 1246+98 or SB Sta. 1246+90 whichever comes first.

E. For the Maple Leaf Portal, Roosevelt Station, U District Station and UW Station site's environmental considerations: Section 01 57 19, Temporary Environmental Controls.

F. University of Washington Access:

1. No work on the UW campus, including the UWS TBM Removal area, allowed during the following events:
   a. UW home football games.
   b. Commencement.
   c. Convocation.
   d. Windermere Cup.
   e. Two unspecified Special Events per year at the University of Washington's Husky Stadium.
   f. UW home basketball games.
   g. Work not allowed from 2 hours prior to two hours after each of the events listed above.

2. Surface works, related to cross passage construction, on UW campus restricted to following periods;
   a. UW winter break.
   b. UW spring break.
   c. UW summer recess.

G. UW Station TBM Removal and Staging

1. Area "J" and working points for that area, shown on Contract Drawing L04-SP001, will be available to the Contractor from two weeks prior to the time of the arrival of the first TBM from the U District Station (TBM breakthrough) for a period not to exceed 3 months following initial TBM breakthrough. Area "J" is also depicted on Exhibit 1(b) of this Specification. The Contractor shall:
a. Determine scheduled TBM breakthrough date for each tunnel bore. Communicate schedule to the Resident Engineer and provide updates on a monthly basis throughout the tunneling operations and on a daily basis within two weeks of TBM breakthrough.

b. Coordinate with the Resident Engineer to occupy Area “J” at the UW Station no sooner than 2 weeks prior to breakthrough by the first TBM.

H. Contract Interfaces:

1. Interfaces with Contracts N140, N150, N180, and N185: Section 01 12 19, Contract Interface.

I. Special Events

1. Construction activates potentially expose the public to a high degree of danger, inconvenience, or risk. These risks are elevated during special community events that may be located in close proximity to the project construction zone. For these reasons, the Contractor shall take additional action to minimize these risks to the public during special community events. The Contractor shall not be entitled to extra payment for the impacts of any special community events on overall construction activities or schedule.

2. The Contractor shall coordinate with the following:

   a. Neptune Theater when working at the U District Station adjacent to the Neptune Theater building to reduce construction impacts during performance or events.

   b. Roosevelt High School during utility relocation or revisions along NE 66th Street east of 12th Avenue and along 12th Avenue NE to reduce impacts on school operations.

3. The Contractor shall maintain a Special Community Event List for the duration of the Contract. The list shall identify local special holidays, parades, festivals, and other similar events that are within the proximity of the project construction area and operations. The Special Community Events List shall be maintained on an on-going basis in date order and shall include the following information:

   a. Name and general description of the event

   b. Date, time of day and duration

   c. Locations(s)

   d. Description of potential impacts (Examples: general increase in vehicular traffic, noise impacts, etc.)

   e. Description of construction remedies to reduce risks and impacts.

4. A partial list of community events that the Contractor shall consider is [listed below]

5. University of Washington related events are listed in Article 1.05.F herein.
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies the conditions of the Maple Leaf Portal, Roosevelt Station and U District Station sites at specified times related to coordination required with other work on the sites.

1.02 SUBMITTALS

A. Letter of Agreement.
B. Warranty and Certification.
C. Record Drawings.
D. As-built Drawings of Contract N125.

1.03 GENERAL

A. 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.

B. 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.

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

D. 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.

E. 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.

F. 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.

1.04 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.

1.05 RECORD DRAWINGS OF EXISTING FACILITIES AT TURNOVER MILESTONES
   A. Format and Procedures: In accordance with Section 01 78 39, As-Built Drawings.

1.06 CONDITIONS ON THE ROOSEVELT AND U DISTRICT STATION SITES UPON HANDOVER FROM CONTRACT N112
   A. The following Articles B. through K. represent the site conditions and items which the N125 Contractor will assume responsibility for after the transfer from the N112 Contractor upon Site Access.
   B. Construction power:
      1. N112 will handover temporary construction power service per the Contract Documents.
      2. See Section 01 51 15 Temporary Electrical Power.
   C. Construction water service:
      1. N125 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. N112 will handover access for temporary construction fire water service per the Contract Documents.
      2. See Section 01 50 00, Temporary Facilities and Controls.
   E. Site grading and asphalt condition:
      1. N112 will handover existing site grading and asphalt surfacing.
   F. Erosion control system:
      1. N112 will hand over the temporary erosion and sediment control (TESC) system facilities per the Contract Documents.
      2. See section 01 57 13 Temporary Erosion and Sediment Control.
1.07 CONDITIONS REQUIRED AT THE MAPLE LEAF PORTAL SITE FOR SUBSTANTIAL COMPLETION:

A. Construction power:
1. Handover temporary construction power facilities to the N180 Contractor by the day of the Milestone Acceptance.
2. Transfer dedicated service connections to N180 Contractor.
3. See Section 01 51 15, Temporary Electrical Power.

B. Construction water service:
1. Transfer service connections for temporary construction water service to the N180 Contractor at the Maple Leaf Portal Site by the day of the Milestone Acceptance.

C. Fire water service:
1. Transfer service connections for temporary construction fire water service to the N180 Contractor at the Maple Leaf Portal Site by the day of the Milestone Acceptance.

D. Construction sanitary sewer:
1. Transfer service connections for temporary construction sanitary sewer service to the N180 Contractor at the Maple Leaf Portal Site by the day of the Milestone Acceptance.

E. Construction telephone and Internet services:
1. Transfer service connections for temporary construction sanitary sewer service to the N180 Contractor at the Maple Leaf Portal Site by the day of the Milestone Acceptance.

F. Construction lighting:
1. Transfer the temporary lighting facilities to the N180 Contractor at the Maple Leaf Portal Site by the day of the Milestone Acceptance.
2. All lighting shall be in operating condition with functioning lamp. All site lighting shall be controlled by photo cell where appropriate.

G. Site access and security:
1. Transfer existing construction fencing, walls and gates to the N180 Contractor at the Maple Leaf Portal Site by the day of the Milestone Acceptance.
2. Verify the condition of the construction fencing, walls and gates to the Resident Engineer prior to the Milestone Acceptance.

H. Site grading and asphalt condition:
1. Transfer existing site grading and asphalt surfacing to the N180 Contractor at the Maple Leaf Portal Site by the day of the Milestone Acceptance.
2. Verify the condition of the site grading and asphalt surfacing in the presence of the Resident Engineer and make any repair or adjustments to permit.
I. Wheel wash:
   1. Clean wheel wash prior to Milestone Acceptance.
   2. Verify operation of wheel wash facilities in the presence of the Resident Engineer prior to the Milestone Acceptance.
   3. Transfer responsibility for maintenance to the N180 Contractor at the Maple Leaf Portal Site by the day of the Milestone Acceptance.

J. Erosion control system:
   1. Transfer responsibility and facilities for the temporary erosion and sediment control (TESC) system at the site on the day of the Milestone Acceptance.
   2. Clean all TESC facilities at time of transfer to include storm drains and temporary sedimentation.
   3. The N180 Contractor at the Maple Leaf Portal Site will manage and maintain the system and allow storm water discharge to the existing treatment and discharge system.

K. Dewatering and process water treatment system:
   1. Transfer responsibility and facilities for the dewatering and process water treatment system(s) on the day of the Milestone Acceptance to the N180 Contractor who will assume the maintenance of the system at the Maple Leaf Portal Site.
   2. Clean all facilities at the time of transfer to include storm drains and temporary sedimentation.
   3. See Section 01 57 24. Temporary Site Water Discharge.
   4. See Section 31 23 19, Dewatering.

L. Site Contractor’s office and parking:
   1. Transfer responsibility and facilities for the office and parking at the site on the day of Milestone Acceptance to the N180 Contractor at the Maple Leaf Portal Site.

M. Temporary tunnel ventilation
   1. Transfer all facilities for the temporary tunnel ventilation on the day of the Milestone Acceptance to the N180 Contractor who will assume the maintenance of the tunnels between Maple Leaf Portal and Roosevelt.

N. Sound Transit Construction Management offices:
   1. Transfer the maintenance of the Sound Transit Construction Management Offices to the N180 Contractor who will assume maintenance of the offices at the Maple Leaf Portal Site.
   2. See Section 01 50 00, Temporary Facilities Controls.

O. Personnel access
   1. Transfer stairway(s) and service elevator(s) to track way level to the N180 Contractor at the Maple Leaf Portal Site.
1.08 CONDITIONS REQUIRED AT THE ROOSEVELT STATION SITES FOR SUBSTANTIAL COMPLETION

A. Construction power:
   1. Handover temporary construction power facilities to the N150 Contractor by the day of the Milestone Acceptance.
   2. Transfer dedicated service connections to N150 Contractor.
   3. See Section 01 51 15, Temporary Electrical Power.

B. Construction water service:
   1. Transfer service connections for temporary construction water service to the N150 Contractor at the Roosevelt Station Site by the day of the Milestone Acceptance.

C. Fire water service:
   1. Transfer service connections for temporary construction fire water service to the N150 Contractor at the Roosevelt Station Site by the day of the Milestone Acceptance.

D. Construction sanitary sewer:
   1. Transfer service connections for temporary construction sanitary sewer service to the N150 Contractor at the Roosevelt Station Site by the day of the Milestone Acceptance.

E. Construction telephone and Internet services:
   1. Transfer service connections for temporary construction sanitary sewer service to the N150 Contractor at the Roosevelt Station Site by the day of the Milestone Acceptance.

F. Construction lighting:
   1. Transfer the temporary lighting facilities to the N150 Contractor at the Roosevelt Station Site by the day of the Milestone Acceptance.
   2. All lighting shall be in operating condition with functioning lamp. All site lighting shall be controlled by photo cell where appropriate.

G. Site access and security:
   1. Transfer existing construction fencing, walls and gates to the N150 Contractor at the Roosevelt Station Site by the day of the Milestone Acceptance.
   2. Verify the condition of the construction fencing, walls and gates to the Resident Engineer prior to the Milestone Acceptance.

H. Site grading and asphalt condition:
   1. Transfer existing site grading and asphalt surfacing to the N150 Contractor at the Roosevelt Station Site by the day of the Milestone Acceptance.
   2. Verify the condition of the site grading and asphalt surfacing in the presence of the Resident Engineer and make any repair or adjustments to permit.
I. Wheel wash:
   1. Clean wheel wash prior to Milestone Acceptance.
   2. Verify operation of wheel wash facilities in the presence of the Resident Engineer prior to the Milestone Acceptance.
   3. Transfer responsibility for maintenance to the N150 Contractor at the Roosevelt Station Site by the day of the Milestone Acceptance.

J. Erosion control system:
   1. Transfer responsibility and facilities for the temporary erosion and sediment control (TESC) system at the site on the day of the Milestone Acceptance.
   2. Clean all TESC facilities at time of transfer to include storm drains and temporary sedimentation.
   3. The N150 Contractor at the Roosevelt Station Site will manage and maintain the system and allow storm water discharge to the existing treatment and discharge system.

K. Dewatering and process water treatment system:
   1. Transfer responsibility and facilities for the dewatering and process water treatment system(s) on the day of the Milestone Acceptance to the N150 Contractor who will assume the maintenance of the system at the Roosevelt Station Site.
   2. Clean all facilities at the time of transfer to include storm drains and temporary sedimentation.
   3. See Section 01 57 24. Temporary Site Water Discharge.
   4. See Section 31 23 19, Dewatering.

L. Site Contractor’s office and parking:
   1. Transfer responsibility and facilities for the office and parking at the site on the day of Milestone Acceptance to the N150 Contractor at the Roosevelt Station Site.

M. Temporary tunnel ventilation
   1. Transfer all facilities for the temporary tunnel ventilation on the day of the Milestone Acceptance to the N150 Contractor who will assume the maintenance of the tunnels between Roosevelt and U District.

N. Sound Transit Construction Management offices:
   1. Transfer the maintenance of the Sound Transit Construction Management Offices to the N150 Contractor who will assume maintenance of the offices at the Roosevelt Station Site.
   2. See Section 01 50 00, Temporary Facilities Controls.

O. Personnel access
   1. Transfer stairway(s) and service elevator(s) to track way level to the N150 Contractor at the Roosevelt Station Site.
P. Temporary Work Bridge

1. Handover temporary work bridge over the Roosevelt Station box excavation to the N150 Contractor.

2. Transfer responsibility for maintenance of the temporary work bridge to the N150 Contractor.

1.09 CONDITIONS REQUIRED AT THE U DISTRICT STATION SITES FOR SUBSTANTIAL COMPLETION

A. Construction power:

1. Handover temporary construction power facilities to the N180 Contractor by the day of the Milestone Acceptance.

2. Transfer dedicated service connections to N180 Contractors.

3. See Section 01 51 15, Temporary Electrical Power.

B. Construction water service:

1. Transfer service connections for temporary construction water service to the N180 Contractor at the U District Station Site by the day of the Milestone Acceptance.

C. Fire water service:

1. Transfer service connections for temporary construction fire water service to the N180 Contractor at the U District Station Site by the day of the Milestone Acceptance.

D. Construction sanitary sewer:

1. Transfer service connections for temporary construction sanitary sewer service to the N180 Contractor at the U District Station Site by the day of the Milestone Acceptance.

E. Construction telephone and Internet services:

1. Transfer service connections for temporary construction sanitary sewer service to the N180 Contractor at the U District Station Site by the day of the Milestone Acceptance.

F. Construction lighting:

1. Transfer the temporary lighting facilities to the N180 Contractor at the U District Station Site by the day of the Milestone Acceptance.

2. All lighting shall be in operating condition with functioning lamp. All site lighting shall be controlled by photo cell where appropriate.

G. Site access and security:

1. Transfer existing construction fencing, walls and gates to the N180 Contractor at the U District Station Site on the day of the Milestone Acceptance.

2. Verify the condition of the construction fencing, walls and gates to the Resident Engineer prior to the Milestone Acceptance.
H. Site grading and asphalt condition:
   1. Transfer existing site grading and asphalt surfacing to the N180 Contractor at the U District Station Site on the day of the Milestone Acceptance.
   2. Verify the condition of the site grading and asphalt surfacing in the presence of the Resident Engineer and make any repair or adjustments to permit.

I. Wheel wash:
   1. Clean wheel wash prior to Milestone Acceptance.
   2. Verify operation of wheel wash facilities in the presence of the Resident Engineer prior to the Milestone Acceptance.
   3. Transfer responsibility for maintenance to the N180 Contractor at the U District Station Site on the day of the Milestone Acceptance.

J. Erosion control system:
   1. Transfer responsibility and facilities for the temporary erosion and sediment control (TESC) system at the site on the day of the Milestone Acceptance.
   2. Clean all TESC facilities at time of transfer to include storm drains and temporary sedimentation.
   3. The N180 Contractor at the U District Station Site will manage and maintain the system and allow storm water discharge to the existing treatment and discharge system.

K. Dewatering and process water treatment system:
   1. Transfer responsibility and facilities for the dewatering and process water treatment system(s) on the day of the Milestone Acceptance to the N180 Contractor who will assume the maintenance of the system at the U District Station Site.
   2. Clean all facilities at the time of transfer to include storm drains and temporary sedimentation.
   3. See Section 01 57 24. Temporary Site Water Discharge.
   4. See Section 31 23 19, Dewatering.

L. Site Contractor’s office and parking:
   1. Transfer responsibility and facilities for the office and parking at the site on the day of Milestone Acceptance to the N180 Contractor at the U District Station Site.

M. Temporary tunnel ventilation
   1. Transfer all facilities for the temporary tunnel ventilation on the day of the Milestone Acceptance to the N180 who will assume the maintenance of the system between U District and UW.

N. Sound Transit Construction Management offices:
   1. Transfer the maintenance of the Sound Transit Construction Management Offices to the N180 Contractor who will assume maintenance of the offices at the U District Station Site.
2. See Section 01 50 00, Temporary Facilities Controls.

O. Personnel access
1. Transfer stairway(s) and service elevator(s) to track way level to the N180 Contractor at the U District Station Site.

P. Temporary Work Bridge
1. Handover temporary work bridge over the U District box excavation to the N180 Contractor.
2. Transfer responsibility for maintenance of the temporary work bridge to the N180 Contractor.

Q. Pedestrian Walkway
1. Transfer responsibility for maintenance and security of pedestrian walkway on the U District Station site Sound Transit R/W No. NL-426 to the N180 Contractor.

1.10 CONDITIONS REQUIRED AT THE UW STATION SITE FOR SUBSTANTIAL COMPLETION OF THE TBM REMOVAL WORK

A. Complete the Work at the UW Station Site as shown in the Contract Drawings. At the completion of the Work, return the site to the as-found conditions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
CONTRACT SPECIFICATIONS

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, provisional sums, and unit prices.

1.02 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 (SOV):
   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.

1.03 SCHEDULE OF VALUES
A. Develop and use the Schedule of Values to provide an allocation of the Work for measurement and payment to an appropriate level of detail to ensure accurate payment for the Work accomplished.

B. 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.

C. 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.
5. Changes resulting from Change Orders (CO), and Change Notice-Work Directive’s (CNWD).

D. The total value of the line items in the Schedule of Values plus any approved COs or authorized CNWDs shall equal to the current contract price.

E. The value of stored material shall be identified in the Schedule of Values with both a material-purchase activity and a separate corresponding installation activity in the Construction Schedule(s).

F. If required by the Resident Engineer, the Contractor shall present documentation substantiating the cost allocations for line items within the Schedule of Values.

1.04 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 schedule of values for 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 reflecting the progress expressed in earned value that occurred during the payment period as approved by the Resident Engineer.

1.05 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. The Provisional Sums are exclusive of Work indicated in the Contract Documents for which payment is included under other specifically designated items in the Contract Price Schedule.

1.06 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.

1.07 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.

1.08 ITEM MEASUREMENT AND PAYMENT

A. 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. Items not listed in the Contract Price Schedule but considered necessary to complete the Work, will be considered incidental to the Work, and separate measurement and payment will not be made.

1. Item #1: All the Work of this Contract.
   a. Item Description: The Work of this item includes construction of underground utility duct banks and appurtenances.
   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, in accordance with the approved Schedule of Values.

2. Item #2: Trench Excavation Safety.
   a. Item Description: The Work of this item includes shoring and safety systems for all trench excavations exceeding 4-foot depths.
   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.

3. Item #3: Provisional Sum for Unidentified Utility Conflicts
a. Measurement: No separate measurement will be made for this item. The work of this item includes cost associated with requirements of resolving unidentified utility conflicts as identified by the Resident Engineer.

b. 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.

4. Item #4: Provisional Sum for Unknown Hazardous and Contaminated Substances
   a. Measurement: No separate measurement will be made for this item. The work of this item includes cost associated with removal of Unknown Hazardous and Contaminated materials that are encountered during construction.
   b. 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.

5. Item #5: Provisional Sum for Contractor Support for Archaeological Investigation
   a. Measurement: No separate measurement will be made for this item. The work of this item includes cost associated with Contractor Support for Archaeological Investigation as directed by the Resident Engineer.
   b. 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.

1.09 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.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies fuel price adjustments.

B. The intent of the adjustments is to reduce the Contractor’s risk of unpredictable price escalations for diesel fuel, and to reduce the Contractor’s “built-in” Bid contingencies to cover such escalations.

PART 2 - PRODUCTS

2.01 GENERAL

A. This Section only applies to diesel fuel. Propose specific types of diesel and types of cement at time of Bid.

PART 3 - EXECUTION

3.01 FUEL PRICE ADJUSTMENT

A. Within five working days of the Notice of Contract Award, the Contractor will be asked to declare in writing whether or not they wish to participate in the Fuel Adjustment provisions outlined in this Specification. In the event the Contractor elects to participate in the Fuel Price Adjustment the Contract price will be adjusted up or down in accordance with this Section.

B. Sound Transit will compensate the Contractor for diesel fuel price escalation up to an aggregate Contract maximum of [______]. This payment will be made from Bid Item [______].

C. The maximum aggregate Contract adjustment downward to the contract price shall not exceed [______].

D. For the purpose of determining the adjustment, the Base Fuel Cost per Gallon shall be the Weekly U.S. On-Highway Diesel Fuel Price for West Coast No. 2 Diesel Retail Sales by All Sellers (Cents per Gallon) dated on the nearest Monday occurring three weeks prior to the date that Bids are opened, published by the Energy Information Administration (Department of Energy), available at: http://tonto.eia.doe.gov/oog/ftparea/wogirs/xls/psw18vwall.xls.

E. The Base Fuel Cost per Gallon is fixed for the duration of the Contract and will be used for determining all adjustments.

F. Only fuel used for on-site equipment, for trucks hauling materials and equipment to the site, and for trucks hauling excavation material to disposal sites will be eligible for Fuel Price adjustment. Fuel for pickup trucks or automobiles used by Contractor staff will not be eligible for Price Adjustment.
G. The Monthly Fuel Cost per Gallon shall be the most recent Monthly U.S. On-Highway Diesel Fuel Price for West Coast No. 2 Diesel Retail Sales by All Sellers (Cents per Gallon), published by the Energy Information Administration (Department of Energy). If the specified index ceases to be available for any reason, the Contracting Agency at its discretion will select and begin using a substitute price source or index to establish the Monthly Fuel Cost per Gallon.

H. No adjustment will be made if the Monthly Fuel Cost per Gallon is within 10 percent of the Base Fuel Cost per Gallon. No adjustment will be made for work performed after the authorized Time for Completion.

I. If the Monthly Fuel Cost per Gallon is greater than or equal to 110 percent of the Base Fuel Cost per Gallon, then:

\[ \text{Adjustment} = (\text{Monthly Fuel Cost} - (1.1 \times \text{Base Fuel Cost})) \times \frac{Q}{100} \]

J. If the Monthly Fuel Cost per Gallon is less than or equal to 90 percent of the Base Fuel Cost, then:

\[ \text{Adjustment} = (\text{Monthly Fuel Cost} - (0.9 \times \text{Base Fuel Cost})) \times \frac{Q}{100} \]

K. Where \( Q \) = Contractor’s Documented Fuel Consumption in the approved current months progress estimate.

L. The Contractor’s Documented Fuel Consumption shall be the sum of the certified receipts for its fuel purchases for equipment used exclusively during the month on N125 by the Contractor and subcontractors’ performing Work under Bid Items [_____].
CONTRACT SPECIFICATIONS

SECTION 01 25 00
SUBSTITUTION PROCEDURES

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(s) 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 (NOT USED)

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>
</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
[ ] Not Accepted

Signature ____________________________

Firm ____________________________ By ____________________________

Address ____________________________ Date ____________________________

Date ____________________________

Telephone ____________________________

Remarks ____________________________

END OF FORM
PART 1 - GENERAL

1.01 SUMMARY
A. This Section specifies the submittal, use, and preservation of Contractor’s Escrow Price Documentation, as defined in Article 1.03, herein (hereinafter also referred to as “Price Documentation”, “Price Document” or “Documents”). The Price Documents provided by the Contractor shall be specific enough that a third person could look at the Price Documents and determine the labor, material, and equipment costs for each Contract Division and Specification Section within the Division. The Price Documents shall also identify field and home office overhead and profit. The Contractor shall execute the enclosed Escrow Price Documentation Instruction Agreement and submit it no later than the meeting to review the Price Documents as set forth in Article 1.04A, herein.

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

1.02 CONTRACTOR RESPONSIBILITIES
A. The Contractor shall submit a legible copy of all Escrow Price Documentation used to prepare the price for this Contract no later than the time set forth in Article 1.04A, herein.

1.03 ESCROW PRICE DOCUMENTATION DEFINITION
A. The terms “Escrow Price Documentation”, “Price Documentation” and “Price Documents” as used in this Section include, but are not limited to, the following documents:

1. Detailed Construction Schedule(s) following negotiation of the MACC.
2. Scope of work on which the Contractor requested any Subcontractors and Suppliers to submit price information.
3. Price information 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 all notes from price determination meeting(s).
10. Takeoff sheets, cut and add sheets, and any and all backup documentation.
11. Price 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 Price 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 all other documentation or data compilations which contain or reflect all information, data, and calculations compiled to, referred to, related to, and used for the above list of items.

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

14. All adjustments made to Price items during the negotiation of the MACC.

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

C. The term Escrow Price Documentation does not include the Price documents provided by Sound Transit for use by the Contractor in preparing price on this Contract.

1.04 DELIVERY OF PRICE DOCUMENTATION TO SOUND TRANSIT

A. Within 5 business days following agreement on the negotiated MACC, the Contractor shall submit Price Documentation to the Senior Contracts Administrator named in the RFFP at:

Sound Transit Procurement and Contracts
401 S. Jackson Street,
Seattle, WA 98104.

B. Escrow Price Documentation shall be submitted as follows:

1. All Escrow Price Documentation shall be in folder(s) or three-ring binder(s). The folder(s) or three ring binder(s) shall be clearly marked “Escrow Price Documentation - Contract No. LR 0177-09 and shall contain the Contractor’s name, contact person, phone number, and date of submittal. Such Escrow Price Documentation shall be stored in an offsite document repository of Sound Transit’s choice.

2. Contractor shall mark all of pages of the Price Documentation it considers proprietary or confidential, accordingly. Such information will be treated as such by Sound Transit; however, Sound Transit cannot ensure that this information would not be subject to release pursuant to a public disclosure request. In the event Sound Transit receives a request for such information, Sound Transit will immediately advise the Contractor and will not release the marked documents for a period of not less than 10 Days in order to give the Contractor an opportunity to obtain a court order prohibiting the release of the information in response to the public disclosure request.

3. The writing on the pages shall be legible.

4. The paper shall be white in color or some other light (neutral) colored paper.
5. Documents shall be in the English language. Currency shall be expressed in U.S. dollars, and measurement units in either metric or U.S. units. Should the Contractor receive a quotation in a language other than English, the Contractor shall provide an English translation of that (those) document(s).

C. Contractor shall include with its Escrow Price Documentation an affidavit signed under oath by an individual authorized by the Contractor to execute Prices and contracts.

1. The affidavit shall list each document with sufficient specificity and reference page number(s) so that a comparison can be made between the list and the Price Documentation to ensure that all Escrow Price Documentation listed in the affidavit has been enclosed and that all documentation has been provided to Sound Transit.

2. The affidavit shall state that the affiant has personally examined the Escrow Price Documentation and that all documentation that was used in preparing the Price and that supports how the Price was calculated was provided to Sound Transit.

D. Documents listed in the affidavit but not included in the folder(s) or three ring binder(s) through error or oversight by the Contractor, shall be submitted to Sound Transit within two business days after notification from Sound Transit that Price Documentation is missing or within 2 business days after the Contractor becomes aware of the error.

E. Prior to Contract execution, Sound Transit and the Contractor shall meet to review the Price Documentation to ensure that the submitted Price Documentation satisfies the requirements of this Section.

F. If Sound Transit determines that the Escrow Price Documentation is illegible, not electronically accessible, or not submitted in accordance with this Section, the Contractor shall:

1. Provide legible copies of the Price Documentation.

2. Supply the software necessary to access the Price Documentation.

3. Comply with the requirements of this Section within 2 business days of Sound Transit’s request.

G. If Sound Transit believes that the Contractor has not provided all Escrow Price Documentation, the Contractor shall, within 2 business days of Sound Transit’s request, supply additional documentation or an explanation as to why the documentation does not exist.

H. Failure to submit Escrow Price Documentation within the times prescribed, failure to be cooperative with Sound Transit in providing the Price Documentation, or destruction of Price Documents is just reason for a Contractor to be found not responsible in which case Sound Transit may reject the Contractor as not responsible.

1.05 USE OF PRICE DOCUMENTATION

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

B. The Escrow Price Documentation may be reviewed and used by Sound Transit to determine the Contractor’s Price concept, to evaluate the Contractor’s breakdown of
Contract Price, evaluate productivity and schedule, in association with Claims or for all other reason related to the Contract.

C. Sound Transit may copy the Escrow Price Documents and may provide the working copy(s) to Sound Transit personnel, agents, or consultants. Sound Transit, its agents, and consultants, may maintain such working copies of the Price Documents and at the request of Resident Engineer, all copies of Escrow Price Documents will be returned to Sound Transit.

D. If a Dispute Review Board is used to resolve disputed claims, the Board members shall have unrestricted use and access to the Escrow Price Documentation for purposes of evaluating, understanding, resolving, and settling disputes/claims. The Dispute Review Board shall maintain submitted documents in a file marked confidential and proprietary which shall be returned to Sound Transit at the conclusion of the DRB process.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

ATTACHMENT

A. Escrow Bid Documentation Agreement

END OF SECTION
SECTION 01 27 23 - ATTACHMENT A

ESCROW PRICE DOCUMENTATION AGREEMENT

Public Body: Sound Transit

Contract No.: LR 0177-09

Project Name: N125 Tunnels, Portal, and Station Excavations

Estimated Contract Completion Date: ____________________________

This Agreement is for the retention of Escrow Price Documentation submitted in accordance with Specification Section 01 27 23, Escrow Price Documentation, Contract No. LR 0177-09 by ________________, (Contractor) the company selected 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 PRICE DOCUMENTATION
   A. The Escrow Price 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 Price Documentation may be used to determine the Contractor’s Price concept related to Claims arising out of this Contract. Pursuant to the Contract Specifications Section 01 27 23, Escrow Price Documentation, Sound Transit may copy the Escrow Price Documents and utilize copies.
   C. For purposes of protecting the Escrow Price Documents, Sound Transit and the Contractor shall each designate three authorized representatives that may access the Escrow Price Documents. Such designations shall be by letter to the other party. The Contractor and/or Sound Transit may change the authorized representatives with 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 Price Documentation to verify the fairness and reasonableness of any proposed adjustment in the Contractor Price or Contract Time. If Sound Transit elects to obtain access to such materials, Sound Transit will notify the Contractor and permit the Contractor to obtain equal access. At no time shall the Contractor have access to the Escrow Price Documents and affidavit located with the Escrow Price Documents without the presence of a Sound Transit authorized representative. Following each examination, the Escrow Price Documentation will be returned to Sound Transit’s offsite document repository.
   D. The Article above does not apply when Sound Transit or Contractor accesses their working copies of the Escrow Price Documentation.
2 AUTHORIZED REPRESENTATIVES

A. For the Contractor are:

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

B. For Sound Transit are:

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

3 REMEDIES FOR REFUSAL OR FAILURE TO PROVIDE OR ALLOW ACCESS TO PRICE DOCUMENTATION

A. If the Contractor fails or refuses to allow Sound Transit to access, examine, copy, and/or maintain a copy of the Escrow Price Documentation, the parties agree that:

1. Sound Transit shall provide access to the Escrow Price Documents to Senior Contracts Administrator 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 or copy the Escrow Price Documentation;

   b. Sound Transit provided timely written notice to the Contractor regarding access to the Escrow Price Documentation;

   c. The Contractor has either failed to acknowledge notice of Sound Transit’s request, is refusing to allow Sound Transit access to the Escrow Price Documentation, or is refusing to allow Sound Transit to access the Escrow Price Documentation and it has been more than two days (48 hours) since Sound Transit provided notice of its intents to access the Escrow Price Documents.

2. An employee from Sound Transit shall be present when Sound Transit accesses the Escrow Price Documentation to ensure the authenticity of the Escrow Price Documents.
Contractor  

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

Sound Transit  

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

Resident Engineer address

END OF AGREEMENT
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for constraints on construction and coordination with:

1. Other Sound Transit Contracts
2. King County Metro (KCM)
3. City of Seattle
   a. Department of Transportation (SDOT)
   b. Public Utilities (SPU)
   c. City Light (SCL)
   d. Planning and Development (DPD)
   e. Fire Department (SFD)
4. The University of Washington (UW)
5. Private Utilities
   a. 360 Networks
   b. Comcast
   c. Puget Sound Energy
   d. Verizon
6. Washington Department of Transportation (WSDOT)
7. Adjacent Property Owners
8. Community Outreach and Relations

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

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. 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 51 15, Temporary Electrical Power
5. Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork
6. Section 31 71 23, Tunnel Excavation by Sequential Excavation Method
7. Section 31 23 19, Dewatering
8. Section 31 32 13.36, Jet Grout Soil Stabilization
9. Section 31 71 26, Tunnel Rescue
10. Section 33 11 00, Water Utility Distribution Piping
11. Section 33 30 00, Sanitary Sewerage Utilities

1.02 GENERAL

A. The Contractor shall attend meetings called by the Resident Engineer to coordinate the operations with the construction of this Contract with others.

B. Sound Transit Resident Engineer will provide a list of all project related contacts for coordination purposes at the Pre-Construction Meeting.

1.03 COORDINATION CONSTRAINTS ON CONSTRUCTION

A. 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. The Ordinance permits normal Work hours as indicated in Section 01 11 00, Summary of Work.

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, obtain a noise ordinance variance from the City of Seattle and comply with its requirements.

C. Sound Transit has applied for a major Public Project Construction Noise Variance to the City of Seattle Noise Ordinance 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 City of Seattle, incorporate the Nighttime Construction Noise Variance Application, into the Contract.

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

E. When coordinating with Sound Transit and Project Stakeholders, note that the following are 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.

2. Coordinate with Sound Transit and Project Stakeholders so that construction activities do not impact the following activities:

   a. University District Street Fair
b. University District Farmer’s Market

c. University of Washington home football games and activities

d. University of Washington commencement activities

e. Neptune Theater performances

f. Two Sound Transit floating holidays per year (exact dates to be determined by Sound Transit)

F. Arrange schedule to comply with the additional construction and access constraints contained in the General Conditions, Section 01 12 16 and elsewhere in the Contract Documents.

1.04 COORDINATION WITH OTHER SOUND TRANSIT CONTRACTORS

Coordinate Work with the following Sound Transit Contractors. Dates of construction are estimated, and are subject to change.

A. Northgate Link Contracts N110; N111; N112, N140, N150, N160, and N180;

B. Refer to Section 01 11 00, Summary of Work and Section 01 12 19 Contract Interface.

1.05 COORDINATED INSTALLATION PROGRAM (CIP) – NOT USED

1.06 COORDINATION WITH KING COUNTY METRO

A. The Contractor shall coordinate its work with the Resident Engineer and King County Metro Transit/King County (KCM) for all street work that affects transit operations.

B. Coordination with the KCM shall include:

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

2. Accommodation for buses when the Contractor is modifying traffic patterns 30 days notice shall be given to KCM before traffic control changes are made that will impact the trolley bus wire alignment of bus zones.

3. Assistance and coordination with KCM facility modifications during construction.

4. 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.

5. 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. A raised landing of 6-inch curb height

b. Accessible for wheel chair lift deployment

c. Provide safe walkways to adjacent cross streets

d. Lighting for night use
e. At least 75 feet long

f. At least 9 feet wide

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

1.07 COORDINATION WITH CITY OF SEATTLE

A. SDOT

1. The Seattle Department of Transportation (SDOT) has jurisdiction over the streets and roadways. Closely coordinate work activities with SDOT.

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

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

4. Road Closures
   a. Refer to Section 01 55 26 and contract plans for MOT and traffic control requirements
   b. Lane closures shall be limited 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].
   c. Obtain prior approval for closing or partial closing of all streets, sidewalks, or bike routes, as applicable.

B. SPU

1. Coordinate Work affecting Seattle Public Utility’s (SPU) utilities through the Resident Engineer with SPU Water Engineering Division and Sewer/Drainage Division.

2. Procedures for coordination with SPU for Work affecting SPU water lines are covered in Section 02 80 00, Removal and Handling of Coal Tar-Containing Materials, Section 33 11 00, Water Utility Distribution Piping, Section 33 11 14, Water Transmission Piping, and as indicated on the Contract Drawings.

3. Procedures for coordination with SPU for Work affecting SPU sewer lines are covered in Section 33 30 00, Sanitary Sewerage Utilities.

4. Procedures for coordination with SPU for Work affecting SPU storm drainage lines are covered in Section 33 40 00, Storm Drainage Utilities.

C. SCL

1. Coordinate Work affecting Seattle City Light (SCL) utilities through the Resident Engineer with SCL. SCL construction coordinator: Ian Cooper (206-615-0610)

2. 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.
3. Costs charged by SCL for a safety watch or line crew required will be borne by the Contractor.

D. DPD
1. Closely coordinate activities with the Seattle Department of Planning and Development (DPD), which has jurisdiction over building permits and compliance.
2. Coordinate Work affecting Seattle Department of Planning and Development (DPD) through the Resident Engineer and DPD.

E. SFD
1. Obtain Seattle Fire Department approval of fire systems and testing thereof.
2. Work area along Brooklyn Ave is restricted as indicated in Section 01 12 16, Work Sequence exhibits. Coordinate delivery, equipment movement, and any other work in this area with the SFD through the Resident Engineer.
3. Coordinate street closures, lane closures and other in-street work activities with SFD.
4. Coordinate work associated with Tunnel Rescue in accordance with Section 31 71 26 Tunnel Rescue.

F. PARKS AND RECREATION
1. The Seattle Parks and Recreation has jurisdiction over the NE Ravenna Boulevard.
2. Obtain Seattle Parks and Recreation approval all work performed on Parks and Recreation Property.
3. Closely coordinate work activities performed in NE Ravenna Boulevard with Seattle Parks and Recreation.

1.08 COORDINATION WITH UNIVERSITY WASHINGTON
A. Coordinate through the Resident Engineer for University of Washington (UW) reviews including all Work outside the Construction Limits.
B. Procedures for coordination with UW for Work outside of the Construction Limits are noted in the Section 01 12 16, Work Sequence and as indicated on the Contract Drawings.
C. The following constraints apply to surface work for cross passage construction within the UW campus.
1. Submit work plans for construction of instrumentation, dewatering and ground improvement based on the requirements of:
   1) Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork
   2) Section 31 71 23, Tunnel Excavation by Sequential Excavation Method
   3) Section 31 23 19, Dewatering
4) Section 31 32 13.36 Jet Grout Soil Stabilization

2. Cross Passage 21:
   a. Limit footprint of ground improvement work at the ground surface to the designated area shown on Contract Drawing L04-SC551.
   b. Submit a traffic control plan to the UW, Seattle Fire Department and the Resident Engineer prior to the closure of Mason Road.
      1) Schedule the closure of Mason Road between March 1st and August 15th to avoid conflicts with the UW football season and snow routes on campus.
      2) Compensate UW for the number of parking stalls taken over by the work area. Compensation shall be based on standard campus parking rates and actual duration of closure.

3. Cross Passage 22:
   a. Limit footprint of work at the ground surface to minimum required to install extensometer indicated.
   b. Schedule extensometer installation on nights or weekends to reduce impacts to pedestrian traffic on campus.
   c. Implement mitigation measures to prevent impacts to the tree and air-intake structure as indicated.

4. Cross Passage 23
   a. Limit footprint of work at the ground surface to minimum required to install extensometer indicated. If additional surface access is required beyond that necessary for extensometer installation, limit the footprint of work are to the area shown on Contract Drawing L04-SC553.
   b. Implement mitigation measures to prevent impacts to the adjacent trees and underlying storm drain.

5. Cross Passage 24
   a. Schedule extensometer installations on nights or weekends to reduce impacts to pedestrian traffic on campus.
   b. Implement mitigation measures to prevent impacts to the underlying utilities and air-intake structures indicated.

6. Cross Passage 25:
   a. Limit footprint of the work related to the dewatering system installation and operation to the area shown on Contract Drawing L04-SC555.

D. Submit a work plan for EMI conduit routing, borehole, and cabinet installation on the UW campus a minimum of 90 days before the start of the associated work. Include drawings, sketches, product data and written text describing the overall approach to the work. Include:
   1. Qualifications of subcontractors installing EMI conduits, boreholes and cabinets.
2. Identify personnel responsible for overseeing tunnel work who will sign out tunnel keys.

3. Proposed materials and equipment to be used. Color of cabinets, junction boxes and conduits shall be based on UW requirements.

4. Construction access and staging requirements for conduit, borehole and cabinet installation.

5. Drawings showing all areas of the tunnel in which work will be performed. Note emergency egress hatches associated with each tunnel reach.

6. Sequence and timing of the each construction activity.

7. Procedures for determining final conduit locations in the UW tunnels and manhole structures. General routing plans within the UW tunnels and manholes are shown on the contract documents however final locations will need to be determined in the field based on:
   a. Actual pipe locations and geometry of the UW tunnels and manholes.
   b. Minimum separation distances between EMI conduits and steam pipes.
   c. UW review of work plan with input and concurrence.

E. Health and Safety Requirements for Work in UW Tunnels

1. An orientation meeting needs to be conducted with the UW Capital Project’s Construction Manager prior to performing any work in the tunnel system. Items to be reviewed at meeting will include the utility systems that are in the tunnel high-voltage electrical cabling, communication and data, high- and low-pressure stream, pressurized water systems, plus other known hazards such as asbestos insulation and low light levels.
   a. If loose asbestos is identified during the work call UW Asbestos office at (206) 685-3357, cell (206) 910-5781 or email asbestos@u.washington.edu.

2. Prior to scheduling any work the contractor will need to identify areas of desired work with sufficient notice for the UW to prepare a good faith survey letter.

3. Emergency egress hatches are installed throughout the tunnel system and most are locked from the outside.

4. Only UW personnel are allowed to shutdown utilities in the tunnel system.

5. Do not lift or move high-voltage electrical cables in the wire raceway racks without prior consultation with the UW high voltage shop.

6. The personnel responsible for overseeing the tunnel work will be allowed to check out tunnel keys after the orientation meeting. Once allowed to sign out tunnel keys, UW escorts will no longer be required to access the tunnels.

1.09 COORDINATION WITH PRIVATE UTILITIES

A. Coordinate Work affecting Private Utilities through the Resident Engineer, and the contacts identified in the following table
   a. INSERT TABLE OF UTILITY AND CONTACT DETAILS – ST CM.
1.10 COORDINATION WITH WSDOT

A. Coordinate the Work within WSDOT Right of Way through the Resident Engineer.

B. Limit work within WSDOT Right of Way to the area indicated.

1.11 COORDINATION WITH ADJACENT PROPERTY OWNERS

A. Table [   ] contains a list of adjacent property owners current at the time of this Invitation to Bid. Commitments to property owners regarding restoration or other features are included in the list in Table [   ]. Fulfill these commitments to the satisfaction of the Resident Engineer is part of the Contract Work.

B. The Contactor shall work in concert with Sound Transit’s Community Outreach Department to advise each property owner of upcoming work that will have a direct impact on the property and will schedule the Work to minimize as much as practical these impacts. Coordination items shall include, but not be limited to, underground utility service connections, driveway reconstruction, utility disruption, water service, grounding work, demolition, landscape salvage, fencing, mail delivery and garbage collection.

C. Driveway access and pedestrian access to all properties (residences and businesses) shall be maintained at all times, unless prior written approval of the property owner is received by the Contractor and provided to the Resident engineer. If the Contractor proposes to close a driveway or pedestrian access, it is the Contractor’s responsibly to make the necessary arrangements with the property owner. The arrangements may include working at night, providing alternative access, or providing temporary structures. The costs of all arrangements with the property owners shall be borne solely by the Contractor.

D. Coordinate the project schedule and Work Hours with the needs of local business and customers.

E. University Manor Apartments:

1. Coordinate the sequence indicated….

2. Identify….

3. Incorporate…

F. The following constraints apply to surface work for cross passage construction north of UW campus.

1. Submit work plans for construction of instrumentation, dewatering and ground improvement based on the requirements of:
   a. Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork.
   b. Section 31 71 23, Tunnel Excavation by Sequential Excavation Method.
   c. Section 31 23 19, Dewatering
   d. Section 31 32 13.36 Jet Grout Soil Stabilization

2. Cross Passage 28:
   a. Limit footprint of work at the ground surface to the designated area shown on Contract Drawing L04-SC556.
b. Schedule work to avoid disruption of U-District Farmer’s Market and Brooklyn Ave Garbage Collection;

c. Maintain two-way traffic on NE 50th Street.

3. Cross Passages 29, 30, 31, and 32:

a. Limit footprint of work at ground surface to the areas designated on drawings Contract Drawings L04-SC556 to SC560.

b. Maintain access to residential driveways as indicated;

c. Schedule work to avoid disruption of garbage collection on 12th Ave NE;

d. Limit work hours in accordance with Section 01 12 16 Work Sequence.

4. Cross Passage 33:

a. Limit footprint of work at ground surface.

b. Maintain access to residential driveway on NE 63rd Street.

c. Maintain pedestrian access to townhomes on NE 63rd Street.

5. Cross Passage 35:

a. Limit footprint of work at ground surface.

b. Maintain 2 lanes of traffic on Roosevelt;

c. Maintain access to businesses between 71st and 72nd:
   1) 4:00 pm to 10 pm Monday through Thursday;
   2) 4:00 pm to 11 pm Friday through Sunday;

d. Maintain access to driveways indicated;

e. Incorporate Bike Lane into MOT plans in accordance with SDOT.

1.12 COMMUNITY RELATIONS

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

B. Jointly contact with Sound Transit those residents, schools 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, ground breaking, and other milestone events.

D. Accommodate site tours. Tours shall be arranged through the Resident Engineer.

E. 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 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)

END OF SECTION
SECTION 01 31 14 - ATTACHMENTS

CENTRAL LINK TRACK ACCESS PERMIT PROCESS:

The goal of the Track Access Permit Process it to provide for safe working conditions for all work that is performed along the Right of Way, Central Link controlled property and in Passenger areas. This is to protect all persons and property. Coordination of all work is necessary to avoid any conflicts.

The Permit Week begins each Monday morning just after midnight and ends the following Sunday at midnight.

To obtain a permit request form, contact the Central Link Track Access Office (Max.Lemke@Soundtransit.org). A copy is also included, following these instructions. The completed form must be submitted by Monday at 8 am for the Permit Week beginning the following Monday. The form must submitted as a Word document (Fill out the permit request form as a Word document and submit by e-mail). If the permit is not submitted before the deadline for the requested week, it will be considered for the following week once the dates have been corrected.

New work that is of a more complicated nature may need additional time for research and schedule for support. Requestors should begin contact at least 3 weeks in advance in order to prepare for the work.

The contractor or agency requesting the permit must have a representative attend the Track Access Coordination meeting held each Wednesday at 1 PM at the Operations and Maintenance Facility (OMF) 3407 Airport Way South, Seattle, WA 98134, Room 449. If the permit is not represented at the meeting, it may not be approved or issued.

Permits are subject to additional requirements as specified by King County Metro (KCM) Rail Operations.

If a permit requires support from Way/Power/Signals/Supervisory Control and Data Acquisition (SCADA) and Facilities personnel, coordination in advance is required. Daily confirmation of intent to use or to cancel may be required. Additionally, notification for the day is required 2 hours in advance of the start time, or the permit will be cancelled.

The Permit will be sent to the requestor as a Portable Document Format (PDF) file, usually by the end of the day on Thursday.

Every person who performs work within the Right of Way (ROW) must have taken the ROW safety training course. The card is valid for one year. The times and dates for the classes vary. Class attendees must sign up with Training Chief Amanda Nightingale to attend the classes. Contact her at Amanda.Nightingale@Soundtransit.org. Contractors will not be issued a permit until all members of their crew have completed the KCM ROW training and have cards issued to them.

All persons working in the ROW must have their ROW card in their possession.

Permitted work may be done only during the permitted time, location and within the restrictions of the permit. Work not identified on the respective permit will result in an immediate suspension of the work and revocation of the permit.
Subcontractors will not be allowed to work under the permit of the Primary Contractor/Permit holder. Subcontractors must apply separately as a primary applicant in order to receive a permit.

Link Control Center (LCC) must be contacted to activate the permit before work starts and must be cancelled with LCC after the work has been completed and all workers and equipment are clear of the Right of Way.

If working within the ROW, radio communication is required at all times. Obtain radios from LCC at 1263 6th Avenue South, Seattle 98134, and return when work is completed.

A report of all Permits issued is distributed by the end of business on Friday.
Company Name: Main Office Phone:  
Work Crew Leader's Name: After Hours Phone:  
Number of Work Sites: Number of Employees:  
On Site Phone #:  
Type of Work to be Performed:  

Equipment to be Used:  

Exact Location of Work: NORTH SOUTH  

At Between: And:  
Start Date: Time: End Date: Time:  

PROTECTION REQUIRED 
De-Energize TPSS Lockout Tags Work Zone Link Staff on Site  
Energize TPSS  
De-Energize OCS Lockout Locks Flagger’s Required  
Energize OCS  
Signals Lockout Track Switching LRV Operations  
Gates Lockout  

Special Requirements:  

CONTRACTOR AGREEMENT 
I will notify the LCC by radio or the number at the top of this permit prior to entering the ROW, any time I leave/re-enter the work area, the scope of the work changes, and upon completion of the work. All workers must carry their ROW card at all times. Failure to do so WILL result in cancellation of this permit by the LCC or KC Metro Light Rail Operations Personnel. I have read and understand the rules and requirements detailed in this permit and will abide by them. This Permit may be revoked at any time for violation of rules & requirements or as deemed necessary for the safety of personnel and equipment.  

Contractor’s Rep. (and contact number): Date:  

KCM LINK AUTHORIZATION 
Facilities Dept: Mike Erickson 206-255-7349 cell, 206 903 7754 ofc. michael.erickson@soundtransit.org  
Track Dept: Steve Bose 206-423-1990 cell, 206 903 7723 ofc. steven.bose@soundtransit.org  
Restricted Access Office:  
Approved Denied  

SCADA/Signals/Comm: Brad Kittredge 206-255-8085 cell, 206 903 7718 ofc. bradley.kittredge@soundtransit.org  
Traction Power Dept: Ray Davis 206-510-3122 cell raymond.davis@soundtransit.org  

KCM LINK Representative: Max Lemke 206 903 7696 ofc., 206-510-3088 cell max.lemke@soundtransit.org  

IMPORTANT  
Permit must be available for review and on the work site at all times.  

Distribution: Original: Track Access Coordinator. PDF Copy to Contractor. PDF and Paper Copies to LCC.
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 13.10, Scheduling of Work.

2. Section 01 45 00.20, Quality Assurance / Quality Control.

3. Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork

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. 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 representatives of Sound Transit, Project Stakeholders, governmental agencies, and public and private utilities.

2. Explain and discuss the responsibilities and authorities of the Resident Engineer.

3. Discuss Equal Employment Opportunity (EEO), Small Business and Disadvantaged Business Enterprises (SBE and DBE), and apprenticeship program requirements.

4. Discuss Community Relations functions.

5. Discuss construction quality control requirements, as specified in Section 01 45 00.20, Quality Assurance / Quality Control.

6. Discuss Contract quality control 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, including critical path activities.

29. Discuss public safety measures.

1.04 CONSTRUCTION PROGRESS MEETINGS

A. Construction progress meetings will be scheduled and conducted by the Resident Engineer 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 Subcontractors.
C. The agenda for construction progress meetings will be prepared by the Resident Engineer 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 13.10, 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 00.20, 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:

2. Inspections.
3. Test Plans, Procedures, and Test Results.
4. Non-conformance Reports.
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 discuss status and 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 00.20, Quality Assurance / Quality Control.

1.10 INSTRUMENTATION COORDINATION AND DATA REVIEW MEETINGS

A. Attend an Instrumentation Coordination and Data Review meeting every week with the Resident Engineer. The contractor’s instrumentation specialist shall attend every 4th
meeting at a minimum. Attendance of the instrumentation specialist may be increased at the discretion of the Resident Engineer depending on the performance of the instrumentation system.

B. At a minimum, the meetings shall cover:

1. Upcoming construction activities and associated instrumentation monitoring requirements.

2. Instrumentation data including a summary of which instruments have exceeded the trigger, maximum and replacement action levels. Trigger and maximum action levels are shown on the contract drawings while replacement levels are included in section 31 09 00.

3. Remedial actions and third party notifications to be implemented for instruments that have exceeded maximum and replacement action levels.

4. Current instrumentation issues including:
   a. Summary of malfunctioning or damaged instruments and associated replacement plans.

1.11 DEWATERING COORDINATION AND DATA REVIEW MEETINGS

A. Attend a Dewatering Coordination and Data Review meeting every week with the Resident Engineer. The dewatering specialist shall attend every meeting during installation of the groundwater monitoring instrumentation and dewatering wells, every meeting from the time pumping begins until target dewatering levels have been achieved then every 4th meeting at a minimum. Attendance of the dewatering specialist may be increased at the discretion of the Resident Engineer depending on the performance of the dewatering systems.

B. At a minimum, the meetings shall cover:

1. Upcoming construction activities and associated dewatering monitoring requirements.

2. Dewatering data including a summary of dewatering drawdowns in pumping wells and monitoring wells, water quality test results and dewatering discharge flows.

3. Remedial actions and third party notifications to be implemented for water quality results that have exceeded permitting requirements and associated compliance plans.

4. Current dewatering issues including:
   a. Summary of malfunctioning or damaged dewatering and monitoring wells and associated replacement plans.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies an Internet-based project 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 project management requirements of this Section for all document communications with Sound Transit.
   2. Section 01 78 39, As-Built Drawings

1.02 REFERENCES

A. Sound Transit:

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 project 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

1. 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.

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

3. 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.

4. 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.

5. When possible, convert documents directly from the original format to PDF.
6. Scan black and white documents, including documents in gray scale, in black and white format at 300 dpi minimum with Optical Character Recognition (OCR) applied.

7. Scan color documents at the lowest resolution possible, with Optical Character Recognition (OCR) applied and resolution set at the minimum needed to assure characters or objects are legible and colors are identifiable. See Section 01 78 39, As-Built Drawings for As-Built Drawing scanning requirements.

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

C. 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.

D. 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.

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

F. This Section shall not relieve obligations to provide Sound Transit with Record Drawings in the physical form specified in Section 01 78 39, As-Built Drawings.

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

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

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

J. Exceptions noted in specific Sections of the Contract.

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

L. 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.


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.

F. 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.

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

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

I. 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:

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

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

E. Software, hardware, and Internet access:

1. Minimum software requirements are as follows:
   a. A 32-bit operating system such as 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.
   f. 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.

2. Minimum hardware requirements are as follows:
   a. Pentium-based (or equivalent) workstation or laptop with a minimum of 2 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.
4. 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.

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

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, and Re-Baseline Contract CPM 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:

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.

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.

4. Three-Week Look-Ahead Schedule: One (1) paper copy. Submit at/prior to the
   Weekly Progress Meeting.

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 construction NTP the contractor shall schedule and conduct a pre-scheduling conference with Sound Transit to commence the development of the baseline contract schedule. The preliminary baseline 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 milestones.

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 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.

N. 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.

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

P. 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#. Ex. N125 – “x” Day “y” hour.

Q. 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 contractor for Sound Transit review at pre-construction scheduling meeting.

R. 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.

S. 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 the Owner.

5. Resource identifier for costs shall utilize the contract Id #. Ex. N125 – 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 Updated 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. All constraints identified in the Contract Documents.
   2. Delivery of Sound Transit-furnished equipment, if any.
   3. Inspection of the work including punch list and Acceptance.
   4. Work to be performed by other agencies or utilities that affect the schedule.
   5. 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 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 accepted 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 the data date shall be 31 January).

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 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 the data date shall be 31 January).

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.


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)

END OF SECTION
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. Procedures: Section 01 33 00, Submittal Procedures.

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

C. 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.

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.

D. 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.

E. 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.

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

G. 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.

H. 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.

1.03 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:

B. Minimum sensor resolution of 8 megapixels.

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 23.10 Internet-Based Document Management System.
2. Identify each print with the following information on a label affixed to the back of the print:
   a. Name of Project.
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 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.

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:
   a. Capable of producing minimum 8.0 megapixel pictures.
   b. Static view.
   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 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.
3. Date of Submittal.
4. Submittal Number and Description.
5. Name and address of photographer.
6. Date(s) and time(s) video recording was recorded.
7. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

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 through the Resident Engineer 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 of 30 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. Provide survey of sewer mains within 100 feet construction sites.
      c. 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 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.

3.04 WEB-BASED PHOTOGRAPHIC DOCUMENTATION REQUIREMENTS

A. Live Streaming Construction Site Images: Provide Web-accessible image of current site image from fixed 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 Project Management System.

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.

   3. Resubmission Review: Allow 21 days for review of each resubmission.

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".

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 Project 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:

<table>
<thead>
<tr>
<th>WIDTH (Vertical)</th>
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<td>22.0 Maximum</td>
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<td>34.0 Maximum</td>
</tr>
</tbody>
</table>

4. Submit Shop Drawings in the following format:
   a. Seven (7) 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.

2.04 OTHER SUBMITTALS

A. 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.

B. 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.

C. 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.

D. 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.
E. **Product Certificates:** Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

F. **Material Certificates:** Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

G. **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.

H. **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.

I. **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.

J. **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.

K. **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.

L. **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.

M. **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 Project 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 receiving a 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, the Contractor shall be solely 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. 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 NTP and ending with Acceptance.

E. 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 security threats.

1.02 REFERENCES

A. Acronyms and Abbreviations

1. AED: Automated External Defibrillator
2. AHJ: Authority Having Jurisdiction
3. ANSI: American National Standards Institute
4. CPR: Cardio-Pulmonary Resuscitation
5. CSM: Sound Transit Construction Safety Manager
6. CSSP: Construction Safety and Security Plan
7. CWP: Construction Work Plan refer to Section 01 45 00.20, Quality Assurance / Quality Control
8. DOSH: Washington State Labor and Industries Division of Occupational Safety and Health (Washington State OSHA)
9. EPA: Environmental Protection Agency
10. JHA: Job Hazard Analysis refer to 1.04 G. herein
11. LEL: Lower Explosive Limit
12. LNTP: Limited Notice to Proceed
13. MSDS: Material Safety Data Sheet
15. NCR: Non Conformance Report
17. NFPA: National Fire Protection Association
18. NIOSH: National Institute of Occupational Safety and Health
19. NTP: Notice to Proceed
20. OCIP: Owner Controlled Insurance Program
21. OSHA: Occupational Safety & Health Act
22. PEL: Permissible Exposure Limits
23. PPE: Personal Protective Equipment
24. PTA: Pre-Task Analysis
25. SQA: Sound Transit Safety and Quality Assurance Department
26. SSSR: Contractor’s Site Safety and Security Representative
27. WAC: Washington Administrative Code
28. 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

3. Revised Code of Washington (RCW)
   a. RCW 49.17 Washington Industrial Safety and Health Act
4. Washington Administrative Code (WAC), all that is applicable to the scope of work under 296-155, 800, etc.

5. National Fire Protection Association (NFPA) Standards
   b. And others that may apply

6. Federal Highway Administration (FHA)

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, utility entities, and 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 employee designated as the EMPLOYEE IN CHARGE (EIC) 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 (EIC) shall have the experience and authority to direct employees, stop work, or correct any contractor or subcontractor deficiencies.

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. Hot work: Any work involving a flame or sparks, such as a torch, grinder, or electric arc welder. A hot work permit is required for all activities requiring welding, cutting, or burning.

E. 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 property, equipment or work products (including all alleged property damages).

4. "Near misses" that could have resulted in any of the above.

F. Personal Protective Equipment (PPE) – Includes all clothing and other work accessories designed to create a barrier against workplace hazards. Examples include safety glasses or goggles, high visibility outer wear, hard hats, hearing protectors, gloves, respirators, aprons, and work boots.

G. Resident Engineer: The individual responsible for administration of the construction contract.

H. Security: Refers to the protection of both Sound Transit property and the personnel and property of the Contractor from trespassing, theft, vandalism, pilfering, or other destructive activities.

I. Threat: A potential action or situation that may cause harm to people or property.

J. 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 corrective actions or deficiencies 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.

K. Track Access Permit: a form signed, approved, and issued by Sound Transit rail operations or the authority having jurisdiction for accessing and conducting ANY activity within 10 feet of the active track, on any platform, or at any active station. Sound Transit Operational access permits are only issued weekly and at the discretion of the Light Rail Operations Chief.

L. 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).

M. 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. Identification and Qualifications of the SSSR or EMPLOYEE IN CHARGE: Within 15 days of NTP.
   1. The contractor and all first tiered subcontractors shall identify an employee(s) as the Employee in Charge of safety and security. This person or designated persons shall be onsite any time work is underway.
   2. Provide a contact list of ALL project EIC personnel with title and contact numbers included. This list shall also include the contact information for the contractor’s corporate or senior safety managers.

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 emergency procedure 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.
   2. Submit a JHA within 15 days of NTP, or a minimum of 14 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 SSSR (Competent Person) shall be clearly identified and present on-site and available for 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.
   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. If a crane of one ton capacity or greater will be used. Complete Crane Inspection Record and the Wire Rope Inspection Record as required by WISHA standards and maintain on-site. Submit certification for all cranes prior to use.

2. A procedure for testing physical or environmental exposures that may impact the health and safety or security of workers, as applicable.

3. A Confined Space Program, if applicable, in accordance with requirements of WAC 296-809-300.

4. 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.

5. Forms are provided in the attached exhibits for use by the contractor and/or subcontractors. The Contractor may use their own corporate forms if the information provided on those forms meets the intent of the Sound Transit submittals. Sound Transit at its discretion may require that Sound Transit forms be used.

G. Monthly Submittals

1. Submit as part of the monthly pay application, a Monthly Injury/Illness Report, (Exhibit B), provided by Sound Transit herein.

H. Incident, Accident, or Injury 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, photographs, names, contributing factors, and any unusual or special conditions or circumstances including testimony of witnesses regarding all incidents.

1.05 CONSTRUCTION SITE SAFETY AND SECURITY PLAN (CSSP)

A. Provide a written safety and security procedure for review and comment by Sound Transit. This CSSP shall detail the methods of protecting workers and if applicable securing the Contractor’s construction site. The project specific CSSP need not be extensive but must address all elements identified in this section.

B. Reconcile comments such that the document receives an acceptable disposition by the Sound Transit Construction Safety Manager.

C. The Contractor’s CSSP shall describe and include procedures for:

   1. List of key personnel, contact information and project position or description of responsibilities;
2. Provide names and contact information for the Contractor’s Site Safety and Security Representative (SSSR) and/or the EMPLOYEE IN CHARGE of safety and security.

3. Date, time and location of the weekly safety and security meetings;

4. An outline of the employee indoctrination, that includes safety and security orientation sessions; with emphasis on training or awareness sessions for the use of proper work procedures, equipment, personal protective equipment, mechanical guards, emergency procedures and security procedures.

5. Provide for daily pre-job or pre-task safety and security meetings and job hazard analyses, job safety assessments, safety and security communications, and lessons learned from incidents or events;

6. Outline procedures for investigations and documentation of all safety and security incidents to determine root cause and necessary corrective actions;

7. Submit a weekly safety and security report (Exhibit D) 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. These reports may be conducted and completed concurrently with the Sound Transit safety representative.

8. Identify the person(s) that will initiate or be responsible for closeout of deficiencies found during site inspections;

9. Maintenance of records of safety and security incidents, and development of safety, security, and loss experience summaries;

10. Emergency Action Plan;
   a. The project-specific safety and security plan shall 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) Report all incidents or conditions that may impact Rail Operations immediately to the resident engineer and the authority having jurisdiction
      2) Injuries to personnel or employees or to the general public on or adjacent to the work site;
      3) Injuries;
      4) Property damage with particular emphasis on utilities;
      5) Fire;
      6) Other exposures or potential security issues or threats that may occur at the work site, i.e., earthquake, severe weather.
   b. Include local emergency and medical addresses/numbers (e.g., fire/police and hospital);
   c. The Emergency Action Plan shall identify the nearest emergency medical facility with a route map and phone numbers.
   d. Provide the Emergency Action Plan in a format that ALL site workers can translate and/or understand.
e. 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 Construction Safety Manager.

11. Fire Prevention and Safety Plan;
   a. Include a 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, DOSH and Fed/OSHA regulations.

12. Control of Hazardous Substances and Hazard Communication Plan; and

13. Provide Security Elements of the CSSP

14. 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.
   a. Investigate security incidents and issue reports;
   b. Ensure prompt reporting of security incidents to the resident engineer, construction manager, construction safety manager, or Sound Transit Security Dispatch at 206 398-5268

1.06 TRAINING

A. Conduct training sessions and awareness discussions during weekly safety meetings, 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.

B. Indocotrination
   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 an acknowledgement form (Exhibit A) to document completion of 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 an acknowledgement form (Exhibit A) to document completion of 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 on the same Business Day of arrival on the project.

E. Hazard Communication

1. All personnel shall be required as needed to complete Hazard Communication training during indoctrination and refresher training annually.

1.07 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 and the applicable work zone traffic control handbook, Municipal 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 walls or 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. 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. Construct guardrails in accordance with DOSH, Fed/OSHA standards, and other applicable laws and regulations.

9. 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.

10. 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.

1.08 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 employment permanent ban from entering or working on Sound Transit projects.

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.

D. Maintain required records and submit to periodic audits of the substance abuse program by the Resident Engineer or the CSM for all random, for cause, and post-incident testing.

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 that may be exposed to vehicle traffic or construction equipment wear high visibility clothing described in this Section.

b. Yellow and Orange raingear, unless compliant with the ANSI 107-2004 standard shall not be considered high visible garment.

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.

e. All sweatshirts, tee shirts, and other outer wear with reflective material and that would not be considered a high visible safety vest shall be ORANGE in color. No other color will be permitted.

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 hard hat 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 hardhats meeting the high visibility headwear requirements of WAC 296-155-305.

D. Eye/Face Protection

1. Contractor personnel shall be provided with, and be required to wear, eye protection at all times when in the work area. Goggles or face shields shall be provided 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.

2. A face shield shall be worn when cutting, grinding or excessive particles are being generated.

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. Hearing protection shall be 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).

2. Post signs to protect the general public if noise levels exceed 85 dbls during work activities.

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 shirts with sleeves removed are not allowed. The minimum shirt allowed shall be a standard T-shirt.

3. Workers will not be allowed to wear stickers, shirts, slogans or pins that express profanity, derogatory or unprofessional statements or images.

J. Gloves

1. Gloves are to be worn at all times. Specific gloves shall be appropriate to the hazard/task. 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, high-pressure tools, handling corrosive liquids, or other activities not specifically covered in this Section shall be reviewed with the Resident Engineer.

PART 3 - PRODUCTS – NOT USED

PART 4 - EXHIBITS

A. ACKNOWLEDGEMENT OF SAFETY/SECURITY INDOCTRINATION
B. CONTRACTOR’S MONTHLY INJURY/ILLNESS REPORT FORM
C. SOUND TRANSIT RECORDKEEPING POLICY FOR OCCUPATIONAL INJURIES AND ILLNESSES
D. SUMMARY OF CONSTRUCTION SAFETY AND SECURITY REPORTS
E. SUPERVISOR’S INCIDENT INVESTIGATION REPORT

END OF SECTION
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: ____________________________________
### Contractor’s Monthly Injury/Illness Report Form for Year of 20_

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**Contractor Company Name:** ________________________________

**Contractor Site Safety and Security Representative Signature:** ____________________________________________

**Date:** ____________________________
SECTION 01 35 29.10 - EXHIBIT C

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.
      \[
      \text{TOTAL RECORDABLE INCIDENCE RATE: } \frac{\text{NO. OF RECORDABLE CASES \times 200,000}}{\text{ACTUAL EMPLOYEE HOURS}}
      \]
   b. Lost Workday Incidence Rate: Total recordable cases that resulted in death or lost work days/restricted duty for the reporting period.
      \[
      \text{LOST WORKDAY INCIDENCE RATE: } \frac{\text{NO. OF LOST WORKDAY CASES \times 200,000}}{\text{ACTUAL EMPLOYEE HOURS}}
      \]
   c. Severity Measure: Total number of work days lost that occurred during the reporting period.
      \[
      \text{SEVERITY MEASURE: } \frac{\text{NO. OF LOST WORK DAYS \times 200,000}}{\text{ACTUAL EMPLOYEE HOURS}}
      \]

   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 12th 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).
SECTION 01 35 29.10 - EXHIBIT D

CONSTRUCTION SAFETY/SECURITY SURVEY FORM

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TO BE COMPLETED BY SOUND TRANSIT CONSTRUCTION SAFETY SPECIALIST/SAFETY OFFICER

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RESPONSE / CORRECTIVE ACTIONS TAKEN:

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RESPONDENT SIGNATURE: DATE:

Original: Contractor Copy: Resident Engineer Copy: Sound Transit Construction Safety Manager
### SUPERVISOR'S INCIDENT INVESTIGATION REPORT

| CONTRACTOR: | | |
| INCIDENT DATE: | | |
| TIME: | | |
| CONTRACT NO: | | |
| INCIDENT LOCATION (SPECIFIC): | | |

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<th>PROPERTY DAMAGE</th>
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<td>WHAT HAPPENED? (Describe operation, activity, condition and, how incident or loss occurred. Use separate sheet and diagram if necessary.)</td>
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<th>PRIMARY CAUSE (Condition or act that caused the incident.)</th>
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<td>Recommended correction action:</td>
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<td>Employee Injury (Describe):</td>
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<td>Company Property Damage or Loss (Describe):</td>
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<td>Owner/injured (Name, address, phone):</td>
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<td>Witnesses (Name, address, phone):</td>
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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 of incident development and corrective action
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for the preparation and implementation of a Contaminated Substance Health and Safety Plan (CS-HASP). 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 40, Hazardous and Contaminated Material Air Monitoring.

2. Section 01 35 43.15 Unknown Hazardous and Contaminated Substances.

3. Section 02 61 13, Excavation and Handling of Contaminated Material.

4. Section 02 80 00 Removal and Handling of Coal Tar Containing Materials.

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 (OSHA)
   b. 29 CFR 1926 OSHA Construction Standards

2. Environmental Protection Agency (EPA)
   a. SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods

3. 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

4. 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
1.03 DEFINITIONS

A. Contaminated Substance 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 296-843-120.

B. Certified Industrial Hygienist (CIH): A trained specialist with at least five 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.

C. Site Safety and Health Officer (SSHO): A trained specialist in health and safety with a minimum of three years experience and working knowledge of use of (Personal Protective Equipment) PPE, regulations and hazard identification.

D. 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.

E. 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 CS-HASP.

F. Contaminated Substance: General term for contaminated soil, groundwater, or other debris or environmental media. See definitions for Contaminated Soil and Contaminated Groundwater.

G. 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.

H. Dangerous Waste: Solid wastes which are dangerous to public health and environment, as defined in WAC 173-303.

I. Exclusion Zone: Area of exposed contamination designated for Hazardous or Contaminated Substance storage, excavation, or removal. All work performed within the Exclusion must be covered in the Contaminate Substance Health and Safety Plan (CS-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 CS-HASP.

J. 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 CS-HASP.

K. Permissible Exposure Limits (PEL): Maximum amount or concentration in air for each contaminant that a worker may be exposed to under OSHA regulations.
L. **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.

M. **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.

N. **Suspected Contaminated Material:** Soil, groundwater, or other debris in contact or close proximity to known contaminated soil, groundwater, or other environmental media, and that has not been tested yet for verification of contamination levels; OR material having visual or odor evidence of contamination, OR environmental media that can reasonably be expected to be contaminated based on a Phase I, Phase II, Brownfields, or other environmental study.

O. **HAZWOPER:** Hazardous Waste Operations and Emergency Response

P. **MTCA:** Washington State Model Toxics Control Act, Chapter 70, 105D, RCW

1.04 **ADDITIONAL HEALTH AND SAFETY REQUIREMENTS**

A. For work related to excavation and handling of contaminated soil and groundwater: Section 02 61 13, Excavation and Handling of Contaminated Material.

1.05 **SUBMITTALS**

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

B. CS-HASP within 30 Days after the effective date of the Notice to Proceed and prior to start of work. Include modifications to the CS-HASP and any task-specific CS-HASP’s developed for this project.

C. Qualifications: Within 30 Days after the effective date of the Notice to Proceed.

D. Certifications: Within 30 Days after the effective date of the Notice to Proceed.

E. 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 CS-HASP.

1.06 **QUALITY ASSURANCE**

A. Qualifications

   1. CIH:

      a. Minimum of five years experience in managing employee health and safety when working in contaminated soils, groundwater, or other contaminated environmental media.
b. 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.

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 hour annual update and completion of three 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 years experience in 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 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 hour annual update and completion of three days on-site training by a fully qualified instructor or mentor.

B. Responsibilities

1. CIH:

a. Responsible for certifying the CS-HASP, any task specific CS-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 contaminated material work to be completed as part of the Contract. Such work includes, but is not limited to: air monitoring, removal of contaminated soil and groundwater, removal of coal tar containing materials, and work related to the presence or potential for unknown contaminated materials specified in Section 01 35 43.15, Unknown Hazardous and Contaminated Substances and Section 02 61 13, Excavation and Handling of...
Contaminated Material and Section 02 80 00, Removal and Handling of Coal Tar Containing Materials.

b. Responsible for the development, implementation, enforcement, and monitoring of the CS-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 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 CS-HASP.

c. Suspend field activities if unknown contamination is identified during field activities until the contamination is characterized, the CS-HASP is updated, and field personnel have been trained on the CS-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 contaminated materials work in accordance with the provisions of the CS-HASP and Section 02 61 13, Excavation and Handling of Contaminated Material.

3. Have the CIH certify the CS-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.
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 CS-HASP conforming to applicable federal, state, and local statutes, rules, regulations, and ordinances, in effect at the time the Work is performed.

C. Ensure that personnel working in contaminated soil, groundwater or other environmental media have current HAZWOPER training and 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 CS-HASP. The signed CS-HASP must be kept on the job site and be made available for inspection.

D. Adhere to applicable federal, state, and local statutes, rules, regulations, and ordinances for the duration of the Contract.

E. Develop and maintain on site industrial hygiene information including right-to-know information, such as Material Safety Data Sheets (MSDS).

F. 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.

G. Meetings: Conducted daily and weekly by the SSHO, health and safety meetings with the workers throughout the duration of all contaminated 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 workweek.

3.02 PREPARATION

A. Prepare and implement a CS-HASP in accordance with the requirements of 29 CFR 1910.120 and WAC 296-843-120. 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. Drug 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 CS-HASP.

B. Distribute the CS-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 CS-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 CS-HASP must be regularly updated and reviewed as work progresses and more information about the site becomes known, including discovery of additional contamination.

3.03 SITE CONTROL MEASURES

A. For excavation around the three underground storage tanks in Denny Way, and for contaminated materials encountered elsewhere, furnish and install site fencing, warning tapes, or other barricades to physically separate the work zones on sites based on the CS-HASP. Establish the following work zones:
1. An Exclusion Zone. Perform work involving contamination inside the Exclusion Zone.

2. Contamination Reduction Zone.

3. Support Zone.

B. Be responsible for costs associated with cleanup of all contamination that may be tracked outside of the exclusion zone.

### 3.04 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.

### 3.05 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 contaminated materials. The CS-HASP must include a map or diagram of the steps to be followed during decontamination.

B. Perform decontamination procedures inside the Contamination Reduction Zone.

### 3.06 EQUIPMENT DECONTAMINATION

A. Decontaminate vehicles and equipment used during the handling of contaminated materials 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.

### 3.07 LOGS, REPORTS AND RECORDKEEPING

A. Maintain logs and reports covering the implementation of the CS-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.

3.08 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 40, Contaminated Material Air Monitoring, to evaluate the inhalation exposure for workers. 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, groundwater debris and/or other 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 CS-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
SECTION 01 35 40
HAZARDOUS AND CONTAMINATED MATERIAL AIR MONITORING

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 30, Hazardous and Contaminated Material Health and Safety Program
   2. Section 01 35 43.15, Unknown Hazardous and Contaminated Substances

1.02 DEFINITIONS
A. CIH and SSHO – As specified in Section 01 35 30, Contaminated Material Health and Safety Program.
B. Contaminated Material – As specified in Section 01 35 30, Contaminated Material 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. Conduct the contaminated material air monitoring program as specified herein, and in accordance with Section 01 35 30, Contaminated Material Health and Safety Program. Conduct an air monitoring program to help evaluate worker exposure to contaminated materials.

1.04 SUBMITTALS
A. Procedures: Section 01 33 00, Submittal Procedures.
B. Plan describing methods for conducting air monitoring, as developed by the Certified Industrial Hygienist (CIH). Submit this plan as part of the Contaminated Material Health and Safety Plan (CMHSP) as described in Section 01 35 30, Contaminated Material Health and Safety Program.
C. 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.

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. As directed by the Resident Engineer, conduct additional work under Section 01 35 43.15, Unknown Hazardous and Contaminated Substances.

END OF SECTION
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. Environmental Protection Agency (EPA)
   a. SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods

3. 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 296-802 Employee Medical and Exposure RecordsSafety Standards for Construction Work
   e. WAC 296-843 Hazardous Waste Operations

4. 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 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 CS-HASP.

D. Contaminated Soil – Soil containing levels of contaminants 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.

E. Contaminated Substance – General term for contaminated soil, groundwater or other debris or environmental media. See definitions for Contaminated Soil and Contaminated Groundwater.

F. Contaminated Substance 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 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.

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 CS-HASP by workers who are appropriately HAZWOPER certified as specified in the CS-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 CS-HASP.

J. 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.

K. HAZWOPER – Hazardous Waste Operations and Emergency Response

L. MTCA – Model Toxics Control Act, as defined in Chapter 70.105D, RCW.
M. 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.

N. 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.

O. Site Safety and Health Officer (SSHO) – A trained specialist in health and safety with minimum three years’ experience and working knowledge of use of PPE, regulations and hazard identification.

P. 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.

Q. 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.

R. 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.

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

B. UCS-HASP: Prior to start of site work.

C. Hazardous and Contaminated Substance Screening and Handling (HCMSH) Plan: Within 3 days from identifying Unknown Hazardous and/or Contaminated Substances.

D. CS-HASP Within 7 days of receiving results indicating that material encountered meets criteria for Contaminated Groundwater, Contaminated Soil, or Contaminated Substance.

E. Qualifications: Within 30 days after the effective date of Notice to Proceed.

F. Certifications: Within 30 days after the effective date of Notice to Proceed.

G. 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 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 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. SSO:
   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 SSO 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 SSO 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 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.
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 developed by Sound Transit, if any. Obtain permits at no additional cost to Sound Transit.

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.

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 offsite 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 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 rinsate 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.

D. Calibrate and maintain air monitoring instruments, in accordance with manufacturer’s recommendations.

E. Monitor air for potential explosive hazards, during excavation of suspected Contaminated Substances, and during handling of materials suspected of containing hazardous materials.

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 CS-HASP. Action levels must be at or 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.

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
SECTION 01 35 43.20
HAZARDOUS AND CONTAMINATED SUBSTANCES AIR MONITORING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for air monitoring procedures required to assist in protecting worker health during construction.

B. Potential substances of concern include:

1. Soil and Groundwater Contaminants covered in Section 01 35 29.10, Contaminated Substances Health and Safety Program and Section 01 35 43, Unknown Contaminated Substances Health and Safety Program

   a. Petroleum hydrocarbons (i.e., gasoline-, diesel-, and oil-range)
   b. Halogenated hydrocarbons (i.e., vinyl chloride, Trichloroethylene, polychlorinated biphenyls, ethylene dibromide, etc)
   c. BTEX (benzene, toluene, ethylbenzene and xylene)
   d. Polyaromatic hydrocarbons (i.e., naphthalene)
   e. Polychlorinated Biphenyls (PCBs)
   f. Metals (i.e., lead, arsenic, cadmium, chromium)
   g. Hazardous particulate matter (i.e., Silica)
   h. Other contaminated substances identified on the work site.

2. Substances creating airborne exposures exceeding established thresholds as a result of products brought onto the worksite, including:

   a. Substances with a Federal or Washington State Permissible Exposure Limit (PEL)
   b. Substances with an American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV)
   c. Substances with a National Institute of Safety and Health (NIOSH) Recommended Exposure Limit (REL)
   d. Substances with a recommended exposure limit or threshold identified by the manufacturer on the Material Safety Data Sheet (MSDS)
   e. Substances for which respirator use is required

3. Hazardous substances inside confined spaces (reference Section 01 35 29). Monitoring must be conducted prior to and during entry of permit required confined spaces using calibrated and maintained direct reading instruments. Readings may be taken by employees trained as Confined Space Entrants and Attendants.
a. Carbon Monoxide (must be less than 25 ppm)
b. LEL (Lower Explosive Limit) readings (must be less than 10%)
c. Oxygen Level (must be between 19.5 and 23.5%)
d. Other contaminants that may be present inside the confined space


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 35 29.20, Health, Safety, Security and Emergency Response Procedures
2. Section 01 35 30, Hazardous and Contaminated Substance Health and Safety Program.
3. Section 01 35 43.15 Unknown Hazardous and Contaminated Substances.

1.02 DEFINITIONS

A. Refer to Section 01 35 29.10, Hazardous and Contaminated Substance Health and Safety Program. For definitions of the following terms:

1. CIH – Certified Industrial Hygienist
2. SSHO – Site Safety and Health Officer
3. Contaminated Substance
4. Hazardous Material
5. Permissible Exposure Levels.

B. Hazardous Air Contaminant: All 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.

C. 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. Standards referenced in this Section have precedence over non-referenced standards, insofar as different standards may contain overlapping or conflicting requirements.

D. Industry Regulations: Applicable regulations pertaining to the construction industry must be adhered to. If there is a conflict between contract language and a regulation, the language that is most protective to human health shall apply.

E. Suspect Areas: Areas where soil or groundwater contamination was previously detected, and where soil or groundwater contamination is suspected based on historical information. (Reference Section 01 35 43.15, Unknown Hazardous and Contaminated Substances and Section 01 35 30, Hazardous and Contaminated Substance Health and Safety Program)
1.03 GENERAL REQUIREMENTS

A. Conduct personal exposure air monitoring in breathing zones of workers when work is being conducted in suspect areas and when working with chemical products where the airborne exposure may exceed established thresholds.

B. Conduct the hazardous and contaminated air monitoring program as specified herein, and in accordance with Section 01 35 30, Hazardous and Contaminated Substance Health and Safety Program. Conduct an air monitoring program to help evaluate worker exposure to hazardous and/or contaminated materials. Plans for conducting air monitoring in accordance with Section 01 35 29.20, Health, Safety, Security, and Emergency Response Procedures must be reviewed and approved by a CIH. These plans may be included as part of the Construction Safety and Security Plan or as an addendum to a Job Hazard Analysis (JHA).

C. Conduct personal exposure air monitoring when, based on review of Material Safety Data Sheets and Job Hazard Analysis in accordance with Section 01 35 29.20, Health, Safety, Security and Emergency Response Procedures, analysis indicates that an exposure could approach established thresholds.

D. Conduct monitoring of permit required confined spaces prior to and during entry (refer to Section 01 35 30, Hazardous and Contaminated Substance Health and Safety Program, for additional requirements related to work inside confined spaces).

E. Conduct air monitoring in tunnels per Section 01 35 29.20, Health, Safety, Security and Emergency Response Procedures.

1.04 SUBMITTALS

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

B. Plan describing methods for conducting air monitoring, as developed by the CIH. Submit this plan as part of the Hazardous and Contaminated Substance Health and Safety Plan (HCS-HASP) as described in Section 01 35 30, Hazardous and Contaminated Substance Health and Safety Program.

C. Plan for mitigating hazardous air contaminant levels in excess of Action Levels.

D. Air monitoring instrument calibration and data sheets.

1.05 QUALITY ASSURANCE

A. Air monitoring shall be conducted by:
   1. CIH or an assistant under the supervision by the CIH
   2. SSHO per written plan reviewed and approved by the CIH
   3. Trained Confined Space Entrants and Attendants prior to and during entry of permit required confined spaces

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Instruments: As required by the CIH.

B. Capable of detecting the contaminants of concern.
C. Continuous, Direct reading instruments for Confined Space Entry and Tunnels

PART 3 - EXECUTION

3.01 PREPARATION
A. Calibrate and maintain air monitoring instruments, per manufacturer’s recommendations.

3.02 AIR MONITORING
A. Monitor air for potential explosive hazards:
   1. In confined space areas.
   2. As required for underground storage tank removal.
   3. Where explosive gases were previously detected.
B. During excavation of contaminated materials, use an instrument to evaluate levels of gaseous contaminants.
   1. The use of this instrument is intended to provide warning and evaluate appropriate action to be taken to minimize exposure to hazardous and/or contaminated materials.
   2. Conduct continuous air monitoring in the areas of possible contamination to evaluate the presence of organic compound vapors.
C. During work identified in written plans, per section 1.03 A, B and C

3.03 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, and in accordance with Federal and Washington State Permissible Exposure Levels and all federal, state and local regulations. These action levels are included in all air monitoring plans.
B. Ensure that action levels are appropriate for the contaminants of concern.

3.04 ACTION
A. If concentrations of hazardous air 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. Implement mitigation plan, and do not proceed with further work until directed by the Resident Engineer.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for minimizing impact to historical buildings and properties.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PROTECTION

A. Comply with measures to maintain access to and mitigate construction impacts to historic buildings and properties along the alignment as stipulated by the Programmatic Agreement between the 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. Sound Transit and/or the North Link Final Environmental Impact Statement (FEIS) have identified and described the following historic properties in the N125 Contract area, which have been assigned right-of-way numbers for design purposes and approximate northbound tunnel stationing along the alignment, contained in Table 1.

<table>
<thead>
<tr>
<th>Right-of-Way Number</th>
<th>Address</th>
<th>Approximate Northbound Tunnel Stationing</th>
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C. Sound Transit and/or the North Link Final Environmental Impact Statement (FEIS) have identified and described the following historic properties in the N125 Contract area, which are located away from the tunnel alignment, and consequently have not been assigned right-of-way numbers or approximate northbound tunnel stationing, contained in Table 2.

### TABLE 2. HISTORIC PROPERTIES WITHOUT RIGHT-OF-WAY NUMBERS AND STATIONING

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<thead>
<tr>
<th>Building Name and/or Address</th>
<th>Cowen Park</th>
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<tr>
<td>4731 15th Avenue NE (University Christian Church)</td>
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<td>4500 University Way (Wells Fargo Bank Building)</td>
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<td>Physics Hall (Mary Gates Building)</td>
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<td>Bagley Hall</td>
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<tr>
<td>Gerberding Hall (Administration Building)</td>
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</tbody>
</table>

D. Minimize construction impacts to historic properties, located in the Contract area.

1. Do not use historic property (listed or eligible for listing on the National Register of Historic Places or a designated City of Seattle Landmark) for construction staging without prior approval from Sound Transit. Sound Transit will consult with the SHPO and/or seek approval for use from local review boards. Any Contractor-proposed staging areas must be authorized by Sound Transit who will conduct the appropriate review for historic properties.

2. 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.
c. Ground stabilization using cementitious or chemical grouts, ground freezing, or other modification techniques.

3. 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.

E. Protect facades of nearby historic buildings from accumulation of excessive dirt. Clean in an appropriate manner at the conclusion of construction. Sound Transit will determine appropriate cleaning methods in consultation with the SHPO or the local review board regulating the property.

F. Repair all historic properties damaged in any way by construction activities in accordance with the Secretary of Interior’s Standard for the Treatment of Historic Properties and the Washington Department of Archeology and Historic Preservation.

END OF SECTION
SECTION 01 35 93
ARCHAEOLOGICAL FINDS

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 archaeological finds are encountered during any construction activities at N125 Sites.

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

1.03 BACKGROUND:

A. Sound Transit has developed a project specific Archaeological Resources Monitoring and Treatment Plans (ARMT Plans) to govern the actions to be taken when cultural resources are discovered during the implementation of the Northgate Link Extension Project. 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 Northgate Link Extension Project. 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, 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 (RCW 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. However, there are no known cultural resource sites within the work area. The entire work area may be monitored by the Project Archaeologist pursuant to the ARMT Plan.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes a list of references for this Contract.

1.02 REFERENCES

A. The following documents are made available for reference in Sound Transit's office:

1. Link CADD/Drafting Manual
2. Sound Transit Link Light Rail Transit Design Criteria Manual (DCM)
3. Utility Report
4. WSDOT Standard Specifications for Road, Bridge, and Municipal Construction
5. Washington State Energy Code
6. City of Seattle Standard Specifications for Road, Bridge, and Municipal Construction
7. City of Seattle Standard Plans for Municipal Construction
8. City of Seattle Energy Code
9. City of Seattle Fire Code
10. North Link Final Environmental Impact Statement
13. University of Washington Master Implementation Agreement (MIA) and Memorandum of Agreement (MOA)
14. Manufacturers Standardization Society Standards

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.

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 60 00, Product Requirements.

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)


5. Washington Association of Building Officials (WABO) Requirements

B. Definitions:


2. Quality Control Plan (QCP): A plan that addresses the applicable 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 Control (CQC) 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 CQC 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 Control (CQC) Manager: At least five (5) years prior experience as a Project Engineer, CQC Manager, Construction Superintendent, or QC Supervisor on a project of comparable complexity to this Contract which includes at least two (2) years experience as Quality Control Manager, Inspector, or Engineer. The CQC 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 CQC Manager. Contract Work is not permitted to be performed without an approved CQC Manager on site for quality control inspections and tests.

C. CQC Manager’s responsibilities include: development and implementation of the Quality Control Plan, attending progress and quality progress meetings, approving IDRs, 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. Quality control inspectors must report directly to the CQC 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 activities and documenting the results of the inspections in the Inspector Daily Reports (IDRs).

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 inspector per worksite per shift.

1.04 CONTRACTOR QUALITY CONTROL PLAN REQUIREMENTS

A. Quality Control Plan Elements:


2. Documented Quality Management System.


4. Subcontractor, Consultant and Supplier Control.
5. Identification, Traceability and Receiving, Handling, Storage and Control of Products Materials and Equipment.

6. Process Control, including Construction Work Plans (CWP) and control of special fabrication and installation processes, i.e., welding, plating, soldering, waterproofing, etc.

7. 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).

8. Identification, Control and Correction of Non-conforming Conditions.

9. Corrective Actions.

10. Quality Records.

11. Audits - Coordinate and cooperate with Sound Transit and Third Party audits.

12. Training requirements for Contractor and subcontractor staff performing audits, inspections, tests and special processes.

B. Quality Control Plan, within 30 days after the effective date of the Notice to Proceed.

1. Contractor QCP 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 QCP acceptable to Resident Engineer.

2. As Work progresses, evaluate on a quarterly basis, revise as necessary and re-submit QCP to Resident Engineer for review.

1.05 SUBMITTALS

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

B. Name and qualifications of Contractor’s Quality Control Manager, within 15 days after the effective date of the Notice to Proceed.

C. Name and qualifications of quality control inspectors at least 15 days prior to commencement of Work to which they are assigned.
D. 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.

E. Name and qualifications of personnel employed to perform special processes, at least 15 days prior to commencement of Work to which they are assigned.

F. 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.

G. List of Construction Work Plans, within 45 days after the effective date of the Notice to Proceed.

H. Construction Work Plans required by the Contract Specifications, a minimum of 21 days prior to commencement of the applicable Work activity.

I. 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.

J. Contractor Inspector’s Daily Reports (IDRs), within seven (7) days of inspection (as submittals) for the first four (4) weeks after the start of inspection. Transmit IDR’s thereafter, within seven (7) 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 CQC Manager on all IDRs. Provide verification statement on IDRs that states: “All supplies and materials incorporated in to the Work are in compliance with the terms of the Contract except as noted.” Sign and date each IDR.
K. Independent Testing Lab Inspection Reports, within seven (7) days after completion of the inspection or test.

L. Independent Testing Lab Test Reports, within seven (7) days after completion of the inspection or test. Submit under the technical specification section which it applies.

M. Utility Strike Log, within seven (7) days after Acceptance.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 QUALITY CONTROL 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.

3.02 SUBCONTRACTOR, CONSULTANT AND SUPPLIER CONTROL

A. 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.

B. 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 seven (7) 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 CQC Manager is responsible for verifying that quality standards are maintained throughout the Contract through in-process inspections, substantial completion inspections and final inspections. CQC 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. Adjustments to control procedures and CWPs may be required based upon results of inspections and tests.

5. Provide seven (7) days advanced notice to the Resident Engineer where Sound Transit or Third Party inspection or test is required.

6. Notify Resident Engineer not less than seven (7) 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.

7. 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 Contractor. Upon receipt of the failed inspections or test information, notify the Resident Engineer by e-mail within one (1) 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
3.06 IDENTIFICATION, CONTROL AND CORRECTION OF NON-CONFORMING CONDITIONS

A. 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 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.

B. 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.

C. 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.

D. Red-tag and remove or isolate all nonconforming items, identified as REJECT, from the Site within 72 hours of discovery.

E. Record all utility strikes involving the hitting or damaging on

F. 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 the 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.

3.08 QUALITY RECORDS

A. 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: Quality plans and procedures, inspection and test plans and procedures, contractor substitution requests, deficiency reports, 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.

3.09 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.

3.10 EXHIBITS

A. Inspector’s Daily Report (IDR) Form
B. Test Matrix Form
END OF SECTION
### Inspector's Daily Report

<table>
<thead>
<tr>
<th>Inspector Initials</th>
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<th>Day</th>
<th>Swing</th>
<th>Night</th>
<th>Contract Unit Description</th>
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- [ ] 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**

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<tr>
<th>Contractor / Subcontractor Name</th>
<th>(Category)</th>
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**Total Work Force**

**Work Force Notes**
Inspector’s Daily Report

List Major Equipment Types

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Job Site Safety / Accident Occurrence

Weather Conditions (Temperature, Precipitation, Sky, Wind Work Impacts)


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Attachments

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Signatures

Inspector Signature Date Quality Manager Signature

Inspector Name Quality Manager Name
## SECTION 01 45 00.20 - EXHIBIT B

### TEST MATRIX FORM

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END OF EXHIBITS
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PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies general requirements for furnishing, installing, operating, and maintaining temporary facilities and controls.

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 29.20, Health, Safety, Security, and Emergency Response Procedures
2. Section 01 51 15, Temporary Electrical Power.
3. Section 01 57 24, Temporary Site Water Discharge.
4. Section 22 14 10, Tunnel Track Drainage Pumping Station Piping and Appurtenances
5. Section 26 29 13, Enclosed Motor and Lighting Controllers

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 13 Installation of Sprinkler Systems
   b. NFPA 14 Installation of Standpipes and Hose Systems
   c. NFPA 130 Fixed Guideway Transit and Passenger Rail Systems with Seattle Amendments
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):

a. Underground Construction WAC 296-155 Part Q

1.03 SUBMITTALS

A. Construction Staging Plan, within 30 days of Notice To Proceed or 14 days prior to mobilization. Layouts of the construction sites including fences, roads, parking, buildings, staging, and storage areas.

1.04 TEMPORARY BRIDGING, HOISTING AND HANDLING MATERIAL DISTRIBUTION

A. Provide 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.

1.05 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 Contractor’s 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.

1.06 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.

1.07 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. Contractor shall conform to requirements of OSHA and WAC 296-800-150.

C. Contractor shall conform to the requirements of Section 01 35 29.20 Health, Safety, Security and Emergency Response Procedures.

1.08 TEMPORARY OFFICES FOR SOUND TRANSIT CONSTRUCTION MANAGEMENT

A. Contractor shall be responsible for operations and maintenance of the temporary office for Sound Transit Construction Management. Maintain and service as specified herein until the Substantial Completion of the Contract or as otherwise permitted by Sound Transit, whichever occurs sooner.

B. The Contractor shall provide the following:

1. One field office which shall consist of one ___-foot by ___-foot trailer unit at the Maple Leaf Portal Site. The field office shall be completely furnished and ready for occupancy within three weeks of NTP.

2. One field office which shall consist of one ___-foot by ___-foot trailer unit at Roosevelt Station Site constructed on the Sound Transit R/W Nos. NL-852 and NL 853 parcels. The field office shall be completely furnished and ready for occupancy within 180 days of NTP.

3. One field office which shall consist of one ___-foot by ___-foot trailer unit at the U District Station Site constructed on the Sound Transit R/W No. NL-428. The field office shall be completely furnished and ready for occupancy within three weeks of NTP.

C. Provide utilities, power, telephone and parking facilities to the field offices for the exclusive use of Sound Transit. The field office shall be situated in the work area at location shown on the Drawings. It shall be maintained and serviced by the Contractor as hereinafter specified until the final acceptance of the Contract or as otherwise permitted by Sound Transit, whichever occurs sooner.

D. Construction Requirements, Systems, and Materials: Obtain and pay all costs for hauling, building, and connection permits. The field offices shall be substantially constructed and satisfactory to Sound Transit. All materials shall be good commercial quality. Provide field office having the following features and facilities:

1. Exterior and interior surfaces, other than factory finished, painted with two coats of an approved paint of a color or colors approved by Sound Transit. No painting will be required on aluminum or stainless steel surfaces;

2. Interior walls and ceiling paneled with finished plywood or gypsum wallboard of not less than one-half inch thickness, or other suitable material;

3. Floors covered with resilient flooring material such as vinyl composition tile or sheet vinyl flooring. Floors shall be constructed to withstand a live load of 150 psf;

4. Lighting shall furnish a minimum of 100 foot-candles at desk height uniformly in all areas;
5. Duplex electrical receptacles around interior walls at approximately ten-foot spacing;

6. An automatically controlled heating/cooling system;

7. Electrical utility connections;

8. Metal stairs at each doorway to the mobile unit.

9. Adequate access from public streets shall be provided to the field office, together with space for parking ten cars. The access roadway and parking area shall be graded for drainage and surfaced with gravel, concrete or pavement in an approved manner;

10. Utility service connection sizes and locations shown on the Drawings are approximate. Final locations and sizes of all required utility service connections shall be the Contractor's responsibility; and

E. Furnish the office with the following:

1. [____] telephones having [____] common telephone number, the number being different from the Contractor's;

2. [____] desks (each 30 inches by 60 inches) and [____] swivel chairs;

3. [____] 36-inch by 60-inch minimum drafting tables with drafting chairs;

4. [____] stack chairs;

5. [____] six foot tall book cases

6. [____] four drawer file cabinets

7. [____] 72-inch by 36-inch conference tables

8. [____] standing hanging plan/shop drawing rack

9. [____] keys to the field office.

F. Provide maintenance and service throughout the specified period as follows:

1. Repair and daily cleaning of the field office, parking and access area;

2. The furnishing of all utilities including telephone service. (Cost of long distance calls to be billed to Sound Transit.);

3. Provide security measures and area protection equivalent to that used by the Contractor for the Contractor's joint shop and office facilities; and

4. Bottled water and water dispenser with hot and cold water.

G. Submittals: Refer to Section 01 33 00, Submittals, for submittal procedures.

1. Shop Drawings: Submit detailed construction drawings of Field Office, furniture and equipment layout, and utility hookup sizes and locations.

2. Product Data: Submit manufacturer's product data for materials used to construct trailers, heating and cooling systems, and various required amenities as listed above.
1.09 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 signs for directing access to impacted businesses 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.
1.10 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 secure the site as shown in the Contract Drawings. Fence shall be Zinc-Coated Chain Link Fence complying with the requirements of ASTM A392 installed with 90% minimum light blockout polyethylene screening.

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 function of the viewing window. Submit plans for viewing windows to the Resident Engineer prior to construction of the windows.

1.11 TEMPORARY WALKWAY

A. Furnish and construct a temporary walkway as identified in the contract plans on the south and west edges of the Koh Property.

B. Provide security at all times for walkway:
   1. Close walkway by means of gates outside working hours.
   2. Flaggers stationed at construction wall access points will also be responsible of oversight of walkway.
   3. Notify law enforcement and ST security of any incidents on the walkway.

C. Provide maintenance and servicing throughout the life of the project:
   1. Inspect walkway daily for trash, Graffiti, moss, slippery surfaces, hazards and general conditions.
   2. Treat walkways during freezing weather with icemelt.
   3. Remove trash daily.
   4. Remove graffiti within 24 hours.
   5. Repair walkway defects immediately.
   6. Maintain and service walkway lighting and traffic mirror as needed. Use shields on lights to protect adjacent residents from glare.
1.12 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, onto surrounding properties, or at vehicular traffic.

E. Temporary Lighting in tunnels.
   1. Provide temporary lighting in the tunnel during construction.
   2. Remove temporary lighting at the end of Work, when permanent tunnel lighting is operational.

1.13 STAGING AND STORAGE AREAS

A. The Contract Documents may describe staging areas that are available for the Contractor’s use. The Contractor is advised that these staging areas are not exclusive for the Contractor and may be used by Sound Transit and other Sound Transit contractors as indicated in the Contract Documents at no additional cost to Sound Transit.

B. Sound Transit does not warrant that the staging areas will be adequate for the Contractor’s operations. In the event the Contractor determines that additional staging/storage areas are needed for its construction operations, it will be the Contractor’s responsibility to obtain and pay for those facilities. The Contractor shall be responsible for obtaining all necessary permits for additional staging areas and for the cost of additional NEPA/SEPA or any other environmental review. All Contractor-proposed staging areas must be authorized by Sound Transit who will conduct or direct the appropriate environmental review.

C. The work areas available for staging and storage are shown on the Contract Drawings.

1.14 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.

1.15 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.

1.16 TEMPORARY TUNNEL VENTILATION AFTER COMPLETION OF TUNNELLING

A. Provide, install, operate and maintain temporary ventilation in the tunnels following breakthrough of the TBM(s) and removal of the tunnel ventilation used during excavation to meet OSHA and WISHA requirements. As a minimum, delivering fresh air at an airflow rate necessary to meet the requirements indicated below.
1. Provide the system ready for operation at the moment that temporary TBM ventilation is no longer required or otherwise effective.

2. Maintain minimum of 60 feet per minute velocity throughout the tunnel, via mechanical ventilation system at all times work is being carried out in the tunnel. During periods when the tunnel is unoccupied this requirement may be reduced to 50 percent with the approval of the Resident Engineer.

3. Submit a temporary pre-construction ventilation system design for review and approval by the Resident Engineer.

4. Include a design that will deliver a minimum 100 cfm per horse power for all diesel operated equipment, 50 cfm air per person.

5. Install fans with screens, anchored with seismic vibration isolators, motors, controls and size to maintain noise level within the defined construction limits etc.

6. Divert air flow to provide proper air movement and maintain flow as defined above.

7. Be responsible for ductwork, isolation damper, electrical power and all system associated accessories.

8. The location and installation of the temporary ventilation shall not create any hazard to construction or interfere with other temporary facilities.

1.17 TEMPORARY TUNNEL DRAINAGE PUMPS AND DISCHARGE

A. Provide temporary pumps, piping and controls to remove drainage water from the tunnel. Drainage water includes normal drainage from seepage, storm, and process water, and emergency flows from the temporary tunnel standpipe. Select and size pump(s) and discharge piping to remove normal and emergency flows throughout the project. Emergency flows include the required discharge flow from the temporary tunnel standpipe.

B. Provide temporary power for pumps during tunnel boring operations as required by this specification. Ground pumps in accordance with the National Electric Code.

C. Temporary pumps shall be operational 24 hours a day, 7 days per week, and until the end of this contract. Maintain an inventory of spare pump(s), of quantity and capacity equal to the installed pumps, at the project site at all times. Provide hoist or other means to remove and replace pumps.

D. Treat tunnel drainage discharge water as required by Section 01 57 24, Temporary Site Water Discharge.

E. The location of the temporary pumps and discharge piping shall not create any hazard to construction or interfere with other temporary facilities.

F. Temporary Pumps at Cross Passage No. 31: Once the sump is constructed and receiving drainage water, utilize the sump with temporary pumps. Drainage shall be removed to either the U District or Roosevelt site. The discharge riser to Ravenna Street shall not be used. Once the permanent tunnel power and control equipment is installed, the Contractor may utilize this equipment for tunnel drainage. Coordinate use of the sump for temporary tunnel drainage with the work shown on the drawings and in these specifications.

1. When the motor control center (MCC) (provided under Section 26 29 13, Enclosed Controllers & MCC) is energized, utilize the pump power supply circuits
and motor starters provided and installed as a part of this contract. Determine the correct settings of the protective devices in the permanent power supply and motor control center equipment and reset and resize said devices to the correct settings.

2. If the temporary sump pump power requirements exceed the ratings of the permanent sump pump power supply or starters, provide another means of supplying power to the temporary sump pumps.

3. Determine a sequence of operation for the pumps provided. When the pump controller (provided under Section 22 14 10, Tunnel Track Drainage Pumping Station Piping and Appurtenances, and installed inside the MCC) is energized, coordinate the sequence of operation with the Section 22 14 10 control contractor. The sequence shall utilize the Section 22 14 10, Tunnel Track Drainage Pumping Station Piping and Appurtenances, level transducer for pump ON/OFF operation and float switches for high and low level alarm.

1.18 TEMPORARY TUNNEL STANDPIPE

A. Provide and maintain a wet temporary standpipe system in each tunnel bore, charged by the fire department, and as described below and in accordance with the following:

1. National Fire Protection Association (NFPA) 130, Standard for Fixed Guideway Transit and Passenger Rail Systems

2. National Fire Protection Association (NFPA) 14, Standard for the Installation of Standpipes and Hose Systems


B. The piping system used to supply cooling water for the TBM shall not be used as a temporary standpipe.

C. Submit an installation and test plan 6 weeks prior to the start of tunnel boring operations.

D. Size standpipe for the pressure required to provide a minimum of 500 gpm, with a 130 psi residual pressure at the hydraulically most remote hose connection, together with a simultaneous flow of 500 gpm at the next most remote hose connection on the same standpipe, and for the test pressure requirements of this specification.

1. Water Supply: Verify current water supply information with Seattle Public Utilities for this project. Information regarding hydrant flow tests can be seen in the Hydrant Flow Profiles Calculation in the Mechanical calculation package.

2. Submit plan for review by Sound Transit prior to approval by SFD.

E. Provide fire hose valves spaced not greater than 200 feet apart.

F. Provide a 4-way, 2.5-inch fire department connection manifold, minimum 6-inch inlet size, connected to the temporary standpipe, and riser to the ground surface level, terminating in an SFD approved fire department Siamese connection located not more than 100 ft from a fire hydrant.

G. Hydro test the entire length of pipe after every 200 feet of new pipe is added. Test the entire standpipe system at a pressure 50 psi greater than the maximum piping system pressure during the flow conditions stated above. Repair all leaks and retest before system is put back in use.
H. Installation, testing, and maintenance of the standpipe shall be performed by individuals who have obtained specific SFD certification in accordance with the SFC.

I. Maintain an air release valve at the high point of the system.

J. Employ means to prevent freezing of the standpipe during the winter time period.

K. The location the temporary standpipe shall not create any hazard to construction or interfere with other temporary facilities.

L. Remove the temporary standpipe system at the end of the contract.

1. As an option, request permission from the Resident Engineer to remove the temporary standpipe after the permanent standpipe system installation is complete and successfully tested. Arrange for temporary connection of the 6-inch fire department connection to the end of the permanent standpipe.

1.19 TEMPORARY WATER SERVICE

A. Seattle Public Utilities will only allow one domestic meter and one fire service connection to serve each of the Sound Transit project sites. The Contractor shall obtain temporary service connections from SPU for their work. For the duration that the N125 contractor and N150 contractor both occupy the site, the N150 contractor may purchase water from and connect to the N125 contractor’s construction water system. The N125 contractor will provide sub-meters for the N150 Contractor’s connections and bill the N150 Contractor for water used in accordance with the SPU’s current water use billing rates.

B. Once the N125 contractor completes construction they will retire their service meters with N150 and then the N150 Contractor will then need to coordinate directly with SPU to obtain service from the existing meters.

1.20 TEMPORARY SEWER CONNECTIONS

A. Construct and maintain side sewer piping as necessary for the Sound Transit Construction Offices and contractor’s convenience at U District Station, Roosevelt Station, and Maple Leaf Portal sites. Provide stub outs for future N140, N150 and N160 use. Discharge to existing sewer manholes within the construction sites.

B. Submit drawings of any proposed temporary sewers to the Resident Engineer for approval. Obtain any necessary side sewer permits.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXHIBITS

A. Exhibit A – Construction Sign

B. Exhibit B – Business Access Signs During Construction

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 providing temporary electrical power for 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 50 00, Temporary Facilities and Controls.

1.02 COORDINATION

A. During the time period when N125 and N160 operations overlap in the construction area, grant the N160 Contractor access to the Seattle City Light (SCL) construction power. The N160 contractor will likewise be obliged to grant the N125 Contractor access to the SCL construction power.

1.03 COORDINATION WITH SEATTLE CITY LIGHT (SCL)

A. Coordinate Work affecting Seattle City Light (SCL) source power throughout the duration of the Contract with SCL through the Resident Engineer.

B. Contractor to coordinate with Seattle City Light (SCL) for the 26 kV temporary power supply needed for construction. Contractor to review the indicated location of conceptual underground raceways and vaults for 26 kV SCL power feeders’ to ensure it will not interfere with other construction activities and site improvements and is acceptable to SCL.

C. Contractor to make complete analysis of the temporary construction loads and power needs based upon the temporary power needed for all electrical loads at the site such as but not limited to TBM equipment, conveying systems in the tunnels, temporary site lighting, power to construction trailers, tunnel lighting and sump pumps.

D. Contractor is responsible for verification and selection of proper voltage system for the TBMs. An assumption made in this specification is based on voltage of 13.8kV derived from utility 26kV power supply through a low resistance grounding 26kV-to-13.8/7.97kV transformer.

E. Contractor is responsible for preparing necessary documentation as required by SCL for service to ensure that there will not be any power quality problems for the power grid.

F. Contractor is responsible for getting all approvals from SCL for equipment to be used.

G. Contractor will coordinate with the SCL through the Resident Engineer for scheduling and termination of the 26 kV cables.
1. Contractor will coordinate through the Resident Engineer for the low voltage 480Y/227 V power supply needs for station construction work and later interfacing with SCL to reroute 26 kV feeders for permanent power. Attend meetings called by the Resident Engineer to schedule and plan coordination activities with Seattle City Light.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.01 CONTRACTOR INSTALLED AND MAINTAINED TEMPORARY POWER

A. Temporary power will be installed as indicated.

B. Provide temporary power as required for construction activities at Roosevelt Station site and U District Station site and TBM operations which start at Roosevelt Station and proceed with boring south through U District Station to the University of Washington Station.

1. Provide temporary conduits from SCL Point of Delivery to a temporary pad-mounted metering cabinet at Roosevelt Station site. SCL to provide and install temporary 26kV power cables in the N125 temporary conduits.

2. Provide temporary conduits from SCL Point of Delivery to a temporary pad-mounted metering cabinet at U District Station site. SCL to provide and install temporary 26kV power cables in the N125 temporary conduits.

C. Provide temporary power source as required for construction activities at Maple Leaf Portal site and TBM operations which start at Maple Leaf Portal and proceed with boring south to Roosevelt Station.

1. Provide temporary conduits from SCL Point of Delivery to a temporary pad-mounted metering cabinet at Maple Leaf Portal site. SCL to provide and install temporary 26kV power cables in the N125 temporary conduits.

D. Provide temporary service equipment with pad-mounted Metering Cabinets to meter power from the SCL construction power feeders for the following items:

1. Temporary power transformers sized to provide the following estimated construction power at Roosevelt Station site:

   a. Based on a 15 minute demand interval, the power demand of work has been estimated to be approximately 7400 KVA at Roosevelt Station construction site, assuming

      1) Two Tunnel Boring Machines (TBM) working at the same time on Northbound and Southbound tunnels. Each TBM power demand requirement will be approximately 3400 KVA including associated conveyors.

      2) Other construction site needs are estimated at approximately 600 KVA demand at 480VAC.

      3) The peak load is estimated at 150% of the 15 minute power demand or 5100 KVA for each TBM. This results in a total TBM and construction peak power demand of 10800 KVA at the Station.
b. It is the Contractor's responsibility to determine actual loads and demands.

c. It is the Contractor's responsibility to determine the Sound Transit Construction Management Office requirements.

2. Temporary power transformers sized to provide the following estimated construction power at Maple Leaf Portal Site:

   a. Based on a 15 minute demand interval, the power demand of work has been estimated to be approximately 4400 KVA at Maple Leaf Portal, assuming
      
      1) Single Tunnel Boring Machine (TBM) working on one tunnel only at the time. Single TBM power demand requirement will be approximately 3600 KVA including associated conveyors.
      
      2) Other construction site and tunnel needs are estimated at approximately 800 KVA at 480VAC.
      
      3) The peak load is estimated at 150% of the 15 minute power demand or 5400 KVA for single TBM. This results in a total TBM and construction site peak power demand of 6200 KVA at the Portal Site.

   b. It is the Contractor's responsibility to determine actual loads and demands.

   c. It is the Contractor's responsibility to determine the construction trailer requirements.

3. Temporary power transformers sized to provide the following estimated construction power at U District Station Site:

   a. Required Tunnel Power: Estimated 1400 kVA power demand to be supplied partially through sub-metering cabinet per Article 3.02.D and partially by temporary power from Roosevelt Site.
      
      1) Provide high voltage temporary feeder routed through one of the tunnels and rated for approximate power demand of 1000 kVA.

   b. Station and site construction power:
      
      1) Provide 1600 amp rated 480Y/277V 3PH, 4 wire switchboard as indicated on Contract Drawings.
      
      2) Construction site needs are estimated at approximately of 600 kVA power demand.
      
      3) Include provision to supply part of tunnel power demand at minimum of 400 KVA.
      
      4) Approximate power needed during construction of U District Station has been estimated at 1500 KVA demand.

   c. It is the Contractor's responsibility to determine actual loads and demands.

   d. It is the Contractor's responsibility to determine the construction trailer requirements.
E. Contractor to provide sub-metering cabinet to power N180 contract loads. The N180 Contractor or others shall cover costs for these loads. Tunnel loads are estimated at 400 kVA and include:
   a. Tunnel lighting panels: 100 kVA
   b. Tunnel pumps: 150 kVA
   c. Allowance for temporary tunnel ventilation: 150 kVA

F. Coordinate with SCL for rerouting of power from temporary switchgear to permanent switchgear inside station as shown in the contract plans. Permanent 26 kV connections will be provided in future contract.

3.02 BACKUP POWER

A. Provide backup power sufficient to meet the secondary power requirements.
   1. Anticipated for additional essential power at the construction site.

B. After the SCL construction power feeder is installed, connect essential loads via a manual transfer switch to the SCL construction power feeder.

3.03 CLOSEOUT ACTIVITIES

A. Permanent electrical feeders that will supply power for permanent tunnel equipment will not be installed during the Work of this Contract. All permanent connections to the SCL power source will be provided in the N140 and N150 contracts.

B. At the conclusion of the N125 contract make construction power available to the N140, N150 and N180 contracts. This power shall be used for tunnel ventilation, lighting sump pumps, tunnel outlets and other essential loads until permanent power is installed under N140, N150 and N160 contracts.

C. This power source may be a continuation of entire temporary service or only a part of SCL temporary power provided at Roosevelt and U District Stations sites under N125 contract.

D. All loads shall be left energized at the conclusion of the N125 contract.

END OF SECTION
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. Submit Weekly Reports, or as directed by the Resident Engineer.
C. Parking Plan

1.03 ACCESS AND HAUL PLANS
A. Written plan with drawings which include 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
      d. On-site roads required to transport materials.
   2. A copy of all necessary street use permits in connection with Contractor's operations and activities.
   Locations where on-street parking should be removed, schedule for parking removal required to provide safe construction activities, and allow adequate truck access and turning movements.
   3. Survey and document pre-existing roadway conditions along proposed haul routes
   4. Copies of truck drivers' driver licenses and certifications kept on record or file and made available upon request.
B. Truck Haul Route Plan shall reflect all constraints and requirements of 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.

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 PLAN
A. Written plans with drawings and narrative describing parking areas. Include the following details:
   1. Location, size (number of stalls), and access requirements, if any, for Contractor's off-site parking 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.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PARKING
A. Parking facilities for Contractor's personnel shall be the Contractor's responsibility and shall not impair the existing community parking and traffic conditions.
B. Provide parking in accordance with local ordinances and regulations and as specified in the Contract Documents.
C. Unless otherwise indicated, be responsible for obtaining and maintaining parking and staging areas.

D. All Subcontractors, Suppliers, and individuals associated with Contract activities must use approved routes and parking.

E. Failure by any employee on this Contract to observe these rules may be grounds for discipline, including discharge of the employee in violation.

3.02 ACCESS AND HAULING

A. Comply with all restrictions specified in the Contract Documents.

B. 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.

C. When hauling is done over highways or city streets trim and cover loads. Clean vehicle shelf areas after each loading.

D. Station flaggers at vehicle access points in construction wall to ensure safety of vehicles and pedestrians.

3.03 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 off-duty police officers for enforcement of haul route restrictions at the expense of the Contractor and 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. Maintain signs, lights and pavement markings along haul routes.

D. Maintain access to alley ways, driveways, walkways and delivery/loading zones. Access to the Neptune Theatre alley and emergency egress will be maintained at all times. If access agreement must be modified, provide access agreement signed by property owner(s) or tenant(s).

E. Provide a new walkway along the south and west edges of the Koh Property. Operate and maintain per Section 01 50 00 Temporary Facilities and Controls.

F. If pavement, curb, sidewalk or landscaping damage results, including but not limited to 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 repair as directed by the Resident Engineer and in accordance with standard plans and specifications of the City of Seattle.
G. Restore signs, pavement markings, and any other traffic control or calming devices removed or modified for the truck haul route to its pre-existing configuration or as directed by the Resident Engineer.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY
A. This Section specifies temporary traffic control.

1.02 REFERENCES
A. This Section incorporates by reference the latest revisions of the following documents:

1. City of Seattle
   a. City of Seattle Traffic Control Manual for In-Street Work
   b. City of Seattle 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. WSDOT Standard Plans for Road, Bridge, and Municipal Construction, M21-01.
   c. 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)

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

B. Traffic Control Plan: In accordance with these documents, WSDOT Standard Specifications or City of Seattle 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

C. Qualifications for Traffic Control Manager (TCM) and Traffic Control Supervisor (TCS).

1.04 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 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, perform work described in this Section in conformance with the applicable requirements of the City of Seattle.

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. Travel lanes, parking lanes and sidewalks outside of the construction wall must be reopened when no construction activities are occurring. No travel lane or parking lane closures are allowed on Roosevelt Way NE between 7am and 9am or on 12th Avenue NE between 4pm and 6pm besides those shown in the Contract Documents.

D. When sidewalks or bike paths are closed temporarily, the Contractor shall 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 or closure of bus stops and posting of informative signs (by others). See Section 01 31 14, Coordination with Others.

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 local jurisdictions, or WSDOT, and transit agencies for closing or partial closing of all streets, sidewalks, or bike routes, as applicable. Give the required advance notice of all full and partial street closures after approval of the traffic control plan, to all agencies providing emergency services, including without limitation,
police, fire, and ambulance services. 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
CONTRACT SPECIFICATIONS

SECTION 01 56 26
TEMPORARY CONSTRUCTION WALL

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies general requirements for furnishing, installing, operating, and maintaining the temporary construction walls around the U-District Station, Roosevelt Station and Maple Leaf Portal sites.

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:
   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):
a. Underground Construction WAC 296-155 Part Q

1.03 SUBMITTALS

A. Construction Staging Plan, within 30 days of Notice To Proceed. A layout of the construction sites including fences, roads, parking, buildings, staging, and storage areas

B. Provide details of construction wall, including structural and wall members, pedestrian gates, and traffic gates in accordance with Section 06 10 00 Rough Carpentry. gate operators and controls.

C. Provide product data for traffic gate operators and controls.

1.04 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. Construct pedestrian gates a minimum of six (6) feet wide and traffic gates a minimum of 20 feet wide. Provide wireless controlled electric operators for opening and closing traffic gates at a minimum speed of 20 feet per minute.

D. 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.

E. Used materials may be employed for temporary fencing, provided such used materials are good, sound, and suitable for the purpose intended.

F. Repair or replace temporary fencing that is damaged from any cause during the progress of the Work at no additional cost to Sound Transit.

G. 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.

H. 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.

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:

1. Developing 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. Furnishing 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. Maintaining newly installed tree protection elements, including, but not limited to, fencing, woodchip mulch, landscape fabric, cabling, and signs.

4. Areas for tree and plant protection include properties under the jurisdiction of the City of Seattle, Washington State Department of Transportation, and The University of Washington. Standards of each property owner must be met or exceeded.

1.02 REFERENCES

A. This Section incorporates by reference the following documents:

1. City of Seattle:
   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.

3. Washington State Department of Transportation
   a. Standard Specifications for Road, Bridge and Municipal Construction 2012

4. University of Washington
   a. Facilities Design Manual

1.03 DEFINITIONS

A. COS: City of Seattle.
B. Critical Root Zone (CRZ): An area surrounding the tree trunk which is equal to 1 foot radius for every 1 inch diameter of diameter of tree at breast height (DBH), measured from the center of the tree.

C. DBH: Diameter of a tree at breast height, as measured 4-1/2 feet above root crown.

D. Dripline: The area on the ground beneath the outer edge of the tree’s canopy.

E. ISA: International Society of Arborists.

F. Landscape 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.

G. Project Arborist: An International Society of Arborists (ISA) certified arborist on the Contractor or Subcontractor’s staff, and approved by Sound Transit.

H. WSDOT: Washington State Department of Transportation.

I. UW: University of Washington.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Per Section 01 31 14, Coordination with Others. Coordination required with property owners having jurisdiction over Work sites.

1.05 SUBMITTALS

A. A Landscape Protection Plan: Submitted for review and acceptance by the Resident Engineer 30 days prior to commencement of any construction activity. Include the following:
   1. Survey with tree locations provided by a professional surveyor.
   2. Final landscape protection locations and phasing plan. Include fence locations and a schedule if fence locations must change to accommodate other site Work.
   3. List and schedule of all intended landscape maintenance practices to be provided.
   4. Tree labels including identification number as assigned.
   5. Each tree’s number, botanical and common name, DBH, CRZ, and minimum tree value.
   6. The watering schedule for temporary watering. Indicate source of water, a reliable method of slow application, and duration for watering.
   7. All Work activities within 50 feet of Landscape Requiring Protection.
   8. Anticipated work methods for work within CRZ of all landscape to be protected.
   10. 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. Photograph Landscape Requiring Protection immediately following Notice to Proceed and again after plants produce a full canopy of leaves if initial photographs are taken when trees are bare of leaves.

2. 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 from which the photograph was taken.
   c. Date photograph was taken.

3. Written inventory of Landscape Requiring Protection, confirming location, type, and size.

4. 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. If not listed herein, provide an appraisal by the Project Arborist for all Landscape Requiring Protection identified by the Contract Documents. The Project Arborist shall provide supplemental appraisal values for any additional landscape, or any additional trees whose critical root zones may be affected by construction and therefore need to be protected. Base the appraisals 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.
4. Wood chips, including laboratory test report.

F. Samples:

1. Landscape protection signage: one
2. Tree appraisal value signage: one.
3. Cabling material: one foot length.
4. Wood chips: one pound bag.
5. Coir mat: one square foot.

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 propagule per gram (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 maximum levels indicated, unacceptable levels of heavy metals, or other chemicals will be rejected.

H. Compliance Reports: Submit observations and recommendations for each site visit conducted by the Project Arborist.

1.06 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. Trees Requiring Protection: Use list of trees in the Landscape Protection Plan (not the Contract Drawings). The DBH sizes in the Contract Drawings list may be superseded by those in the Landscape Protection Plan).

PART 2 - PRODUCTS

2.01 MATERIALS

A. Landscape Protection Fencing
   1. In accordance with the jurisdictional standards of the property owner for each site.
   2. If no standards exist, use chain fencing only.
      a. Chain link fence materials including footings, posts, braces, and mesh to be used to form a 6 foot high enclosure.
      b. Footings:
         1) Type 2: above ground precast concrete block type footings, 100 pounds minimum.
      c. 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.
d. Mesh: 2 inch by 2 inch 11 gauge chain link fabric, minimum.

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. Tree tags: Race-track shaped aluminum tags engraved with individual tree numbers as indicated on Contract Documents.

E. Water: Potable water supplied by the Contractor.

F. Mycorrhizae Fungal Inoculant: Mycogrow Gel, manufactured by Fungi Perfecti (Olympia, WA) or Mycorrhizal Landscape Inoculant, manufactured by BioOrganics (Santa Monica, CA), or accepted equal to meet jurisdictional requirements.

G. 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 to meet jurisdictional requirements.

H. Wood Chips: Chipped wood mulch or hog fuel, which has composted for a minimum of 1 year, or accepted equal to meet jurisdictional requirements. Submit mulch to laboratory to be checked for undesirable pathogens. Submit laboratory report.

I. Coir mat: Geocoir@DeKoWe 400 by Belton Industries, Koir Mat 400 by Nedia Enterprises, or accepted equal to meet jurisdictional requirements.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prior to any construction activity Project Arborist shall:

1. Submit a Landscape Protection Plan for review and acceptance which meets or exceeds the standards of the jurisdiction of the property owner.

2. Verify adequacy of the extent of Landscape Requiring Protection as defined in the Contract Documents.
   a. Review Contract Documents and periphery of Site for any additional landscape or any additional trees whose critical root zones may be affected by construction and therefore need to be protected.
   b. Tag trees with designated numbers.
c. Post tree preservation area/restrictions signage and appraised value signage on all Trees Requiring Protection as specified herein.

d. Protect Landscape in accordance with approved Landscape Protection Plan.

e. Protect soil and roots within the CRZ of all Landscape Requiring Protection with a 1” mesh opening coir mat under four (4) inches deep of wood chips. Provide a minimum of 6 inches radius zone clear of mulch at the base of each tree or shrub.

f. Coordinate with Project Arborist regarding areas requiring special attention as identified and specified on the Contract Documents. In areas requiring attention for measures of special protection:

1) If required, root prune within the CRZ 3 months prior to commencement of construction activity.

3.02 INSTALLATION

A. Landscape protection fencing:

1. Fencing per jurisdictional requirements: Install fence on above ground precast concrete block type footings in locations as indicated in approved Landscape Protection Plan.

2. Install fencing and wood chips to protect Trees Requiring Protection from construction activities unless otherwise approved by Resident Engineer.

3. If construction activities are expected adjacent or near Trees Requiring Protection, install chain-link fencing in accordance with jurisdictional standards for the duration of any construction activities.

4. Do not compact soil or use heavy equipment in the CRZ when installing protective fencing installation.

5. Provide diagonal bracing to vertical posts at corners of enclosures and wherever needed to ensure rigidity of the fencing.

6. 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.

7. Install fabric to form continuous fencing. Attach fabric to posts 12 inches on center with 11 gauge wire ties securely fastened, or with bolted ring clips, and to top rail not over 3 feet on center.

8. Attach orange flag strips 12 inches long at 3 feet on center along the fence, 5 feet above grade.

9. Provide 1 locked gate at each fenced area.

B. Landscape protection signage:

1. Affix one landscape protection sign to each Tree Requiring Protection using a method accepted by the Project Arborist.

C. Wood chips:
1. 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 clear zone at the base of each tree.

2. In areas of Landscape Requiring Protection with understory landscape as indicated by Contract Drawings, 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.

3.03 PROTECTION

A. At commencement of construction activities, the Project Arborist shall:

1. Monitor any work within CRZ of all Trees Requiring Protection including all excavation, demolition, and all resurfacing of sidewalks and road beds. See Specification 31 11 00, Clearing and Grubbing, for excavation requirements for trees.

2. Within the CRZ, hand-excavate to prevent tears and breaks in root surfaces. Leave roots larger than 2 inches in diameter intact and undamaged. During the time of exposure, keep roots moist with moist soil, wet mulch, and burlap, or accepted equal.

3. Use air spade to dig all trenches within CRZs, as identified on tree protection plan. Cut off roots cleanly with a diamond blade when roots are exposed or disturbed by work activities. Place utility conduit either under roots by tunneling, or over roots using adequate sand bedding. Obtain acceptance from Resident Engineer that bedding is adequate.

4. Monitor and be on site at time of removal of existing hardscape within CRZs to avoid root damage. As hardscape is removed, identify existing subgrade and assist in establishing final grade or new pavement subgrade by providing direction for root protection. Where new pavement is planned, direct the cutting of roots 6 inches clear of planned paving edge.

5. Monitor maintenance of all Landscape Requiring Protection to ensure it is in a healthy condition. Report any deficiencies or concerns to the Resident Engineer immediately. Implement adjustments to the protection plan as directed by the Resident Engineer as needed during the course of the Work.

6. Immediately report any deficiencies or concerns to the Resident Engineer.

7. Implement adjustments to Landscape Protection Plan and list of Landscape Requiring Protection as needed and as accepted by the Resident Engineer.

8. Perform on-site review as needed during construction for activities that are adjacent to or affecting all Landscape Requiring Protection.

9. Provide Compliance Reports of maintenance site visits and field inspections to review and respond to site conditions and health status of all Landscape Requiring Protection including:

   a. Construction activities affecting protected areas.
   b. Status of protection elements.
   c. Maintenance and watering conditions.
10. 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.

B. Landscape Protection:

1. Protect landscape in accordance with approved Landscape Protection Plan.

2. Coordinate with Project Arborist regarding areas requiring special attention as identified and specified on the Contract Documents.

3. Locate tree protection in accordance with the Contract Documents and approved Landscape Protection Plan unless otherwise directed by Project Arborist.

4. Protect soil and roots within the CRZ of all Trees Requiring Protection with a 1" mesh opening coir mat under 4 inches of wood chips. Provide a 12 inch radius zone clear of mulch at the base of each tree.

5. In areas requiring attention for measures of special protection:
   a. Protect soil and roots within the CRZ of all trees with a 12 inch layer of wood chips.
   b. Provide a 24 inch radius zone clear of mulch at the base of each tree.

6. 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.

7. Carefully plan and execute operations to avoid damaging trees. Coordinate with Project Arborist and Resident Engineer in requirements specified herein.

8. Protect against cutting, breaking or skinning of roots, skinning or bruising of bark, compaction of root zones, and breaking of branches.

9. Perform any heavy equipment work from locations, angles, and directions that minimize compaction to tree or shrub roots. Under the supervision of the Project Arborist and Resident Engineer, tie back flexible limbs and overhead branches which may, in the opinion of the Project Arborist and Resident Engineer, are damaged by the passage or activity of equipment. Anticipate limbs that may be in the way of necessary equipment to avoid limb damage and provide a remedy before work occurs. Do not remove tree limbs without the prior written acceptance of the Resident Engineer.

10. Provide additional inches of wood chips in CRZs of Landscape Requiring Protection as indicated by the Contract Drawings when directed to do so by the Resident Engineer as needed to protect CRZs from any Work.

C. Use of area within protective fences and within the CRZ of all Trees Requiring Protection:

1. Do not store materials potentially harmful to tree 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.

2. Alter no grades within the required protective fence area.
3. Control soil moisture within the protected area. Prevent flooding of the soil, and protect root areas from leachate, cement, oil, fuel and lubricating oil, and all contaminants.

4. Notify the Resident Engineer and Project Arborist 48 hours in advance of the need to move a tree protection fence.

5. Upon relocation of fence, continue all other protection efforts and maintenance of Landscape Requiring Protection in accordance with the accepted Landscape Protection Plan.

3.04 MAINTENANCE

A. Landscape Maintenance:

1. Perform all pruning, thinning, and other maintenance under the direction of the Project Arborist.

2. Prune as necessary for safety, to promote the health of the tree, and to allow clearance for construction within the tree 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 acceptance by the Resident Engineer.

3. Fertilize and inoculate all Trees and Landscape Requiring Protection throughout the life of the Contract. Under direction of Project Arborist, aerate and inject mycorrhizae and slow release fertilizer into the root zone surrounding all Trees and Landscape Requiring Protection. Perform injection with a soil injection needle attached to an applicator accepted by Project Arborist.

4. Water Landscape Requiring Protection at least once per week or as directed by the Project Arborist. 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.

5. Maintain the woodchips at the specified depth. Should the depth of wood chips measure less than the specified depth at any time, 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.

6. Notify the Resident Engineer and Project Arborist 48 hours prior to all work to be performed within the CRZ of any Tree Requiring Protection.

7. Maintain all Landscape Requiring Protection in a healthy and flourishing condition until Acceptance of the Contract, as directed by the Project Arborist. Prevent damage to roots, trunks, and crown of Trees Requiring Protection, and provide maintenance required to guarantee the health of the trees. Protection and maintenance responsibilities include, but are not limited to:

   a. Replacing damaged tree protection fencing regardless of cause, including acts of vandalism.

   b. Aerating compacted soils.

   c. Controlling surface runoff.

   d. Expertly pruning and treating damaged roots.
e. Replacing wood chips within tree protection areas to maintain a minimum 4-inch depth of chips.

f. Keeping mulch a minimum of six (6) inches away from base of trunk.

g. Performing work under the direction of the Project Arborist.

h. Remove weeds in planting areas throughout the duration of the Contract.

B. Fence Maintenance

1. Maintain fences 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. Tree protection fencing may be removed temporarily for specific construction operations only under review and acceptance of the Project Arborist and the Resident Engineer.

3.05 REPAIR/RESTORATION OF DAMAGED LANDSCAPING

A. Repair and restore landscaping 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.

B. Damages for loss or injury to Landscape Requiring Protection including loss or injury as a result of vandalism or construction activities:

1. In the event of damage or loss to any Landscape Requiring Protection due to failure to protect and maintain said tree, pay Sound Transit as liquidated damages a sum equal to:

   a. The value of each lost tree, as determined by the Project Arborist’s confirmed and accepted appraisal values as noted in Article 1.04C.

   b. The cost to remove and dispose of said tree, and

   c. An additional $1,500 per damaged or lost 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 Requiring Protection 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 requiring protection killed or irreparably damaged due to vandalism, natural acts, diseases, or failure to protect or maintain tree. Remove and dispose the entire tree including stump and roots to a depth of two feet below finish grade.

4. Replace at Resident Engineer’s direction any tree or plant lost or, in the opinion of the Resident Engineer, irreparably damaged as a result of failure to protect or to adequately maintain. Replacement conditions 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. 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.

C. Locate and install replacement trees and plants in accordance with jurisdictional standards and by direction of the Resident Engineer. The Resident Engineer may require lost trees be replaced in areas other than in their original location.

D. Warranty for replacement trees and plants as follows:

1. Warranty for trees and plants: A period of 1 year after notice of Final Acceptance.

2. Replace trees and 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.

3. Be responsible for maintenance of all replacement trees and plants during the Warranty Period. Inspect the plant materials to ensure that the areas are receiving proper care. Sound Transit will provide periodic reviews and notify of any areas needing attention.

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.

6. Any tree or plant that is 25 percent or more dead or disfigured is 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 sculptural 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.

E. Pruning of Damaged Trees

1. Sterilize equipment with alcohol prior and during trimming and pruning operation.

2. Under the direction of the Project Arborist, cleanly cut off broken limbs and branches to the nearest crotch in accordance with good horticultural practice. Cut limbs and branches greater than 1/2 inch in diameter. Carry out all pruning of damaged trees to the approval of the Resident Engineer.

3. Maintain Trees Requiring Protection in as good of a condition at the completion of the Work as at the commencement of the Work. If such a condition does not exist at the completion of the Work, provide corrective measures at the direction of the Project Arborist.

4. Pay for all costs for the repair of any damage to trunks or major limbs 3 inches in diameter or over 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.
3.06 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.

3.07 SCHEDULE

A. Trees to be Protected

EMI – BURKE GILMAN EM CONDUIT CROSSING (SEE SHEET R212LT001)

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>Botanical Name</th>
<th>Common Name</th>
<th>SIZE (DBH)</th>
<th>CRZ Dia</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6193</td>
<td>Cedrus deodara</td>
<td>Deodar cedar</td>
<td>26.9</td>
<td>54’</td>
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<td>6194</td>
<td>Cedrus deodara</td>
<td>Deodar cedar</td>
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<td>Elm</td>
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<td>Elm</td>
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<td>7260</td>
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<td>Elm</td>
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<td>7261</td>
<td>Prunus emarginata</td>
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EMI – 101 (SEE SHEET R212LT003)

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<td>Pin oak</td>
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<td>4889</td>
<td>Magnolia x soulangeana</td>
<td>Saucer magnolia</td>
<td>5, 5.5</td>
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EMI – 102 (SEE SHEET R212LT004)

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<td>Red oak</td>
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<td>4802</td>
<td>Quercus coccinea</td>
<td>Scarlet oak</td>
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<td>10’</td>
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<td>4803</td>
<td>Ulmus carpinifolia</td>
<td>Smoothleaf elm cv.</td>
<td>24,11,19.5</td>
<td>66’</td>
<td>$15,458</td>
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NORTHGATE LINK EXTENSION
TUNNELS, PORTAL, AND STATION EXCAVATIONS
SECTION 01 56 39
TEMPORARY TREE AND PLANT PROTECTION
PAGE 12 OF 16
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LINK CONTRACT N125
90%
<table>
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<th>Botanical Name</th>
<th>Common Name</th>
<th>SIZE (DBH)</th>
<th>CRZ Dia</th>
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<td>3, 4</td>
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<td>Wheel tree</td>
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<td>Magnolia stellata</td>
<td>Star magnolia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>Magnolia stellata</td>
<td>Star magnolia</td>
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</tr>
</tbody>
</table>

ROOSEVELT STATION SITE - (SEE SHEETS N092CR001 - N092CR005)

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>Botanical Name</th>
<th>Common Name</th>
<th>SIZE (DBH)</th>
<th>CRZ Dia</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST-03</td>
<td>Tilia X Euchlora</td>
<td>Crimean linden</td>
<td>12&quot;</td>
<td>-</td>
<td>$2,226</td>
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<tr>
<td>ST-04</td>
<td>Tilia X Euchlora</td>
<td>Crimean linden</td>
<td>11.5&quot;</td>
<td>-</td>
<td>$2,319</td>
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<tr>
<td>ST-05</td>
<td>Tilia X Euchlora</td>
<td>Crimean linden</td>
<td>12&quot;</td>
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<td>$2,226</td>
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<tr>
<td>ST-06</td>
<td>Acer Campestrae</td>
<td>Hedge maple</td>
<td>5.1&quot;</td>
<td>-</td>
<td>$899</td>
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<tr>
<td>ST-07</td>
<td>Acer Campestrae</td>
<td>Hedge maple</td>
<td>4.7&quot;</td>
<td>-</td>
<td>$744</td>
</tr>
<tr>
<td>ST-08</td>
<td>Acer X Freemanii 'Scarsen'</td>
<td>Scarlet Sentinel maple</td>
<td>4.5&quot;</td>
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<tr>
<td>ST-09</td>
<td>Deciduous</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ST-12</td>
<td>Deciduous</td>
<td></td>
<td>6&quot;</td>
<td>-</td>
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</tr>
<tr>
<td>ST-13</td>
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<td>6&quot;</td>
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<td>-</td>
</tr>
<tr>
<td>ST-14</td>
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<tr>
<td>NUMBER</td>
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<td>Common Name</td>
<td>SIZE (DBH)</td>
<td>CRZ Dia</td>
<td>VALUE</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------------</td>
<td>------------------------</td>
<td>------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>ST-15</td>
<td>Deciduous</td>
<td></td>
<td>10&quot;</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ST-18</td>
<td>LIRIODENDRON TULIPIFERA 'Arnold'</td>
<td>Arnold tulip tree</td>
<td>4&quot;</td>
<td>8'</td>
<td>$512</td>
</tr>
<tr>
<td>ST-19</td>
<td>Liriodendron tulipifera 'Arnold'</td>
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<td>8'</td>
<td>$512</td>
</tr>
<tr>
<td>ST-20</td>
<td>Liriodendron tulipifera 'Arnold'</td>
<td>Arnold tulip tree</td>
<td>4.2&quot;</td>
<td>10'</td>
<td>$504</td>
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<tr>
<td>ST-21</td>
<td>Liriodendron tulipifera 'Arnold'</td>
<td>Arnold tulip tree</td>
<td>4.5&quot;</td>
<td>10'</td>
<td>$617</td>
</tr>
<tr>
<td>ST-22</td>
<td>Deciduous / To Be Assessed</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ST-23</td>
<td>LIQUIDAMBAR STRYACIFLUA</td>
<td>Sweetgum</td>
<td>22.2&quot;</td>
<td>46'</td>
<td>$16,028</td>
</tr>
<tr>
<td>ST-24</td>
<td>Deciduous</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ST-25</td>
<td>Zelkova serrata 'Village Green'</td>
<td>Village Green Zelkova</td>
<td>4&quot;</td>
<td>8'</td>
<td>$502</td>
</tr>
<tr>
<td>ST-26</td>
<td>Zelkova serrata 'Village Green'</td>
<td>Village Green Zelkova</td>
<td>4.6&quot;</td>
<td>10'</td>
<td>$558</td>
</tr>
<tr>
<td>ST-27</td>
<td>Zelkova serrata 'Village Green'</td>
<td>Village Green Zelkova</td>
<td>4.4&quot;</td>
<td>10'</td>
<td>$611</td>
</tr>
<tr>
<td>ST-28</td>
<td>Zelkova serrata 'Village Green'</td>
<td>Village Green Zelkova</td>
<td>3.8&quot;</td>
<td>8'</td>
<td>$377</td>
</tr>
<tr>
<td>ST-29</td>
<td>Zelkova serrata 'Village Green'</td>
<td>Village Green Zelkova</td>
<td>3.3&quot;</td>
<td>8'</td>
<td>$299</td>
</tr>
<tr>
<td>ST-101</td>
<td>Liquidambar stryaciflua</td>
<td>Sweetgum</td>
<td>16.3&quot;</td>
<td>34'</td>
<td>$8,633</td>
</tr>
<tr>
<td>ST-102</td>
<td>Liquidambar stryaciflua</td>
<td>Sweetgum</td>
<td>20.7&quot;</td>
<td>42'</td>
<td>$12,337</td>
</tr>
<tr>
<td>ST-103</td>
<td>Liriodendron tulipifera 'Arnold'</td>
<td>Arnold tulip tree</td>
<td>4&quot;</td>
<td>8'</td>
<td>$484</td>
</tr>
<tr>
<td>ST-104</td>
<td>Liriodendron tulipifera 'Arnold'</td>
<td>Arnold tulip tree</td>
<td>3.8&quot;</td>
<td>8'</td>
<td>$435</td>
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<tr>
<td>ST-105</td>
<td>Liriodendron tulipifera 'Arnold'</td>
<td>Arnold tulip tree</td>
<td>4.1&quot;</td>
<td>10'</td>
<td>$479</td>
</tr>
<tr>
<td>ST-106</td>
<td>Liriodendron tulipifera 'Arnold'</td>
<td>Arnold tulip tree</td>
<td>4&quot;</td>
<td>8'</td>
<td>$484</td>
</tr>
<tr>
<td>ST-107</td>
<td>Liriodendron tulipifera 'Arnold'</td>
<td>Arnold tulip tree</td>
<td>4.5&quot;</td>
<td>10'</td>
<td>$653</td>
</tr>
<tr>
<td>ST-108</td>
<td>Zelkova serrata 'Village Green'</td>
<td>Village Green Zelkova</td>
<td>3.4&quot;</td>
<td>8'</td>
<td>$212</td>
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<tr>
<td>ST-109</td>
<td>Zelkova serrata 'Village Green'</td>
<td>Village Green Zelkova</td>
<td>4&quot;</td>
<td>8'</td>
<td>$502</td>
</tr>
<tr>
<td>ST-111</td>
<td>Deciduous</td>
<td></td>
<td>-</td>
<td>-</td>
<td>Not Appraised</td>
</tr>
<tr>
<td>ST-112</td>
<td>Deciduous</td>
<td></td>
<td>-</td>
<td>-</td>
<td>Not Appraised</td>
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### Table 1: 12TH AVE NE SEWER - (SEE SHEET R092CR001)

<table>
<thead>
<tr>
<th>NUMBER</th>
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<th>Common Name</th>
<th>SIZE (DBH)</th>
<th>CRZ Dia</th>
<th>VALUE</th>
</tr>
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<tbody>
<tr>
<td>ST-114</td>
<td>Deciduous</td>
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<tr>
<td>ST-115</td>
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<tr>
<td>ST-116</td>
<td>Deciduous</td>
<td>-</td>
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<td>-</td>
<td>Not Appraised</td>
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</tbody>
</table>

### Table 2: U DISTRICT STATION

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>Botanical Name</th>
<th>Common Name</th>
<th>SIZE (DBH)</th>
<th>CRZ Dia</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST-30</td>
<td><em>Psuedotsuga menziesii</em></td>
<td>Douglas fir</td>
<td>12.7&quot;</td>
<td>-</td>
<td>$2,552.00</td>
</tr>
<tr>
<td>ST-31</td>
<td><em>Chamaecyparis pisifera 'squarrosa'</em></td>
<td>Sawarra cypress</td>
<td>21.3&quot;</td>
<td>-</td>
<td>$6,273.00</td>
</tr>
<tr>
<td>ST-32</td>
<td><em>Chamaecyparis pisifera 'squarrosa'</em></td>
<td>Sawarra cypress</td>
<td>19.3&quot;</td>
<td>-</td>
<td>$5,149.00</td>
</tr>
<tr>
<td>ST-33</td>
<td><em>Ilex aquifolium</em></td>
<td>English Holly</td>
<td>10&quot;</td>
<td>-</td>
<td>$1,163.00</td>
</tr>
<tr>
<td>ST-34</td>
<td><em>Chamaecyparis pisifera 'squarrosa'</em></td>
<td>Sawarra cypress</td>
<td>24.5&quot;</td>
<td>-</td>
<td>$8,634.00</td>
</tr>
<tr>
<td>ST-35</td>
<td><em>Sorbus aucuparia</em></td>
<td>European mountain ash</td>
<td>16.1&quot;</td>
<td>-</td>
<td>$4,632.00</td>
</tr>
<tr>
<td>ST-36</td>
<td><em>Chamaecyparis pisifera 'squarrosa'</em></td>
<td>Sawarra cypress</td>
<td>24.5&quot;</td>
<td>-</td>
<td>$8,634.00</td>
</tr>
<tr>
<td>ST-38</td>
<td><em>Juglans cinerea</em></td>
<td>Butternut</td>
<td>3&quot;</td>
<td>-</td>
<td>$100.00</td>
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<tr>
<td>ST-39</td>
<td><em>Thuja occidentalis</em></td>
<td>Eastern arborvitae</td>
<td>11.7&quot;</td>
<td>-</td>
<td>$1,555.00</td>
</tr>
<tr>
<td>ST-40</td>
<td><em>Chamaecyparis pisifera 'squarrosa'</em></td>
<td>Sawarra cypress</td>
<td>22&quot;</td>
<td>-</td>
<td>$6,651.00</td>
</tr>
<tr>
<td>ST-41</td>
<td><em>Thuja occidentalis</em></td>
<td>Eastern arborvitae</td>
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<td>$412.00</td>
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<tr>
<td>ST-42</td>
<td><em>Chamaecyparis pisifera 'squarrosa'</em></td>
<td>Sawarra cypress</td>
<td>17&quot;</td>
<td>-</td>
<td>$6,836.00</td>
</tr>
<tr>
<td>ST-43</td>
<td><em>Thuja occidentalis</em></td>
<td>Eastern arborvitae</td>
<td>6.3&quot;</td>
<td>-</td>
<td>$447.00</td>
</tr>
<tr>
<td>ST-44</td>
<td><em>Chamaecyparis obtusa var. formosana</em></td>
<td>Formosan Hinoki Cypress</td>
<td>13.5&quot;</td>
<td>-</td>
<td>$4,103.00</td>
</tr>
<tr>
<td>t-48</td>
<td><em>Betula pendula</em></td>
<td>European White Birch</td>
<td>12&quot;</td>
<td>-</td>
<td>Not Appraised</td>
</tr>
</tbody>
</table>
END OF SECTION
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.

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 D1004 Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
   f. ASTM D3776 Standard Test Method for Mass Per Unit Area (Weight) of Fabric.
   g. ASTM D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.

2. American Association of State Highway and Transportation Officials (AASHTO)
   a. AASHTO M252 Corrugated Polyethylene Drainage Pipe, Nominal Sizes of 75 to 250 mm in Diameter.
b. AASHTO M294 Corrugated Polyethylene (PE) Pipe, Nominal Sizes 300 to 1500 mm in Diameter.

3. Washington State Department of Ecology (ECOLOGY)

4. City of Seattle (COS)
   a. COS Standard Specifications for Road, Bridge, and Municipal Construction.

5. King County CODE (KCC) – Industrial Waster Rules and Regulations
   a. KCC 28.84.060

6. American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF)
   a. Standard Methods for the Examination of Water and Wastewater

1.03 DEFINITIONS

A. Plan: Temporary Erosion and Sediment Control Plan(s) (TESC).

B. Wet season: October 1 through April 30.

C. Dry season: May 1 through September 30.


E. CSEMS: Construction Site Environmental Management Supervisor: See Section 01 57 19, Temporary Environmental Controls for requirements.


I. Operation 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.

J. Bulk Fuels: Total Petroleum Hydrocarbons (TPH) with any fraction of crude oil that is contained in plant condensate, crankcase motor oil, gasoline, kerosene, diesel motor fuel, benzol, fuel oil, and other products derived from the refining of crude oil contained in drums or tanks, above ground or buried.
1.04 SUBMITTALS

A. Temporary Erosion and Sediment Control Plan(s).
B. Manufacturer Data and Test Results for all products.
C. Spill Plan in accordance with COS Standard Specifications 8-01.3(2)C.
D. TESC BMPs (Best Management Practices) inspection log:
   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 Certified Erosion and Sediment Control Leads (CESCL).
F. Qualifications for Construction Site Environmental Management Supervisor.

1.05 QUALITY ASSURANCE

A. Implement the TESC Plan, including design of and all revisions to, and the construction, maintenance, replacement, and modification of the erosion and sedimentation control facilities, until Acceptance of current work, in accordance with Section 01 12 19, Contract Interface.
   1. Employ Construction Site Environmental Management Supervisor (CSEMS) as defined in Section 01 57 19, Temporary Environmental Controls, with the following responsibilities:
      a. Installation, operation, and maintenance of the facilities.
      b. Inspect all BMP’s daily, and ensure each day that the log of TESC BMP performance is prepared, maintained, and that copies of the TESC Daily Inspection Reports are submitted to the Resident Engineer weekly, for the previous week.
      c. Available to accompany the Resident Engineer and Washington State Department of Ecology (DOE) personnel during weekly inspections of all BMPs at a time designated by the Resident Engineer.
B. Make revisions to the Plan(s) and the work to meet the requirements of this Section.
C. 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.
D. Use of Experimental BMP’s:
   1. Obtain approval for all experimental BMP's from Resident Engineer for 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. Minimize the transport of sediment to surface waters, drainage systems, and adjacent properties. Complete installation of appropriate erosion and sediment control systems including but not limited to perimeter control, and catch basin inserts prior to and in conjunction with all site activities, including initial utility relocation, demolition, site restoration, clearing, earthwork activities, construction of walls, utility trenching and tunneling.

B. Obtain applicable permits, approval of stormwater discharge treatment methods, BMPs and necessary equipment in place prior to land disturbing activities.

1.07 SYSTEM STARTUP

A. Pre-Construction Meeting

1. See Section 01 31 19, Project Meetings.

1.08 CONTRACTOR TEMPORARY EROSION AND SEDIMENT CONTROL PLAN

A. Contractor Erosion and Sediment Control Personnel: Designate sufficient employees as responsible representatives in charge of erosion and sedimentation control. The employees’ responsibility includes overseeing of all water discharge issues. One of these designees is onsite at all times when work activity is taking place.

1. All designees shall be certified as Certified Erosion and Sediment Control Leads (CESCL) in accordance with the Washington State Department of Ecology’s training course requirements.

2. Assign one of the designated employees responsibility for erosion and sedimentation control to be the Contractor’s Construction Site Environmental Management Supervisor (CSEMS). The CSEMS shall:
a. Be solely responsible for developing, maintaining, and modifying the TESC Plan for the life of the Contract and ensuring compliance with all requirements of this Section.

b. Be currently certified as a Certified Professional in Erosion and Sediment Control (CPESC) offered by CPESC, Inc. (www.cpesc.org).

c. Have the authority to act on behalf of the Contractor and shall be available on call 24 hours per day through the life of the contract.

B. Prepare and submit 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 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.

1. The Plan(s) will contain the following information:

   a. Best Management Practices (BMPs)

      1) To control erosion and sedimentation from the Contractor's activities, and treat stormwater discharge to meet applicable city, state and federal permits and requirements.

      2) Implement such practices as perimeter BMPs, installation of surface water controls, stabilization of exposed soils, flagging of clearing/construction limits, maintaining existing vegetation where possible, and the collection and treatment of runoff to minimize impacts on wetlands, wildlife, fish, and endangered species.

      3) During the construction period, upgrade and modify the BMPs as needed to meet discharge requirements for changing construction activities, storm events, and changing site conditions.

   b. Include a description of the inspection and monitoring of TESC BMPs over the life of the Project. At a minimum, inspect daily all TESC BMPs and after any significant rain event (0.5 inch or greater).

   c. Provide narrative on how they will educate the 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.

   d. 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.

2. Schedule BMP implementation correlated to wet and dry season activities. This may include activities such as temporary seeding and permanent seeding activities which change with seasons.
3. Temporary Erosion/Sedimentation Control Drawings. Indicate at a minimum, the following specific information:
   b. Required BMP’s to be installed at the start of construction.
   c. Locations and construction details of all ditches, berms, culvert pipes, filters, and basin outfalls.
   d. Locations, types and quantities of all seeding, slope coverings, and ditch liners
   e. Proposed reroutes of existing surface water and underground drainage within site to erosion control facilities prior to release to the offsite storm drain or sanitary sewer system. Refer to Section 01 57 24, Temporary Site Water Discharge.
   f. Location of all facilities that are designed to treat sediment-laden runoff prior to the runoff being discharged to the existing drainage system. In lieu of providing onsite treatment of the runoff the runoff may be collected and hauled off site for treatment using an approved method.
   g. Location of outlets of subsurface drainage system

4. Design a wheel wash for all construction conditions to remove particulate matter that would otherwise be deposited on area roadways. Equip wheel wash with a fully automatic flocculent dosing system that promotes sludge settlement.
   a. Use a closed-loop recirculating design that is separate of a wastewater treatment facility storage and settling pond.
   b. Include BMPs for the wheel wash discharge water to meet applicable city, state and federal permits and requirements for containment, treatment and disposal as explained in Section 01 57 24, Temporary Site Water Discharge.
   c. Include backup design criteria for approval.
   d. Include maintenance procedures.
   e. Designed to clean tires and truck under carriage.

5. Collect, treat, and dispose of water used for sawcutting and slurry cuttings produced by the sawcutting operation in accordance with applicable permits and requirements. Refer to Section 01 57 24, Temporary Site Water Discharge, for handling of process water.

6. BMP installation, maintenance, removal, and inspection.

7. Construction stormwater runoff conveyance, storage, treatment, and discharge.

8. Hazardous materials storage and handling, including fueling of vehicles and power equipment. Limit bulk fuels storage and secondary containment facilities to a maximum total of 250 gallons.

9. Plans for the transport and offsite disposal of all construction spoils, solid wastes, including wastewater and excavated soils.
10. Collect any floating debris that enters the water during construction once per day. Contain and secure this material on site, and then dispose of it at the appropriate upland facility. If heavy debris or deleterious material enters the water and sinks, record the location of the material in a log that is kept through the duration of the project. When construction is completed, employ a diver to remove this material/debris and dispose of it at the appropriate upland facility.

11. Prevent solid and liquid waste from entering the water.

12. Provide mitigation measures to prevent disturbances of aquatic habitat and environments.

13. Conform to the following surface water drainage requirements as applicable to the specific sites:

   a. SMMWW.
   b. City of Seattle Critical Areas Ordinance.
   d. FDI.

14. .

PART 2 - PRODUCTS

2.01 SUMMARY

A. The materials, BMPs, and methods listed below are some of the materials, BMPs, and methods that the Contractor may choose to use in meeting the requirements of this Section. Those listed are commonly used on construction sites in the area. Unless otherwise noted, the materials, BMPs, and methods listed are not required and the list of materials, BMPs, and methods is not intended to be all-inclusive. 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. Wattles: Cylinders of biodegradable plant material such as straw, coir, or wood shavings encased within biodegradable or photodegradable netting.

   1. Use rolls at least six (6) inches in diameter, unless otherwise specified.

B. Quarry Spalls: Meet the requirements of COS Standard Specifications, Section 9-13.7, Quarry Spalls, 4-inch to 8-inch.

C. Reinforced Plastic Fabric:

   1. Construed, copolymer laminate.
   2. Reinforcing: Non-woven grid of high strength nylon cord submerged in a permanently flexible adhesive medium.
   3. Equal tear resistance in all directions.
   4. Ultraviolet light stabilized.
5. Material to be from a single manufacturer.

6. Physical strength requirements:
   a. Tear strength: 130 pounds in accordance with ASTM D1004.
   b. Elongation: 620 percent in accordance with ASTM D882.
   c. Minimum life expectancy: 2-1/2 years of normal outdoor exposure.

D. Fabrics/Mats/Blankets
   1. Geotextile fabric:
      a. Temporary silt fence geotextile fabric shall meet the following:

<table>
<thead>
<tr>
<th>Geotextile Property</th>
<th>Test Method</th>
<th>Posts with Wire or Polymeric Mesh</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOS sieve</td>
<td>ASTM D4751</td>
<td>0.60 millimeters maximum for woven film (30 US Std. Sieve)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.30 millimeter maximum for all other geotextile types (50 US Std. Sieve) and 0.15 millimeter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>minimum (100 US Std. Sieve)</td>
</tr>
<tr>
<td>Water permittivity</td>
<td>ASTM D4491</td>
<td>0.02 sec$^{-1}$ minimum</td>
</tr>
<tr>
<td>Grab Tensile Strength, min. in machine and x-machine direction</td>
<td>ASTM D4632</td>
<td>100 pounds minimum</td>
</tr>
<tr>
<td>Ultraviolet (UV) Radiation Stability</td>
<td>ASTM D4355</td>
<td>70 percent strength retained minimum, after 500 hrs. in weather meter</td>
</tr>
</tbody>
</table>

   2. Permanent revegetation mat
      a. Highly flexible polymeric mat with a three-dimensional web-like weave.
      b. Color: Green.
      c. Biologically inert.
      d. Acid and alkaline resistant.
      e. Ultraviolet degradation resistant.
      f. Physical properties:
         1) Porosity: 85 percent to 95 percent.
         2) Flexibility: 2000 milligrams per centimeter (mg/cm) ASTM D1388.
         3) Weight: 18 ounces per square yard (oz/sy) ASTM D3776.
         4) Thickness: 0.12-inch ASTM D1777.
         5) Tensile strength: Length 15 pounds, width five (5) pounds.
         6) Elongation: Length 150 percent, width 100 percent.

   3. Erosion control blankets
      a. Biodegradable wood materials.
b. No chemical additives.
c. Photodegradable extruded plastic netting top and bottom.
d. Smolder resistant.
e. Physical properties of blanket for slope protection:
   1) Weight: 0.98 pound per square yard (lbs/sy).
   2) Netting: 1-inch by 2-inch.
f. Physical properties of blanket for channel protection:
   1) Weight: 1.0 lb/sy.

E. Triangular Silt Dikes
   1. Made of urethane foam sewn into a woven geotextile fabric.
   2. Dike is 10 inches high with a 20-inch base and seven (7) feet long.
   3. A two (2)-foot apron extends beyond both sides of the triangle.
   5. Provide a sleeve one end to allow attachment of additional sections as needed.

F. Wire Fabric
   1. 2-inch by 4-inch mesh, 14 gage.

G. Hold Downs:
   1. Sandbags.
      a. Secure with 1/4-inch polypropylene rope at ten feet on center maximum each way.
      b. Anchor rope with 2-inch by 4-inch fir, standard or better.
      c. Use sand bags filled with clean, poorly-graded, round pea gravel.

H. Perforated Pipe: Polyethylene drainage tubing, ASTM F405 and AASHTO M252.
J. Grass Seed: Composed of the following seed mixture and rate of application indicated unless otherwise specified:

<table>
<thead>
<tr>
<th>Kind &amp; Variety of Seed in Mixture</th>
<th>Percent By Weight</th>
<th>Minimum Percent Purity</th>
<th>Minimum Percent Germination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turf-type Perennial Rye</td>
<td>50</td>
<td>98</td>
<td>90</td>
</tr>
</tbody>
</table>

SEED MIX NO. 1 (EROSION MIXTURE)
(three approved types)

<table>
<thead>
<tr>
<th>Grass Type</th>
<th>Coverage</th>
<th>Height</th>
<th>Germination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creeping Red Fescue</td>
<td>20</td>
<td>98</td>
<td>90</td>
</tr>
<tr>
<td>Chewings Fescue</td>
<td>20</td>
<td>98</td>
<td>90</td>
</tr>
<tr>
<td>Hard Fescue</td>
<td>10</td>
<td>98</td>
<td>90</td>
</tr>
</tbody>
</table>

The rate of application is five (5) pounds per 1000 square feet.

K. Fertilizer: Conform to COS Standard Specification, Section 9-14.3.

L. 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.


N. Asphalt Berm: As detailed in the Reference Drawings and supplemented with COS Standard Specifications Section 8-06. Asphalt: As specified in Section 32 12 16, Asphalt Paving.

O. Stabilized Construction Entrance: Meeting the requirements as stated in the COS Construction Stormwater Control Technical Requirements Manual, BMP E2.10.

P. Inlet Protection: Specifically designed for catchbasins and inlets, made of a filter fabric insert with a 48 inches by 36 inches adapter skirt, retrieval strap, overflow bypass, and sediment accumulator. Inlet protection by Silt Sack, Streamguard or approved equal.

Q. Temporary Storage Tanks: Provide a minimum storage tank size of 4,000 gallons. Use a portable tank to allow tank movement around the construction site as the work progresses. Use tanks with a minimum of two (2), 3-inch valves and a 22-inch entrance to allow for easy cleaning and/or vacuuming of removed sediments.

R. Washed Gravel: 3/4-inch to 1-1/2 inch minimum diameter washed gravel.

**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.

1. During the construction period at each Site, no disturbance beyond the clearing/construction limits is permitted.

2. Maintain the clearing/construction limits for the duration of construction.

B. Temporary spoil piles:

1. Cover the piles after two (2) Days of inactivity during the wet period and seven (7) Days of inactivity during the dry period.

2. Place all excavated material not hauled directly from the construction site in a temporary spoil pile surrounded by ecology blocks or equivalent.
3. Control water seepage and runoff and direct to water treatment system. Treatment of seepage and runoff from piles is required prior to discharge from site.

C. Unless otherwise indicated, clean all catch basins and pipes prior to paving and upon completion of construction, in accordance with the COS, Standard Specification Section 7-07.3. Coordinate and obtain approval from Seattle Public Utilities (SPU) prior to flush of storm sewer and drains. If using water from the Seattle water system, obtain and pay for a fire hydrant use permit as needed. A backflow prevention device will be required and will be inspected by SPU at time of permit purchase. Do not flush sediment-laden water into the downstream system from the cleaning operation.

D. Stockpile on-site sufficient BMP materials and supplies to protect the entire site.

E. 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. Wattles: Installed in accordance with the SMMWW.

B. Quarry Spalls:
   1. Install at locations required by the Plan and in accordance with the SMMWW.

C. Plastic sheeting:
   1. Install in accordance with COS Standard Specifications on all excavation faces and stockpiles.
   2. Completely cover stockpiles including slope faces.
   3. For short term installations (two months or less) overlap joints with minimum two (2) feet lap and tape seam. For longer-term installation (two months or more) overlap joints with a minimum of three (3) feet.
   4. Anchor plastic sheeting in 2-foot-by-2-foot trench around the entire perimeter of stockpile or exposed slopes.
   5. Install hold-downs at all excavation faces and at stockpiles.
   6. Secure hold-downs with polypropylene rope at ten feet on center, maximum each way, across the entire surface of plastic sheeting.
   7. Anchor the polypropylene rope by driving 2-inch by 4-inch stake at the top of excavations or bottom of stockpiles and tying rope to stake.

D. Silt Fence:
   2. Excavate a trench, roughly eight (8) inches wide and 12 inches deep, upslope and along the line of the posts to allow the filter fabric to be buried.
   3. Bury wire and filter fabric into and above the ground in accordance with the COS Standard Specification 8-01.3(10)A. Do not staple filter fabric to existing trees or install within the “Critical Root Zone”, and obtain approval from Resident Engineer before installation within the outer drip line of existing trees designated to remain. Refer to COS Standard Specification Section 1-07.16(2).
4. When Extra-Strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case, take extra care to staple or wire the filter fence fabric directly to the posts with all other provisions of the standard notes still applying. Use extra care when joining or overlapping these stiffer fabrics.

5. Backfill the trench with 3/4-inch to 1-1/2-inch minimum diameter washed gravel or native soil.

6. Remove filter fabric fences when the upslope area has been permanently stabilized or just prior to paving. Remove retained sediment and properly dispose of or rake smooth, mulch, and seed sediment left in place.

7. Repairs:
   a. Promptly repair any rips, tears, holes, and other defects in the geotextile fabric or the backing or both by placing new material(s) over the damaged materials the full width and height of fence including buried or covered fabric and backing. Overlap existing fence material(s) a minimum of five (5) feet each side of the defect. Support the repaired fence by securely tying it to five (5) evenly spaced posts.
   b. Replace broken posts with two (2) posts spaced one (1) foot on each side of the broken post driven 30 inches into the soil, or braced to upslope anchors. Securely tie the fabric and backing to each new post.
   c. Replumb posts that lean greater than 1H:4V and support them at the top with bracing or guying to an adequately installed upslope anchor.
   d. Repair the silt fence where water or sediment is escaping beneath it by installing new fabric and backing over the existing material extending three (3) feet upslope with a minimum 3-foot overlap on both sides. Place large aggregate ballast over the surface repair with a minimum 6-inch depth. Install a new post or posts along the leak with spacing not exceeding two (2) feet. Repair or replace immediately any other conditions that reduce the effectiveness of the silt fence.

E. Triangular silt dike:
1. Install with ends curved up to prevent water from flowing around the ends.
2. Attach the fabric flaps and check dam units to the ground with wire staples. Wire staples: No. 11 gauge wire and 8 inches to 12 inches in length.
3. When multiple units are installed, overlap the sleeve of fabric at the end of the abutting unit and staple.
4. Locate and install check dams as soon as construction allows.
5. Place check dams perpendicular to the flow of water.
6. When used as check dams, secure the leading edge with rocks, sandbags, or a small key slot and staples.
7. In the case of grass-lined ditches and swales, remove check dams and accumulated sediment when the grass has matured sufficiently to protect the ditch or swale unless the slope of the swale is greater than four (4) percent. Seed and mulch the area beneath the check dams immediately after dam removal.
F. Mulch:
1. Apply mulch in accordance with COS Standard Specifications, Section 8-01.3(6).
2. When indicated by the Plan to apply a separate mulch application for an area in addition to seeding, apply mulch immediately following the seeding.
3. Mulch by approved hand methods areas that are not accessible by mulching equipment.

G. Grass seeding:
1. Revisit all disturbed areas prior to the beginning of the wet season to identify which ones can be seeded in preparation for the wet season.
2. Install surface runoff control measures such as gradient terraces, interceptor dikes or swales, level spreaders and sediment traps/basins prior to seeding.
3. Cultivate all areas to be seeded to meet the COS and Ecology requirements.
   a. Cultivation may be accomplished by diskng, raking, harrowing, or other acceptable means. Perform all cultivating at right angles to the slope.
5. Seeding may be accomplished by approved hand methods when impracticable to do by hydroseeding.
6. Seed disturbed areas within one (1) week of the beginning of the wet season.
7. Fertilize all areas which are seeded.

H. Inlet Protection:
1. Install in accordance with COS Standard Specification 8-01.3(12).

I. Gravel Filter Berm:
1. Install in accordance with COS Construction Stormwater Control Technical Requirements Manual, BMP E3.25.

J. Stabilized Construction Entrance:
1. Install in accordance with COS Construction Stormwater Control Technical Requirements Manual, BMP E2.10.

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 TESC practices as needed to ensure continued performance of their intended function. Conduct all maintenance and repair in accordance with the approved TESC Plan(s).

J. Inspect and maintain the TESC facilities on inactive sites daily or 24 hours following a storm event.

K. Operate and maintain storm and surface water facilities as follows:
   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. Remove sediment, trash, and debris from catch basin interiors when debris exceeds 1/3 of the depth from bottom to pipe invert.
   5. Perform inspection for systems using catch basin inserts. Clear or replace clogged fabric.
   6. Immediately remove all sediment accidentally introduced into a catch basin.
   7. 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.
8. If dead animals or other health hazards are present, contact local health department and/or animal control regarding removal and disposal.

L. 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.

M. Remove particulate matter deposited on paved public roads, sidewalks and bicycle and pedestrian paths to reduce mud and dust. Refer to Section 01 57 19, Temporary Environmental Controls.

N. Collect, treat, and disposal of water used for and slurry and cuttings produced by the sawcutting operation:

   1. Vacuum slurry and cuttings during cutting and surfacing operations continually with a wet-vac carried by laborer directly behind the cutting operation.
   2. Do not leave slurry and cuttings on permanent concrete or asphalt pavement overnight.
   3. Do not allow slurry and cuttings to drain to all natural or constructed conveyance system.
   4. Dispose of collected slurry and cuttings in a manner that does not violate groundwater or surface water quality standards.
   5. For disposal and treatment methods, Refer to Section 01 57 24, Temporary Site Water Discharge.

O. Continually monitor operations to determine whether slurry, cuttings, or process water could enter waters of the state. If inspections show that a violation of water quality standards could occur, stop operations and immediately implement preventive measures such as berms, barriers, secondary containment, and vacuum trucks.

P. 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.

Q. 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.

F. Be solely responsible for all damages, fines, levies, judgments, stop work orders, and related schedule impacts incurred as a result of Contractor, Subcontractor, or Supplier failure to comply with the requirements of this Section. Said damages, fines, levies, or judgments will be deducted from payments due. The project schedule will not be changed to accommodate the time lost.

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. 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 S1.40 Specifications and Verification Procedures for Sound Calibrators
   c. ANSI S1.43 Specifications for Integrating-Averaging Sound Level Meters
   d. ANSI S2.4 Auxiliary Analog Equipment for Shock and Vibration Measurements

2. International Electrotechnical Commission (IEC)
   a. IEC 60942 Electroacoustics – Sound Calibrators
   b. IEC 61672 Electroacoustics – Sound Level Meters

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. Sound Level Measurements: A-weighted and “slow” and “fast” response readings from instruments complying with TYPE 1 requirements of American National Standard Institute (ANSI) S1.4, Specification for Sound Level Meters, and S1.43 Specifications for Integrating-Averaging Sound Level Meters or CLASS 1 requirements of the International Electrotechnical Commission (IEC) 61672.

C. A-Weighted Sound 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 recorded root mean square (RMS) A-weighted sound level for a given time interval or event with “fast” time weighting, which is defined as having a time constant of 125 milliseconds.

H. 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.

I. Maximum percentile Sound Level $L_{01}$: Represents the level exceeded 1% of the time, or 36 seconds in an hourly period, and is very useful for identifying louder construction sound emissions with minimal influence of ambient conditions

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)


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 5 years experience in construction noise analysis and control.

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 or will be applying for a Major Public Project Construction (Noise) Variance (MPPCV) at the U District Station site, the Roosevelt Station site and the Maple Leaf Portal site. The final noise levels will be defined in said MPPCV at each of the three construction sites.

B. Perform Work within the permissible noise and vibration levels, work schedule limitations, and procedures provided for in this Section, the MPPCV 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 that 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 daytime and nighttime Leq and Lmax 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.

c. Summary of Code requirements pertaining to daytime and nighttime noise emissions from the site, special permissions and mandatory mitigation measures included in the MPPCV, and any additional noise mitigation measures necessary to satisfy Project requirements.

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. The Plan must comply with the terms and conditions of approval of the MPPCV approved for the construction site.

4. Prepared and certified by the Acoustic Specialist.

B. Noise Mitigation Measures - If the results of the noise calculations indicate that noise level limits will be exceeded, identify additional noise mitigation measures to be used during the work (include both mandatory and additional noise mitigation measures), their anticipated effects (dBA reductions), and a schedule for their implementation. Recalculate 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 Code and MPPCV requirements.

C. 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. Furnish noise and vibration monitoring data to the Resident Engineer on a weekly basis, or as otherwise required by any approved MPPCV for the construction site. 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.

3. 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. The vibration monitoring locations 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. The noise monitoring locations at construction sites governed by an approved MPPCV shall be located in accordance with said MPPCV. For construction sites not governed by an MPPCV, noise measurements are 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.

4. Vibration sensitive building plan
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 NOISE MEASUREMENT EQUIPMENT

A. Perform noise measurements using permanently installed sound monitoring stations equipped with the following measurement and documentation devices:

1. Sound level analyzer with the following capabilities:
   a. Capable of measuring A-Weighted sound levels.
   b. Type 1 rating as delineated in ANSI S1.4 and S1.43, or Class 1 rating per IEC 61672.
   c. Continuous broadband logging of one-second $L_{eq}$ and $L_{max}$
   d. Continuous spectral logging of one-second $L_{eq}$ and $L_{max}$
   e. Periodic reporting (at least 15 and 60 minutes) of $L_{0,1}$ based on the “fast” A-weighted sound pressure level
   f. Capability to record sound files (minimum sampling rate 24 kHz) based on a threshold trigger event, adjustable in 1 dB increments, and capable of triggering on the “fast” time weighted sound pressure level.
   g. Sufficient internal memory and power supply for one week of logging, with sound recordings

B. One random-incidence microphone housed in an environmental shroud, providing protection from rain and wind conditions. The environmental shroud should be capable of outdoor measurements for at least one year without service or replacement. The sound level analyzer shall be able to compensate for the presence of the shroud. Calibrate sound level analyzer, microphones, and calibrators annually at a National Voluntary Laboratory Accreditation Program (NVLAP)-accredited acoustical laboratory for certified laboratory conformance. Submit a current certificate of conformance to the Resident Engineer before using the sound level meter and submit updated certificates following subsequent calibrations or upon the completion of repairs to the instrument. Field calibrations shall be performed not less than weekly. Charge Injection Calibration (CIC) is acceptable for weekly calibration checks for long-term monitoring setups. However, an acoustic calibrator conforming to ANSI S1.40 or IEC 60942 shall be used for calibration not less than monthly. Clearly note in monitoring reports when calibrations cause changes in sensitivity by 1 dB or more.

2.03 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 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 waveform 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 GENERAL

A. Do not exceed the maximum permissible sound levels required under Seattle’s Noise Control Code during the hours of construction, except as otherwise allowed under an approved MPPCV or other noise variance approved by the City of Seattle.

B. Work shall be performed in accordance with noise mitigation, control, and monitoring requirements listed in 3.03, 3.04, 3.05, and 3.06 during all hours of operation. When work is performed during nighttime hours under any approved noise variance, conditions of the noise variance shall be observed. In the case of conflicting requirements between this specification section and variance requirements, the more restrictive requirement shall govern.

C. For operation of construction equipment that could exceed allowable noise limits during nighttime hours between the hours of 10 pm and 7 am weekdays and 10 pm and 9 am Saturdays, Sundays or legal holidays, the Contractor must obtain appropriate noise variance from the City of Seattle. Contractors are given noise performance criteria that they are required to meet during nighttime hours. This criteria gives the Contractor flexibility of either prohibiting certain noise generating activities during nighttime hours or providing additional noise control measures to meet these noise limits.

D. 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.

E. The noise levels should be measured at the nearest monitoring points.
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. Table 4 contains the threshold vibration limits for construction vibration monitoring.

B. For all areas, conduct construction activities so that vibration levels at the nearest affected building monitoring points 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 3.

C. Vibration levels at buildings affected by construction operations refer to vertical direction vibration on ground surface or building floor.

D. 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 geophones to structure face or columns. Mount geophones level and orient towards the construction activity.

3. See Contract Specifications Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork, for other installation, monitoring, and reporting requirements.

E. Conduct daily measurements of vibration during peak vibration generating construction activities. Any activities that may produce vibration levels above values shown in Table 3 whenever a structure is located nearby the construction activity are subject to vibration monitoring. Peak vibration generating construction activities are limited in the design.

3.03 CONSTRUCTION METHODS – EQUIPMENT

A. 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 Control Code limitations.

C. Construction equipment, both stationary and mobile, should be of recent manufacture and incorporate effective noise-suppression design, including features such as shrouds, baffles, and mufflers or as recommended by the manufacturers. Locate stationary equipment that generates noise away from sensitive receptors and shield with a noise-attenuating barrier or shroud.

D. Line or cover storage bins and chutes with sound-deadening material. Ensure all vehicles engaged in loading on-site have lined truck beds.

E. Provide mufflers or shield paneling for other equipment, including internal combustion engines, recommended by manufacturers thereof.

F. Blasting, impact pile driving, vibratory sheet installation and vibratory rollers 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 and vehicles.
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 as approved by Seattle Department of Transportation.
1. Conduct truck loading, unloading and hauling operations so noise and vibration are kept to a minimum.

2. Limit the time that steel decking or plates for street decking or covering excavated areas are in use.

3. 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 as required to meet the noise limits specified and satisfy Code and MPPCV conditions.

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 FAST response of the sound level meter.

3. Fit the measurement microphone with an appropriate windscreen at a location approved in the Noise and Vibration Control Plan.

4. Take noise measurements of $L_{eq}$, $L_{max}$, and $L_{01}$ at each of the locations approved in the Noise and Vibration Control Plan, at least once each week during one daytime period and one nighttime period, and after a change in construction activity or construction location. Measure for not less than 15 minutes with continuous sound recording during the measurement period. Longer monitoring periods or continuous monitoring shall be performed at Sound Transit’s direction, utilizing level-triggered sound recording features to identify sound sources that may be associated with noise limit exceedances.

5. 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.

6. If, in the estimation of the person performing the measurements, non-Project 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 ambient noise level.

7. 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, ambient, on-going construction) on the form.

8. 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 nearby properties.
9. 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 nearby properties.

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>
<thead>
<tr>
<th>Vibration Type (Permissible Duration)</th>
<th>Vibration Limit (RMS VdB re 1 microinch/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustained (≥ 1 hr/day)</td>
<td>80</td>
</tr>
<tr>
<td>Transient (&lt; 1 hr/day)</td>
<td>90</td>
</tr>
<tr>
<td>Transient (&lt; 10 min/day)</td>
<td>100</td>
</tr>
</tbody>
</table>

TABLE 4. THRESHOLD VIBRATION LIMITS FOR CONSTRUCTION VIBRATION MONITORING

<table>
<thead>
<tr>
<th>Location</th>
<th>IES Standard</th>
<th>Peak Particle Velocity (in/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery Pavilion</td>
<td>VC - C</td>
<td>0.008</td>
</tr>
<tr>
<td>Wilcox Hall</td>
<td>VC - D</td>
<td>0.002</td>
</tr>
</tbody>
</table>

END OF SECTION
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>Category (b)</th>
<th>Model (c)</th>
<th>ID No. (d)</th>
<th>HP (e)</th>
<th>Noise Level</th>
<th>Date</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>At 50 Feet (f)</td>
<td>Begin (g)</td>
<td>End (h)</td>
</tr>
</tbody>
</table>

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 three months.

PART B: CALCULATED CONSTRUCTION NOISE LEVELS AT NEAREST RESIDENTIAL AND COMMERCIAL RECEIVERS FOR EACH CONSTRUCTION ACTIVITY

<table>
<thead>
<tr>
<th>Nearest Noise Sensitive Receivers</th>
<th>Calculated Sound Pressure Level (dBA)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Equipment used for each construction activity is taken from Part A of the Noise Control Plan, report L_{eq} and L_{max} values.

NOISE MITIGATION MEASURES  ANTICIPATED EFFECTIVENESS (REDUCTION IN DBA)

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:

Location No (if approved in Noise and Vibration Control Plan):

Wind Speed: ___________ Km/Hr  Direction:
             (MPH x 1.6)

Weather Conditions (clear and sunny, rainy, overcast, foggy, etc.):

Location of Sound Level Meter: (Daytime - No closer than 15 meters from loudest piece of equipment and 3 meters from any building, Nighttime – use approved measurement location per the Noise and Vibration Control Plan)

Monitoring was Conducted: _________ Meters from Equipment (_______________)
             (Type(s): Leave Blank for Baseline)

Property Zoning: □ Residential □ Commercial  □ Industrial

Sound Level Meter: Make and Model: ___________  □ A - Weighted Sound Level (Fast)

Duration of Measurement: (15 minutes to 1 hour)

<table>
<thead>
<tr>
<th>CALIBRATION LEVEL</th>
<th>Limit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leq</td>
<td></td>
</tr>
<tr>
<td>L01</td>
<td></td>
</tr>
<tr>
<td>Lmax</td>
<td></td>
</tr>
</tbody>
</table>

Field Notes;

Check one of the following:

□ Ongoing Construction □ Post-Construction: ___________  □ Ambient (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.

2. Section 01 35 30, Hazardous and Contaminated Material Health and Safety Program.
3. Section 01 35 40, Hazardous and Contaminated Material Air Monitoring.
4. Section 01 35 43.15, Unknown Hazardous and Contaminated Substances.
5. Section 01 57 13, Temporary Erosion and Sediment Control.
6. Section 01 57 15, Temporary Construction Noise and Vibration Control.
7. Section 01 57 24, Temporary Site Water Discharge.
8. Section 01 74 00, Cleaning and Waste Management.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents:

1. Washington Administrative Code (WAC):
   a. WAC Chapter 173-303 Dangerous Waste Regulations.

2. Other Agency Requirements
   a. National Pollution Discharge Elimination System Permit (NPDES Permit).
   b. City of Seattle (COS) Critical Area Ordinance.

1.03 DEFINITIONS

A. Bulk Fuel – Fuel in quantities greater than 250 gallons.

B. Hazardous or Contaminated Waste – Material generated by the Contractor’s operations that is either Hazardous or Contaminated.

C. PM10 – Particulate Matter 10 microns in diameter or less.
D. 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.

1.04 SUBMITTALS:

A. Procedures: Section 01 33 00, Submittal Procedures.
B. Contractor-Generated Hazardous and Contaminated Waste Management Plan.
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. Coordinate 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 Temporary Erosion and Sediment Control Plan(s): Within 21 Days of effective date of NTP. Coordinate plan(s) with requirements of Section 01 57 13, Temporary Erosion and Sediment Control.
F. Qualifications for Construction Site Environmental Management Supervisor.
G. Spill Control Plan: As required under the Clean Water Act and related federal and state laws and regulations, within 21 Days of effective date of Notice to Proceed (NTP). Coordinate plan with requirements of Section 01 57 24, Temporary Site Water Discharge.
H. Noise and Vibration Control Plan and Noise and Vibration Monitoring Plan: In accordance with Section 01 57 15, Temporary Construction Noise and Vibration Control.
I. Citations issued in conjunction with this project.
K. Waste Management Plan: Refer to Section 01 74 00, Cleaning and Waste Management
L. Waste Management Report: Refer to Section 01 74 00, Cleaning and Waste Management

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. Spill Control Plan.
   3. Air Pollution Control Plan.
   4. Storm Water Pollution Prevention Plan: Section 01 57 24, Temporary Site Water Discharge.

B. Qualifications:
1. Construction Site Environmental Management Supervisor (CSEMS):
   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 5 years of experience being responsible for construction site erosion and sediment control regulatory requirements, BMPs, TESC Plan development, and stormwater monitoring.
   c. Approved by the Resident Engineer, to implement, manage, and enforce compliance with the requirements herein.
   d. Be stationed locally and available accompany the Resident Engineer and Washington State Department of Ecology (DOE) personnel during weekly inspections of all BMPs at a time designated by the Resident Engineer.

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 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. 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.

1.07 AIR POLLUTION CONTROL PLAN

A. Implement best management practices of dust control technologies so that no visible emissions beyond the site boundaries occur.

B. Prevent odors that interfere with public, including limiting use of chemical products and keeping construction equipment in good mechanical condition to minimize exhaust emissions.

C. The application of any chemical dust suppressants must be approved by the Resident Engineer prior to use.

1.08 ENVIRONMENTAL COMPLIANCE MANUALS

A. Prepare manual for the U District Station, Roosevelt Station, and Maple Leaf Portal Construction Sites.

B. Include the following information in the manual:
   1. Surface water discharge treatment system operation and maintenance manual.
   2. Sanitary sewer discharge treatment system operation and maintenance manual.
3. Permits that should be included, but not limited to are:
   a. Grading.
   b. Noise variance.
   c. NPDES permits.
   d. Sewer discharge permits.

4. 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 POLLUTION CONTROLS - GENERAL
   A. 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:

3.02 AIR POLLUTION CONTROLS
   A. Noise and Vibration Control: Refer to Section 01 57 15, Temporary Construction Noise and Vibration Control.
   B. Criteria for Fugitive Dust:
      1. 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.
      2. Take precautions to minimize fugitive dust emissions from operations involving demolition, excavation, grading, clearing of land, and disposal of solid waste.
      3. 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.
   C. The following procedures and techniques shall 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.
      1. 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 and secure all loads of materials, debris, and soil transported from construction sites. Immediately remove spillage resulting from hauling operations along or across public traveled ways.
      2. Cover loads of hot asphalt to minimize odors.
3. 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.

4. Establish regular cycles and locations for cleaning trucks that haul soil from site.

5. 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.

6. Use water sprinkling, temporary enclosures, and other methods to minimize dust and dirt migration. 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.

7. Promptly clean up spills of transported material on public streets and roads.

8. Prevent runoff of all water used for dust control from entering storm drains or waters of Washington State.

9. 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.

10. To the maximum extent practicable, establish and maintain records for routine maintenance program for all hauling trucks used for the Contract. Keep records available for inspection by the Resident Engineer.

11. Do not allow internal combustion engines to idle on City streets and State & Federal highways.

12. Use electrically-powered equipment where needed to meet requirements.

13. Make equipment for fugitive dust control available at all times.

14. Each quarter, wash windows and exterior walls of buildings within areas specified in Exhibit A – U District Station Site, Exhibit B – Roosevelt Station Site and Exhibit C – Maple Leaf Portal Site.

15. 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.

16. 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.

17. Report all complaints from the public to the Resident Engineer.

18. If portions of the site are temporarily inactive or abandoned for whatever reason, provide dust control and abatement continuously during periods of inactivity.

3.03 STORM WATER POLLUTION CONTROLS

A. 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.

B. Cover, containment, and protection from vandalism shall be provided for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment. On-site fueling tanks shall include secondary containment.

C. Refer to Section 01 57 24, Temporary Site Water Discharge.

D. Conduct fueling only in designated controlled locations with appropriate BMPs installed to contain and absorb potential spills. No bulk fuel storage greater than 250 gallons may be stored on the construction site or staging areas.

E. Temporary Erosion and Sediment Control:
   1. 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, and Section 01 57 24 – Temporary Site Water Discharge, City of Seattle and WSDOT Standard Specifications.

F. Maintaining Flow of Sewers and Drains:
   1. 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.
   2. Do not allow the contents of sewer, drain, or inlet connection to flow into trenches.
   3. Maintenance of sewers and drains may require, at the Contractor’s expense, the use of temporary pump stations with backup generators.

G. Mud Control
   1. Take proper measures to prevent tracking of mud or other debris onto public and private 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. Immediately remove mud or other debris 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. The Resident Engineer may require additional cleaning if in his/her opinion excessive mud or other debris is present.
   3. Street Sweeping
      a. Provide street sweeping and watering down services on streets, sidewalks, driveways, and parking areas surrounding construction sites. Promptly clean up spills of transported material on public and private roads and parking lots by sweeping. Coordinate with traffic control requirements, Section 01 55 26, Traffic Control.
      b. Mechanical Street Sweeper shall have a combination of mechanical brushes, water spray, and vacuum system capable of trapping and
preventing fugitive dust emissions and removal of sediment present on the roadway as a result of contractor activities.

4. Wheel / Truck Wash
   a. Where construction vehicles a leave a muddy site and enter paved public streets, maintain a stabilized construction entrance, BMP C 105, and a suitable truck wheel-washing facility. Clean all trucks, or other vehicles leaving the site, of mud and dirt, including the exterior body surfaces of vehicles.
   b. Include water spray nozzles aimed at tires and undercarriage.
   c. Ensure water pressure and volume rates are sufficient to clean.
   d. Include other methods, such as laborers with hoses, when needed to meet requirements to prevent mud and debris being transported off-site.
   e. Design to meet Ecology BMP C106 in Chapter 4, Volume II, SMMWW, or equivalent.
   f. Use a closed-loop recirculating design that is separate from a wastewater facility storage and settling pond.
   g. Do not discharge wash water to storm drain system.
   h. Include BMPs for the wheel wash discharge water to meet applicable city, state and federal permits and requirements for containment, treatment and disposal as explained in Section 01 57 24, Temporary Site Water Discharge.

5. Equipment Wash
   a. Do not discharge thinners or solvents into the sanitary or storm sewer systems when cleaning large machine parts where discharge of water is required. Use alternative methods for cleaning larger equipment parts such as high pressure, high temperature water washes, or steam cleaning.
   b. Equipment washing detergents can be used and wash water discharged into the sanitary sewer system if grit is removed from the solution first. Do not exceed the discharge limits set by the sewer authority with the water discharged into the sewer.
   c. Small parts can be cleaned with degreasing solvents which are reused or recycled. Do not discharge solvents into storm sewer in accordance with the SMMWW, nor into sanitary or combined sewer system.
   d. Do not discharge process water from equipment washing to the storm drainage system. Refer to Section 01 57 24, Temporary Site Water Discharge.

H. Sawcutting: Collect, treat, and disposal of water used for and slurry and cuttings produced by the sawcutting operation:
   1. Vacuum slurry and cuttings during cutting and surfacing operations continually with a wet-vac carried by laborer directly behind the cutting operation.
   2. Do not leave slurry and cuttings on permanent concrete or asphalt pavement overnight.
3. Do not allow slurry and cuttings to drain to all natural or constructed conveyance system.

4. Dispose of collected slurry and cuttings in a manner that does not violate groundwater or surface water quality standards.

5. For disposal and treatment methods, Refer to Section 01 57 24, Temporary Site Water Discharge.

I. Continually monitor operations to determine whether slurry, cuttings, or process water could enter waters of the State. If inspections show that a violation of water quality standards could occur, stop operations and immediately implement preventive measures such as berms, barriers, secondary containment, and vacuum trucks.

3.04 CONTRACTOR-GENERATED HAZARDOUS OR CONTAMINATED WASTE CONTROLS

A. 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.

B. Spill Control Plan

1. Spill Prevention, Control, Containment, and Countermeasures Plan (SPCCC)

   a. Adopt a Spill Control Plan and identify persons responsible for implementing the plan if a spill of a dangerous or hazardous waste should occur,

   b. Identify on a drawing for each Site: Staging, storage, maintenance and refueling locations and their relationship to drainage pathways, waterways, and other sensitive areas.

   c. Identify spill prevention and containment methods to be used at each Site.

   d. Identify site security measures, inspection procedures and personnel training procedures as they relate to spill prevention containment, response, management, and cleanup.

   e. Address: Equipment maintenance, refueling, and cleaning activities and on site storage areas for hazardous materials.

   f. 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.

   g. Consider use of less toxic vegetable-based biodiesel and hydraulic oils as alternatives to petroleum-based fuels and oils.

   h. Chemical storage:

      1) 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.

2) Store all chemical products on durable impervious surfaces and within bermed containment capable of containing 110 percent of the largest single container in the storage area.

3) Identify and implement reasonable steps to prevent releases of liquid products from malicious tampering or vandalism.

4) Store liquid products under cover, such as tarpaulins or roofed structures.

5) Clearly designate all waste storage areas, whether for waste oil or hazardous waste, as such and keep segregated from new product storage.

6) Segregate non-compatible chemicals and securely store in separate containment areas that prevent mixing of incompatible or reactive materials.

7) Stop and store all empty barrels that have not been cleaned in an upright position.

i. 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.

j. Fuel Storage: All portable fuel storage tanks shall be:

1) Specifically engineered to meet or exceed all national environmental and hazardous waste regulations.

2) Underwriters Laboratory (UL)-certified and National Fire Code compliant.

3) Durable, all steel, double wall construction.

4) Have a secondary shell providing up to 110% containment.

5) Coated with a weather and corrosion-resistant exterior.

6) Provided with an interstitial space check port to help identify any possible fluid release.

7) Have a maximum storage capacity of 250 gallons.

8) Accompanied by a spill kit and fire extinguisher staged within 15 feet.

2. Spill Response Plan

a. Report all spills that occur regardless of the size or type of the spill to the Resident Engineer. Maintain a log of all spills.

b. Submit a Spill Report Information Form to the Resident Engineer for all spills greater than one gallon.
c. The Spill Report Information Form shall be retained on-site available for review upon request of the Resident Engineer, local, and state agencies.

d. The provided Spill Report Information Form (Exhibit D) shall be used, and any modifications to the form must be approved by the resident Engineer.

e. 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.USG.MIL/INDEX.HTM and notify the regional Department of Ecology Office.

f. 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.

C. 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.

D. 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 clean up and disposal of Hazardous or Contaminated Wastes that are accidentally released during performance of the Work.

E. 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.

3. Refer to Section 01 35 43.15 for additional requirements.

3.05 EXHIBITS

A. 
B. 
C. 
D. Spill Reporting Information Form

END OF SECTION
### SPILL REPORTING INFORMATION FORM

Please complete this form and retain on file.

<table>
<thead>
<tr>
<th>Person reporting spill:</th>
<th>Telephone number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of spill:</td>
<td>Time of spill:</td>
</tr>
<tr>
<td>Time / Date spill was cleaned up:</td>
<td></td>
</tr>
<tr>
<td>Source of Spill – Equipment:</td>
<td></td>
</tr>
<tr>
<td>Material type:</td>
<td></td>
</tr>
<tr>
<td>Material quantity:</td>
<td></td>
</tr>
<tr>
<td>Weather conditions:</td>
<td></td>
</tr>
</tbody>
</table>

**Spill reported to:**
- Police/Fire Dept. (911)
- Ecology – (425) 649-7000
- Sound Transit – Resident Engineer
- National Response Center 800-424-8802
- Spill Response Subcontractor
- Other: __________________________

**Cause(s) and effect(s) of spill:**

- Spill containment and clean up procedures initiated:

- Description of spill location and surroundings:

- Corrective actions taken to prevent future incident:

- Agency(s) on the scene:

- Report completed by:
  - Printed Name: ________________________________
  - Signature: __________________________________
  - Title: ______________________________________
  - Date: ____________________________

**END OF EXHIBITS**
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 (CSEMS) shall be responsible for all work specified herein. Refer to Section 01 57 19, Temporary Environmental Controls for The CSEMS qualifications.

C. Site Water discharge flow according to Exhibit 1.

1.02 REFERENCES

A. Referenced Standards: This Section incorporates, by reference, the latest revisions of the following documents.


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. FOG: Fats, oils and grease.

F. Groundwater: Water in a saturated zone or stratum beneath the land surface or a surface of water.

G. Initial Site Construction Activities:
   1. Mobilization of equipment and materials.
   2. Temporary security fence installation.
   3. Sediment Control BMP’s (sediment ponds, storage tanks, traps, filters, silt fences, stabilized construction entrances, etc.) shall be constructed as one of the first steps in grading. These BMP’s shall be functional before other land disturbing activities take place.
   4. Start-up of treatment systems.
   5. Major grading not allowed except as needed for BMP construction.

H. KCDNRP: King County Department of Natural Resources and Parks.

I. Leachate: Water that has become contaminated by contact with material within the soil profile.

J. Non-Compliance Event (or Events): Occurrence where surface water, groundwater, or sanitary sewer water discharge or discharge to groundwater exceeds allowable discharge limits.

K. 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 all raw material, intermediate product, finished product, byproduct, or waste product.
3. Water used for sawcutting.

4. Decant water, originating as either groundwater or added potable water, from excavated spoils that contain additives, conditioners including bentonite, cementitious materials, or pollutants.

5. Water in bottom of tunnel and station box excavation.

6. Water entering the excavation from or through soldier pile and lagging or secant pile walls or invert slab and including any working slab areas.

7. Water discharge from slurry mixing and treatment plant and jet grouting operation.

8. Site water in contact with and chemically affected by site conditions which cannot be treated on site to meet surface water discharge criteria.

L. Site Water:

1. All water on the Work Site that requires discharge from the Site.
   a. Classified as either: Stormwater, Dewatering Water, Sanitary Sewage, or Process Water.

M. Stormwater: Water originating as precipitation that does not infiltrate into the ground or evaporate.

N. Surface Water:

1. Lakes, Rivers, Federal Waters and Waters of the State.
2. Wetlands, streams, and open drainage channels.
3. City of Seattle stormwater system.

O. Wet Weather Discharge: Any measurable precipitation in Site rain gauge during previous 72 hours at time of discharge.

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 a pretreatment system shall be approved and by King County and Seattle Public Utilities (SPU) prior to commencement of discharges to the sanitary sewer.

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 and dispose of solid and liquid wastes generated by construction activity (such as demolition debris, construction materials, contaminated materials, and waste materials from maintenance activities, including liquids and solids from street sweeping operations, cleaning catch basins and other stormwater and wastewater pretreatment facilities), in accordance with:

1) NPDES Permit Special Conditions S3, Compliance with Standards.

2) WAC 173-216-110, and other applicable regulations.

c. 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 mils plastic liner or six (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 State waters without providing “all known, available, and reasonable methods of treatment” (AKART), nor allow such leachate to cause violations of surface water quality standards (Chapter 173-201A WAC), or ground water quality standards (Chapter 173-200 WAC).

5. Chemical Usage:
   a. Use chemicals according to the manufacturer’s instructions.
   b. Do not use chemical if its toxicity to aquatic organisms is not known.
   c. Any chemical usage for stormwater treatment requires prior approval from the Washington State Department of Ecology. Submit the request for chemical treatment usage 30 days prior to the anticipated usage date.

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.
4) Seattle Municipal Code Chapter 22.800-808.
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) The benchmark value for turbidity is 25 NTU or less.
8) Do not discharge Process Water or domestic wastewater to Surface Water or Groundwater.
9) Comply with the Effluent Limitations in Table 1.

TABLE 1 - EFFLUENT LIMITATIONS: DISCHARGES TO SURFACE WATER

| Parameter                                      | Maximum Daily
|-----------------------------------------------|-----------------
| Turbidity<sup>1</sup>                         | 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.
| Turbidity (non-chemical treatment)<sup>2</sup> | 25 NTU, or less |
| Turbidity (chemical treatment)<sup>2,4</sup>  | Do not exceed 5 NTU for the maximum daily average. |
| Total Petroleum Hydrocarbons<sup>3</sup>      | 5 mg/L          |
| pH                                            | In the range of 6.5 to 8.5 standard units with a human-caused variation within a range of less than 0.2 unit. |

<sup>1</sup>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 discharge stream(s) or receiving water body.

<sup>2</sup>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.

<sup>3</sup>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).

<sup>4</sup>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 local permitting authority:
   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 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 FOR 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>
<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 1</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 2</td>
</tr>
<tr>
<td>Temperature</td>
<td>NA</td>
<td>NA</td>
<td>150 degrees F 3</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>
<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>
</tbody>
</table>

1. At no time two (2) successive readings on an explosive hazard meter at any location be more than five (5) percent of the lower explosive limit. Ensure no single reading exceed ten percent of the lower explosive limit.


3. Ensure that Discharge do not cause the temperature of the sanitary sewer to exceed 104 degrees F. Maintain the temperature of the discharge within 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 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, organic compound listed in 40 CFR 433.11 (e) Total Toxic Organics (TTO) definition, acetone, 2-butanone (MEK), 4-methyl-2-pentanone (MIBK), and xylenes.

e. Implement good “housekeeping” in order to prevent a concentrated discharge of a pollutant.

f. Treat the 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 Major Discharge Authorization.

h. The discharge-receiving sewer shall be kept clear of blockages at all times. Coordinate any cleaning or access to SPU utilities with SPU.

1.05 SUBMITTALS

A. Storm Water Pollution Prevention Plan (SWPPP) - see Section 01 11 00, Summary of Work.

1. 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.

2. 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.

B. Surface Water Discharge: Related Documentation

1. Treatment System design info, monitoring procedures. (If needed to comply with Surface Water Discharge Requirements):

   a. Separate submittals for each of the proposed treatment systems.

   b. Proposed modifications to the Treatment System.
2. Monitoring Results: Quantity and Quality, daily for each discharge location.

3. Temporary Discharge Plan in accordance with COS Standard Specifications 8-01.3(2)D.


5. Contingency Plan.

6. Obtain Surface Water Discharge submittal approvals prior to start of Initial Construction Activities in conjunction with authority and approval of local jurisdictions.

C. Sanitary Sewer/Combined Sewer Discharge: Related Documentation

1. Treatment Systems design information and monitoring procedures.
   a. Separate submittals for each of the proposed treatment systems.
   b. Proposed modifications to the Treatment Systems.

2. Industrial Waste Discharge Permit Application. See Section 01 11 00, Summary of Work.

3. Monitoring Results: Quantity and Quality, 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. Operation and Maintenance Manuals: Submit operation and maintenance instructions and data for equipment provided herein, 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, 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, and how to meet them.

1.08 SITE WATER DISCHARGE RELATED DOCUMENTATION

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 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 Code Title 28 and the King County Major 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.

1.09 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. 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, including City of Seattle, King County, and Ecology.

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 Waste Discharge Permit.

4. Submit the report within two (2) days after the initial Event occurrence or one (1) day after receiving Independent Testing 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 BMP's to bring discharge into compliance.

1.10 SANITARY AND COMBINED SEWER DISCHARGE AND OFFSITE DISPOSAL DOCUMENTATION

A. Treatment and Disposal:

1. Submit a report outlining how process water discharges to the sanitary and combined sewer will be treated and/or disposed of:

   a. Ensure the report is 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 to the Resident Engineer, prior to any pretreatment system modifications or upgrades.

   d. Method to convey or truck Site Water from the Site.

   e. Water discharge to sanitary sewer is acceptable under the conditions of the authority and approval of the local jurisdiction.

   f. Discharge of Site sanitary sewage from Contractor sanitary facilities to the Sanitary Sewer System is acceptable with approval of the local permitting authority.

   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) Provide all receiving facility permit profiles for treating, handling, recycling or disposing of waste materials.

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.

h. Local jurisdiction approval of the pretreatment facility plan and 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 upon becoming aware of a Non-compliance Event.

2. Submit a written report of the violation to the Resident Engineer 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 (2) days after the initial event occurrence or one (1) day after receiving Independent Testing Laboratory results, whichever time is shorter.

C. Contingency plan shall include provisions for the following:

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.
1.11 CHEMICAL USAGE DOCUMENTATION

A. Document and submit chemicals used to treat water discharged to Surface Water.

B. Document the following:
   1. Identification of chemical used.
   2. Commercial source.
   3. Material Safety Data Sheet (MSDS).
   4. Quantities used.
   5. Quantities of water treated.
   6. Dosage rate.

C. Provide Certification as described in 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.

1.12 CERTIFICATION

A. Include in monitoring reports, non-compliance notifications, and chemical usage documentation 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.”

1.13 PERMITS OBTAINED BY SOUND TRANSIT AND THE CONTRACTOR

A. Comply with Notice of Intent procedures to obtain 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 11 00, Summary of Work, for additional requirements of the Permit.

   2. 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, including City of Seattle, King County, and Ecology.

   3. 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.

   4. Does not include water rights to allow beneficial use of groundwater or surface water.
5. Requires monitoring as specified herein.
6. Limits quantity of discharge as specified herein.
7. Maintain a copy of the NPDES Permit and Site Specific SWPPP at each construction Site office.

B. Major Discharge Authorization (Waste Discharge Permit):
1. Refer to Section 01 11 00, Summary of Work, for additional requirements of the Permit.
2. Obtained by Sound Transit for the N125 Northgate Link Extension, North Portal to UW Station 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 in conjunction with authority and approval of local jurisdictions.
4. Requires monitoring as specified herein.
5. Limits quantity of discharge.
6. Maintain a copy of the Major Discharge Authorization at each construction Site office.

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 0.10 inch.
5. If a plastic gauge is used:
   a. Gradations: at a minimum every 0.05 inch.

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 of the Project’s NPDES permit.

   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.
      3) All testing requirements shall be in accordance with the Project’s NPDES permit.

2. Collect water samples for all construction locations in accordance with the Project’s NPDES permit.

3. Rain gauge:
   a. Read each Day (Monday through Sunday) at 9:00 am local time.

4. Frequency of monitoring is modified in Table 4 after a Non-compliance Event. See Article 3.02A.13.f herein for frequency of monitoring after a Non-compliance Event.

5. Samples and measurements represent the volume and nature of the monitoring parameters, including representative sampling of all 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 the Resident Engineer. 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:
   a. Monitor nonpolar fats, oils, grease (FOG), pH, and settleable solids at each Site where there is a discharge in accordance the Project’s NPDES Permit.
   b. Record nonpolar FOG as follows:
      1) Collect three (3) grab samples of equal volume collected at least five (5) minutes apart and analyzed separately.
      2) Report total nonpolar FOG as average of the three (3) samples.
      3) If the average value is greater than 100 milligrams per liter, report the three (3) 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 in-line 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. Flow meter to be non-resettable.

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 (1) 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 (3) 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 all facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required.

   d. Sample or monitor all substances or parameters at all locations to ensure Contract compliance.

3.03 EXHIBITS

A. Temporary Site Water Discharge Flow Chart

END OF SECTION
TEMPORARY SITE WATER DISCHARGE FLOW CHART

---

1. **Stormwater**
   - Treatment (1)
   - Meets IWD Permit Requirements
     - No → Implement Contingency Plan
     - Yes → To Sanitary Sewer
   - To Sanitary Sewer
     - Implement Contingency Plan
     - No → Meets NPDES Discharge Requirements
       - No → State Waters Discharge Monitoring Location
         - (1) Treatment Shall Be Separate
       - Yes → To Lake Union
   - To Lake Union

2. **Dewatering**
   - Able to be Treated to Meet NPDES Permit Requirements
     - Yes → Treatment (1)
     - No → Consult with Local Agencies for Sewer Discharge Permission
       - Implement Contingency Plan
       - No → To Sanitary Sewer
         - Implement Contingency Plan
         - No → Meets NPDES Discharge Requirements
           - No → State Waters Discharge Monitoring Location
             - (1) Treatment Shall Be Separate
           - Yes → To Lake Union
   - To Lake Union

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END OF EXHIBIT
SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for:
   1. Existing and new product requirements.
   2. Procedures for selecting products.
   4. Nameplates
   5. Spare parts and maintenance materials.
   6. 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 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.

2.05 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.

2.06 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. 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 requirements 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, As-Built Drawings.
   2. Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork.

1.02 REFERENCES

A. WSDOT Standard Specifications
B. City of Seattle Standard Specifications

1.03 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.
B. Qualifications.
C. Calibration reports, upon request.
D. Survey field notes and all survey calculations.
E. Record Drawings (as-built drawings)
   1. Stamped, signed, and dated by Licensed Professional Land Surveyor registered in the State of Washington
   2. In accordance with Section 01 78 39, As-Built Drawings.
   3. In Adobe Acrobat 7.0 or later PDF format
F. Settlement monitoring surveys in accordance with Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork.

1.04 QUALITY ASSURANCE

A. Qualifications:
2. Chief Tunnel Surveyor: Previous experience with tunnel boring machine guidance system and trained by the guidance system supplier.

1.05 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 Surveyor licensed 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 and the local jurisdiction 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 Sound Transit. 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. 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. Carry out instrument calibrations prior to the start of survey work and every 12 months thereafter. Furnish calibration reports upon request.

3. 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.

4. The Contractor's surveys are a part of the Work and may be checked by the Resident Engineer at any time. Be responsible for lines, grades, or measurements that 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.

5. 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.

6. In advance of any restoration paving, produce survey information to check the line and grade used for paving elevations and slopes.

7. 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 underground station section.

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 for the tunneling progress, whichever comes first or as required by the Resident Engineer. 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 an As-Built Drawing, indicating the results of the survey and any deviation from the tolerances indicated in Section 31 71 19, Tunnel Excavation by Tunnel Boring Machine.

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
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>Horizontal Survey Stake or Markers</td>
</tr>
<tr>
<td>------------------------------------</td>
</tr>
<tr>
<td>Distance</td>
</tr>
<tr>
<td>------------------------------------</td>
</tr>
<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>
</tr>
<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>
</tr>
<tr>
<td>Structures, building construction</td>
</tr>
<tr>
<td>Equipment installation</td>
</tr>
<tr>
<td>Trimming or preparation of earth subgrade for roadways, concrete pipe, and other concrete structures</td>
</tr>
<tr>
<td>Roadway subbase 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>
</tbody>
</table>

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.
<table>
<thead>
<tr>
<th>Vertical Grade Stakes or Markers for:</th>
<th>Elevation (plus/minus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough excavation and embankment for roads and other work not otherwise provided for</td>
<td>0.10 foot</td>
</tr>
<tr>
<td>Trimming of excavation and embankment, unless otherwise provided for</td>
<td>0.10 foot</td>
</tr>
<tr>
<td>Trimming or preparation of earth subgrade for roadways, concrete pipe, and other concrete structures</td>
<td>0.05 foot</td>
</tr>
<tr>
<td>Roadway subbase and base, steel pipe, and other work not otherwise provided for</td>
<td>0.05 foot</td>
</tr>
<tr>
<td>Roadway surfacing, steel reinforcement, and other formed concrete</td>
<td>0.02 foot</td>
</tr>
<tr>
<td>Structures, building construction</td>
<td>0.01 foot</td>
</tr>
<tr>
<td>Equipment installation</td>
<td>As required by manufacturer</td>
</tr>
</tbody>
</table>

END OF SECTION
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: 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 33, Photographic Documentation
2. Section 01 35 91, Historic Treatment Procedures
3. Section 31 50 00, Excavation Support and 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. Qualifications for independent third party pre-construction inspectors for utilities and buildings, if required.

D. 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. 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.

I. 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.

J. Major underground utilities:
   1. Be responsible for all protection, effects, 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.

K. Minor underground utilities:
1. Be responsible for all protection, effects, and damages on minor utilities.

2. Sound Transit is not responsible for costs resulting from conflicts with minor underground utilities.

L. Remove, plug, or fill abandoned pipelines per the local jurisdiction’s requirements.

M. 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.

N. Aboveground electrical, cable, and communication facilities:
   1. Attention is called to all overhead items including, but not limited to, power and telephone lines, 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.

O. 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.

P. 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.

Q. 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.

R. 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.

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 of all historic buildings listed in Section 01 35 91, Historic Treatment Procedures. Have an independent third party perform pre- and post- construction survey inspections for all buildings shown in the Contract Drawings with Structure Settlement Points. No building survey is required for historic properties that do not include buildings.

B. Submit the third party independent subcontractor's qualifications to the RE for review, prior to authorization of work.

C. The third party inspection firm shall have a minimum of five years performing work of similar nature.

D. 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.

E. Document all visible cracks, defects or unusual conditions. Document and record all comments made by property owners during inspections.

F. Coordinate all pre-construction surveys with the Resident Engineer. Do not perform pre-construction surveys unless accompanied by the Resident Engineer.

G. Require third party to maintain the original inspection reports until Final Acceptance.

END OF SECTION
SECTION 01 74 00
CLEANING AND WASTE MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section specifies requirements for administrative and procedural requirements for construction waste management and cleanup 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 Control

2. Section 01 57 24, Temporary Site Water Discharge

1.02 SUBMITTALS

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

B. Waste Management Plan: Within 21 days of effective date of NTP.

1. 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.

2. 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.

3. 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.

4. 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.

5. Contact Information: Include in the Plan the name and contact information of the person designated as responsible for implementing the Waste Management Plan.

C. 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.

D. 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. Provide daily litter pickup and general cleanup within the Construction Limits indicated in the Contract Drawings and up to 50 feet away from the Construction Limits. Clean up both construction and non-construction material, including such things as drug paraphernalia and human waste. Provide trash receptacles for worker’s lunches, cigarette butts, and other miscellaneous garbage. Assume no less than 1 hour per day for this activity.

1. Dispose or recycle waste, trash, and debris in a safe, acceptable manner, in accordance with applicable laws and ordinances.

2. Bury no waste material and debris on the site.

3. Burning of trash and debris on the site is prohibited.

C. Remove graffiti from walls, trailers, and equipment within 24 hours.

D. Remove materials and equipment from the site when no longer necessary.

E. Maintain planted landscape areas adjacent to the construction site. Mow and weed areas as needed.

F. Dust Control: Refer to Section 01 57 19, Temporary Environmental Controls.

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 all 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.

D. 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.

E. Clear and clean drainage systems.

F. Tunnels and Cross Passages:

1. Prior to final inspection, remove all construction equipment from the tunnels and cross passages.

2. Power wash, sweep, remove all debris, and flush drains in the tunnels and cross passages.
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.

3.04 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 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.

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 74 00, Cleaning and Waste Management.

1.02 QUALITY CONTROL
A. Facilities: Maintain facilities in accordance with the Contract Documents until Acceptance. 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. General: Complete requirements prior to Final Inspection:
B. 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.
C. Remove or prepare temporary facilities per Section 01 12 19, Contract Interface.
D. Clean the site and all applicable appurtenances and improvements as specified in Section 01 74 00, Cleaning and Waste Management.
E. Properly mount operating instructions for equipment and post as specified or required.
F. Complete As-Built Drawings, specifications, and as-built surveys, and submit to the Resident Engineer as specified in Section 01 78 39, As-Built Drawings. Also include the required closeout documents in the O&M Manuals described in Section 01 78 23, Operation and Maintenance Data.

G. Warranties

1. Prepare a listing of all warranties (manufacturers’, special, etc.) required by the Contract, citing the corresponding specification section and paragraph for each warranty, to the Resident Engineer (RE) for review and approval within 45 days of the Notice to Proceed.

2. Prepare a written document, ready for execution by the Contractor, or the Contractor and subcontractor, supplier, or manufacturer for each special warranty as specified. Unless otherwise specified, submit drafts to the RE for approval not later than 30 days prior to the Pre-final Inspection. Refer to the individual Sections for specific content and other requirements for special warranties.

3. Include all warranties required by the contract, including special warranties, in the final Operations and Maintenance Data submission.

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).
   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.
   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 26 – Electrical.
   f. 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. Submit Operations and Maintenance Manuals no later than 60 days before commencement of start-up, testing & commissioning activities. 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 of 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 includes requirements for preparation, maintenance, completion, and submission of As-Built Drawings.

1.02 SUBMITTALS
A. Incremental As-Built Drawings, within 14 days of request by the Resident Engineer
B. Final As-Built Drawings, within the time frame specified in the General Conditions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL
A. Utilize full-sized Contract Drawings for the As-Built Drawings. Update to show:
   1. Dimensions and details of field changes made by Contractor.
   2. Changes made by Change Order, approved Substitution request or approved deviation request.
   3. Clarifications to details identified by Field Clarification or Request for Information (RFI).
   4. Dimensional location of all embedded, buried and concealed features as placed by Contractor, including mechanical pipe, electrical conduit, structural embedments, and items not located or shown on the Drawings but placed by Contractor.
   5. Dimensional location of substantially differing site conditions of existing utilities, structures, and objects exposed, but not placed, during construction.

3.02 MARKING DEVICES
A. Use colored pencils or pens to annotate As-Built Drawings, using the following conventions:
   1. Red: Information to add to the electronic record drawings.
   2. Green: Information to delete from the electronic record drawings.
   3. Blue: Communications, instructions, or reference information used to clarify changes to be made to the electronic record drawings (but not itself added). This may include dimensions and references to other documents.
B. Stamp set “As-Built.”

3.03 RECORDING

A. General:
1. Record changes concurrently with construction progress. No Work shall be covered or concealed until the As-Built information is obtained and documented.
2. Record actual arrangement and routing of embedded conduit and piping relative to visible structural items. Dimension conduit and piping off of walls, columns, or other similar features.
3. Provide coordinates obtained from As-Built field surveys in tabular format on the As-Built Drawings.

B. Minimum Recording Standards:
1. Graphical Sketch: If the Contract Drawings are not of sufficient size, scale, or the detail/level-of-change is too complex to incorporate directly on the drawings, include a sketch to convey the change information. Sketch can originate from:
   a. Change Documentation: Provided in response to an RFI, through a Field Clarification, or other similar document.
   b. Contractor Generated: If no sketch from the change documentation exists, provide one.
2. Sketches shall include:
   a. Sufficient details and dimensions to accurately locate all objects within the Conformed Drawing
   b. The change documentation number, if applicable (e.g., RFI number, Field Clarification number) and the related As-Built Drawing number, in blue pen or pencil
   c. The change documentation sketch number, if applicable, in blue pen or pencil
      1) If none exists, create a sketch identification number and note directly on the sketch and the related As-Built Drawing (e.g., U250-ABS-0001, U250-ABS-002).
3. As-Built Drawings shall include:
   a. The cross referenced sketch identification number and change documentation number, if applicable

C. The following are prohibited:
1. Simply referencing change documentation without supporting graphical information
2. Providing information that is irrelevant to changes in the drawings

D. Other:
1. Do not include information related to Change Notice – Request for Proposals.
2. Store sketches separately from the Conformed Drawing in a neat and organized manner, and submit with As-Built Drawings.

3.04 MAINTENANCE AND VERIFICATION

A. At the request of the Resident Engineer, make available for verification that the As-Built Drawings are being maintained with current information, that the information is being recorded in a legible and neat manner, and that the information is accurate and complete.

B. If the As-Built Drawings are not being maintained in a satisfactory manner, the Resident Engineer may withhold part or all of a monthly progress payment, until the As-Built Drawings have been brought current with neat, legible and accurate information.

3.05 INCREMENTAL SUBMISSIONS

A. At the request of the Resident Engineer, submit:

1. Reproductions of RE-selected As-Built Drawings and related documentation, including sketches, in the same size, scale, and color as the original

2. Color scanned, electronic Portable Document Format (PDF) files of incremental As-Built Drawings with a minimum density of 300 dpi

B. Incremental submissions do not constitute the final deliverable. Continue to maintain the original As-Built Drawings, recording any subsequent changes to them through the construction period. Deliver as part of the entire As-Built Drawing set.

C. Incremental submissions shall not exceed more than three (3) requests per 12 month period. Total number of sheets for all requests shall not exceed half the original number of sheets in the Conformed Document set.

3.06 FINAL SUBMISSION

A. Submit:

1. Reproductions of Final As-Built Drawings and related documentation, including sketches, in the same size, scale, and color as the original, to the Resident Engineer for review and acceptance

2. Color scanned, electronic Portable Document Format (PDF) files of Final As-Built Drawings with a minimum density of 300 dpi

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. Removal and disposal of pavements, curbs, and sidewalks, and other facilities.

2. Protect trees outside of the limits of construction and as indicated in the Contract Documents.

3. Remove monitoring wells in accordance with WAC 173-160 Monitoring Well Abandonment, and Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork.

4. Remove utility poles within five days of all tenants vacating poles. The utility pole shall become the property of the Contractor.

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 12 16, Work Sequencing.

2. Section 01 12 19, Contract Interface.


4. Section 01 45 00.20, Quality Assurance / Quality Control.

5. Section 01 50 00, Temporary Facilities and Controls.

6. Section 01 56 39, Temporary Tree and Plant Protection.

7. Section 01 57 19, Temporary Environmental Controls.

8. Section 01 74 00, Cleaning and Waste Management.

9. Section 01 78 39, As-Built Drawings.

10. Section 02 80 00, Removal and Handling of Coal Tar-Containing Materials

11. Section 03 05 15, Portland Cement Concrete.

12. Section 31 09 00, Geotechnical Instrumentation and Monitoring of Earthwork.
13. Section 31 11 00, Clearing and Grubbing.
14. Section 31 20 00, Earth Moving.
15. Section 32 13 13, Concrete Paving.

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.
B. Asphalt Concrete Pavements: Streets, driveways, alleyways, or other surfaces constructed from bituminous mix, or any combination of bituminous mixes or surfaces treatments.
C. Concrete Pavements: Streets, driveways, alleyways, or other slabs greater than six inches in thickness, constructed from portland cement concrete, including those constructed with an asphaltic overlay.
D. Concrete Sidewalks: Concrete slabs six inches or less in thickness, with or without asphaltic overlay.

1.04 SUBMITTALS
A. Procedures: Section 01 33 00, Submittal Procedures.
B. Demolition, Disposal and Salvage Construction Work Plan.
C. Permits:
   1. Demolition.
   2. Hauling and debris disposal.
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, and foundations left on site. Refer to Section 01 78 39, As-Built Drawings.
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 80 00, Removal and Handling of Coal Tar-Containing Materials.

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 and hours of operation.

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 00.20, 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. Install temporary chain link fencing around the area of work, as indicated on the Contract Drawings. Refer to Section 01 50 00, Temporary Facilities and Project Control.

2. 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.

3. 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.

4. Protect utilities, pavements, and facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by the demolition operations.

5. 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.

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.

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.

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 five (5) business days thereafter.

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.

6. Rodent Control Program to continue throughout demolition and utility relocation, and for 1 month following these activities. In addition, at the direction of the Resident Engineer, rodent control will continue to be applied to buildings in close proximity to the project site.

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 shown within the “Contractor Working Limits” may be removed by others prior to notice to proceed date of the N125 Contract. Verify the quantity of existing trees prior to starting work. Assume no salvage value for trees 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. Blasting will not be permitted.

C. Provide two weeks for moving of buildings after completion of Hazardous Material removal in the basement and foundation area, in accordance with Section 01 12 16, Work Sequence, and Section 01 12 19, Contract Interface.

D. 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.

E. 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 Project Control.

F. Demolish and remove foundations, footings, and grade beams.
G. Remove poles, signs and fences, including footings. Restore damaged concrete after
demolition. Remove overhead wires and lights before removal of poles. Removed
existing fencing materials may be reused for construction fencing, subject to approval by
the Resident Engineer.

H. Break up and remove asphalt and concrete pavement, curbs, walks, steps, retaining
walls, slabs and aprons.

I. 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 unless
otherwise shown on the Contract Drawings. 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.

J. Abandon Catch Basins, Valve Chambers, Manholes and Inlets as specified in the City of
Seattle Standard Specifications.

3.05 SALVAGE

A. Information is provided on the Contract Salvage the following items:

1. Brick pavers on east side Brooklyn Avenue NE to SDOT.

2. 20-inch gate valve in the valve vault at the northeast corner of the intersection of
   NE 63rd Street and 12th Avenue NE to SPU.

3.06 DISPOSAL OF DEBRIS

A. Divert, at a minimum, 75% of the materials resulting from Work under Bid Item No. (to be
determined), by weight, from Landfill disposal. Materials diverted from Landfill disposal
mean that the materials are salvaged, reused, recycled and not sent to any transfer
station or landfill.

B. Dispose of waste and excess materials at a legally licensed landfill/disposal facility.

C. Dispose of removed materials, waste, trash, and debris in a safe, acceptable manner, in
   accordance with applicable laws and ordinances and as prescribed by authorities having
   jurisdiction.

D. Remove trash and debris from the site at frequent intervals so that its presence will not
   delay the progress of the work or create unsafe or unsanitary conditions.

E. Provide records of disposal showing weight of materials and location and type of disposal
   site. Also provide a complete list of salvaged materials, including estimated weight.
   Salvaged materials will be used by Sound Transit to evaluate whether the recycled
   material requirements specified herein are met.

F. Runoff shall be contained so drainage through concrete spalls or debris remains on-site
   and does not go into storm drains without being treated.

3.07 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:

2. Section 01 35 30, Hazardous and Contaminated Substance Health and Safety Program.
3. Section 01 35 43.15, Unknown Hazardous and Contaminated Substances.
4. Section 01 35 43.20, Hazardous and Contaminated Substance Air Monitoring
5. Section 01 57 19, Temporary Environmental Controls.
6. Section 01 57 24, Temporary Site Water Discharge.
7. Section 31 20 00, Earth Moving
8. Section 31 23 19, Dewatering.
9. 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
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 29.20, Health, Safety, Security and Emergency Response Procedures:
   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, Hazardous and Contaminated Substance 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, Hazardous and Contaminated Substance 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, Health, Safety, Security and Emergency Response Procedures.

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 29.20, Health, Safety, Security and Emergency Response Procedures.

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 29.20, Health, Safety, Security and Emergency Response Procedures.

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 Material 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
PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section specifies requirements for removal, containment, storage, transportation, handling, disposal, and managing coating debris from the Water Transmission Main in 12th Avenue NE regulated as hazardous substances and Dangerous Waste, in accordance with applicable Federal, State, and Local Regulations.

1. Pipe exterior surfaces might have coal tar enamel or asphaltic coatings.
2. Pipe interior surfaces might have suspected coal tar enamel coatings, coated over with cement mortar.
3. Use controls, as appropriate to control all potential fugitive dust and protect workers against exposures.

1.02 REGULATORY REQUIREMENTS

A. Code of Federal Regulations (CFR)

1. 29 CFR 1910 Occupational Safety and Health Standards
2. 29 CFR 1926 OSHA Construction Standards
5. 40 CFR 261 Identification and Listing of Hazardous Waste
6. 40 CFR 262 Standards Applicable to Generators of Hazardous Waste
7. 40 CFR 263 Standards Applicable to Transporters of Hazardous Waste
8. 40 CFR 268 Land Disposal Restrictions

B. Washington Administrative Code (WAC)

1. WAC 296-24 General Safety and Health Standards
2. WAC 296-62 General Occupational Health Standards
3. WAC 296-155 Safety Standards for Construction Work
4. WAC 296-843 Hazardous Waste Operations
5. WAC 173-303 Dangerous Waste Regulations
6. WAC 123-304 Minimum Functional Standards for Solid Waste Handling
7. WAC 173-340 Model Toxics Control Act – Cleanup
C. Washington State Department of Ecology

1. Publication 94-49 Guidance on Sampling and Data Analyses Methods
2. Publication 97-602 Analytical Methods for Petroleum Hydrocarbons

D. Local health departments, landfill and disposal requirements.

1.03 REFERENCE STANDARDS

A. Steel Structures Painting Council (SSPC):
   1. Surface Preparation Specification No. 11 (SSPC-SP-11) - Power Tool Cleaning to Bare Metal.
   2. VIS 3-89 - SSPC Visual Standard For Power and Hand Tool Cleaning of Steel.

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, Security and Emergency Response Procedures
   2. Section 01 35 29.10, Hazardous and Contaminated Substance Health and Safety Program.

1.04 DEFINITIONS

A. Chipped Coal Tar Debris: all debris generated by the manual and mechanical removal of coal tar enamel coating from pipe interior.

B. Coal Tar Enamel: coating on the interior or exterior of pipes consisting of coal tar enamel and synthetic coal tar epoxy.

C. Contaminated Substance 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 296-843-120.

D. Certified Industrial Hygienist (CIH): A trained specialist with at least five 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.

E. Site Safety and Health Officer (SSHO): A trained specialist in health and safety with a minimum of three years’ experience and working knowledge of use of (Personal Protective Equipment) PPE, regulations and hazard identification.

F. 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.

G. 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 CS-HASP.
H. Contaminated Substance: General term for contaminated soil, groundwater, or other debris or environmental media. See definitions for Contaminated Soil and Contaminated Groundwater.

I. 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.

J. Dangerous Waste: As defined in WAC 173-303; the terms Dangerous Waste and Hazardous Waste (as defined in 40 CFR Part 261) are to be considered synonymous for this project.

K. Exclusion Zone: Area of exposed contamination designated for Hazardous or Contaminated Substance storage, excavation, or removal. All work performed within the Exclusion must be covered in the Contaminant Substance Health and Safety Plan (CS-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 CS-HASP.

L. 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 CS-HASP.

M. Permissible Exposure Limits (PEL): Maximum amount or concentration in air for each contaminant that a worker may be exposed to under OSHA regulations.

N. 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.

O. 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

P. Suspected Contaminated Material: Soil, groundwater, or other debris in contact or close proximity to known contaminated soil, groundwater, or other environmental media, and that has not been tested yet for verification of contamination levels; OR material having visual or odor evidence of contamination, OR environmental media that can reasonably be expected to be contaminated based on a Phase I, Phase II, Brownfields, or other environmental study.

Q. HAZWOPER: Hazardous Waste Operations and Emergency Response

R. MTCA: Washington State Model Toxics Control Act, Chapter 70, 105D, RCW

S. Engineering Control System: An engineered system for preventing uncontrolled emission of dust and particulates during removal, transfer, storage, and coating activities. Secondary Containment Unit: A locked, watertight structure of sufficient size to contain all coating and Contaminated Construction Debris in approved storage containers. The secondary containment shall be designed to retain 110% of the volume of the largest single container if any waste is in liquid form. Waste Manifest: Form used by generators, transporters, and Treatment, Storage and Disposal (TSD) facilities to track the movement and disposal of dangerous wastes. The manifest lists the type and quantity of waste, the generator it originated from, the transporter that shipped it, and the TSD to which it was shipped.
1.05 GENERAL REQUIREMENTS

A. As basis for bid, coal tar is assumed to be present in the exterior and interior of the Water Transmission Main in 12th Avenue NE.

B. The Work includes measures necessary to adequately protect workers from coal tar exposures during the general demolition process and surface preparation activities.

C. The Work includes measures necessary to adequately control dust during activities where coal tar-containing materials are disturbed as required by WAC 296-155-176 and air pollution standards as required by the Puget Sound Clean Air Agency (PSCAA).

D. Segregate coal tar components to be disposed of separate from general construction waste as required by WAC 173-303, Dangerous Waste Regulations. Include the proper packaging and disposal of coal tar-containing items in the Work.

E. Assume full responsibility and liability for compliance with Federal, State, and local regulations pertaining to work practices, hauling, disposal, and protection of workers, visitors to Site, and building occupants in areas adjacent to work areas.

1.06 SUBMITTALS

A. Procedures: Section 01 33 00, Submittals.

B. Submit a Workplan for Dangerous Waste Coatings Removal, presenting the methods to be used in compliance with labor and Industry requirements, at least 1 week prior to the pre-construction meeting. The Workplan may be submitted in conjunction with the Demolition Plan. No coating removal activities are allowed until the complete submittal package has been reviewed and accepted by the Resident Engineer. At a minimum, the Plan include the following components, if a chemical paint removal product is to be used:

   1. Material Safety Data Sheets (MSDS) for all products used for coatings removal

   2. Description of the method for application and removal of the chemical product. Address in the Plan the number of applications of chemical product to be used with a specified time allocation to yield acceptable coating removal.

   3. Plans for waste and product containment to assure that no releases to the environment or public occur during all phases of site work, onsite storage and offsite transport and disposal.

   4. Description of methods for conducting air monitoring to ensure that emissions of dust, particulates, and vapors do not exceed allowable limits as specified in the Contaminated Substance Health and Safety Program (CS-HASP), Section 01 35 30.

   5. Submit the plan for Contractor worker safety, including PEL and PPE, as part of the CS-HASP.

C. Provide documentation that the Washington State Department of Ecology certifies the analytical laboratory to perform the appropriate analyses.

D. Submit copies of waste profiles, waste and/or transportation manifests, and signed disposal certificates from the TSDF.

1.07 QUALITY ASSURANCE

A. Qualifications: Comply with experience requirements specified in Contaminated Substance Health and Safety Program (CS-HASP), Section 01 35 30.
B. Meetings: Contractor may be asked to attend regularly scheduled meetings to discuss issues related to coal tar containing material.

C. Surface Cleaning: Provide sufficient time and access for the Resident Engineer to inspect all pipe surfaces to verify that these specifications are being met.

D. Engineering Control Systems: Allow Resident Engineer access to inspect all engineering control systems to verify that the specifications are being met.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 REMOVAL OF COATINGS

A. Collect, store and manage all coating debris (chipped coal tar debris), and any other construction debris or soil that is contaminated by the coating debris as dangerous waste and hazardous substances as required under WAC 173-303. Stockpiling of coating debris on ground at the work site, or other releases to the environment are prohibited. Perform all on-site aspects of the sampling and transport for disposal of the dangerous waste. Coordinate loading, transport and off-site disposal of Dangerous Waste. Inform Resident Engineer at every step of the process. The Contractor is responsible for loading, transporting and off-loading of the recyclable wastes.

B. Ensure that no debris or dust escapes from either the inside or outside of the pipes during coating removal, transport, or any other site activity. Determine the required Engineering Control System, subject to the Resident Engineer's review and approval. Resident Engineer will suspend work, as specified in Article 1.07 of this Section, if emissions exceed allowable levels.

C. Remove coal tar or asphaltic coatings on the interior and exterior of the pipes within 4 inches of the cut lines if flame cutting is used.

D. Provide for inspections conducted and documented by the Resident Engineer and/or site health and safety supervisor as necessary to determine the effectiveness of the CS-HASP.

E. Remove coal tar enamel coating to bare metal for 6 inches on either side of weld lines. Remove the coating with hand or power tools. Operate appropriate equipment and engineering controls to control all dusts. Collect the debris into approved primary containers, label and store in secondary containment. Arrange and pay for disposal as Dangerous Waste.

3.02 STORAGE AND MANAGEMENT OF CHIPPED COAL TAR DEBRIS

A. Store collected chipped coal tar debris separately in DOT 17-C or DOT 17-H metal drums in accordance with WAC 173-303 and the approved Demolition Work Plan.

B. Immediately prior to use, initially label containers as "Dangerous Waste" in accordance with WAC 173-303-190, and changed to "Extremely Hazardous Waste" if the sample results so warrant. Provide durable labels, legibly marked with waterproof ink, including the following information: Identification of the Sound Transit location where the waste is generated, the facility contact person, and the site EPA generator ID number. Label the date accumulation begins in a container and the date the container becomes full.

C. Initially identify chipped coal tar debris from interior surface preparation as WP03 due to the carcinogenic characteristics of Polycyclic Aromatic Hydrocarbons. After Contractor
has performed sampling and the test results are available, adjust the waste identification numbers on the accumulated waste in accordance with the sample results. Differentiate between the initial waste identification and any change warranted by sample results.

D. Store and secure all waste drums and containers in a locked, watertight unit(s), subject to review by the Resident Engineer. Ensure that the secondary containment unit(s) are large enough to hold all drums and containers used for storage prior to shipment.

E. Perform the sampling activity to analyze the coal tar debris after the generation of each type of coating waste.

F. After reviewing the results of the analyses supplied by the Contractor, the Resident Engineer will direct the Contractor to make whatever changes are warranted to the drum labels.

3.03 TRANSPORT, DISPOSAL AND/OR RECYCLING OF COAL TAR DEBRIS

A. Perform all sampling, waste identification, waste profiling, preparation for disposal, and disposal of all debris and coating wastes.

B. Provide the appropriate Dangerous Waste manifests, along with appropriate container makings, labels, and placards required for transporting the Dangerous Waste Coating Debris and dangerous waste Contaminated Construction Debris.

C. Submit copies of all disposal documentation to the Resident Engineer.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

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.

1. This Section includes specifications for materials used in and for proportioning and prequalifying portland cement concrete mix designs.

2. 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 for Excavation Wall Facings, 31 74 16 Precast Concrete Tunnel Lining, 31 74 19.05 Shotcrete for SEM Tunnels, 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.

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 00.20, Quality Assurance/Quality Control
2. Section 03 30 00, Cast-In-Place Concrete
3. Section 03 35 00, Concrete Finishing
4. Section 03 37 13, Shotcrete for Excavation Wall Facings
5. Section 03 41 00, Precast Structural Concrete
6. Section 31 50 00, Excavation Support and Protection
7. Section 31 74 16, Precast Concrete Tunnel Lining
8. Section 31 74 19.05, Shotcrete for SEM Tunnels

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 121R Quality Management System for Concrete Construction
   c. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
d. ACI 229R Controlled Low-Strength Materials

e. ACI 301 Standard Specifications for Structural Concrete

f. ACI 304R Guide for Measuring, Mixing, Transporting and Placing Concrete

g. ACI 304.2R Placing Concrete by Pumping Methods

h. ACI 305R Hot Weather Concreting

i. ACI 306.1 Standard Specification for Cold Weather Concreting

j. ACI 311.5 Guide for Concrete Plant Inspection and testing of ready-Mix Concrete

k. ACI 318 Building Code Requirements for Structural Concrete

l. ACI 501 Guide to Shotcrete


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 Test Method for Compressive Strength of Cylindrical Concrete Specimens

d. ASTM C40 Standard Test Method for Organic Impurities in Fine Aggregates for Concrete

e. ASTM C42 Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

f. ASTM C88 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

g. ASTM C94 Standard Specification for Ready-Mixed Concrete

h. ASTM C127 Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate

i. ASTM C128 Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Fine Aggregate

j. ASTM C131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

k. ASTM C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

l. ASTM C138 Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

m. ASTM C142 Standard test Method for Slump of Hydraulic Cement Concrete

n. ASTM C150 Standard Specification for Portland Cement
o. ASTM C157 Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete

p. ASTM C172 Method of Sampling Freshly Mixed Concrete

q. ASTM C173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method


s. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete

t. ASTM C289 Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)

u. ASTM C295 Guide for Petrographic Examination of Aggregates for Concrete

v. ASTM C311 Standard Test Method for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete

w. ASTM C470 Specification for Molds for Forming Concrete test Cylinders Vertically

x. ASTM C494 Standard Specification for Chemical Admixtures for Concrete


z. ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

aa. ASTM C666 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

bb. ASTM C979 Standard Specification for Pigments for Integrally Colored Concrete

cc. ASTM C989 Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars

dd. ASTM C1017 Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete

ee. ASTM C1077 Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

ff. ASTM C1116 Standard Specification for Fiber-Reinforced Concrete and Shotcrete

gg. ASTM C1202 Standard Test Method for Electrical Indication of Concrete’s Ability to Resist Chloride Ion Penetration
hh. ASTM C1240 Standard Specification for Silica Fume Used in Cementitious Mixtures
ii. ASTM C1260 Standard test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
jj. ASTM C1293 Test Method for Concrete Aggregates by Determination of Length Change of Concrete Due to Alkali-Silica Reaction
kk. ASTM C1602 Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ll. 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

4. Washington State Department of Transportation (WSDOT)
a. Standard Specifications for Road, Bridge and Municipal Construction (WSDOTSS)

1.03 DEFINITIONS

A. Concrete Mix Designation: Concrete mixes are defined in Tables 03 05 15-A through Table 03 05 15-D (Exhibit Tables). 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 these tables.

B. Controlled Density Fill (CDF): Conform to Section 2-10.2(3)A3 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.

1.04 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures

B. Test Results and Certificates: For continuously approved mix designs as required in Part 3 of this Section, including the Department of Planning and Development (DPD) continuously approved mix data, if applicable, as specified in DPD Director’s Rule 12-2006.

C. Prequalification Test Program Plan and Schedule: To prequalify concrete mixes before start of Initial Testing, as required in Part 3 of this Section.

1. Proof that the mix is exempt from testing or has met Initial Testing requirements shall be submitted to Sound Transit and the Resident Engineer at least 30 Days before concrete placement.
D. Prequalification Test Report: For Initial Testing and Final Testing as required in Part 3 of this Section. Test results shall be reported in writing to Resident Engineer, concrete manufacturer, and Contractor within 48 hours of testing. The testing report, as a minimum, shall include the following:

1. Project identification name and number.
2. Date of concrete placement.
3. Name of concrete testing and inspecting agency.
4. Location of concrete batch in Work.
5. Design compressive strength.
6. Test results for all prequalification criteria identified in Exhibit Tables.
7. Strength gain with age (3-day, 7-day, 28-day, 56-day (if required)) as a minimum.
8. Concrete mixture proportions and materials.
9. Mix constituent ratios including (water)/(total cementitious material) ratio and (supplemental cementitious material)/(total cementitious material ratio).
10. Admixtures and their ratios.
11. Unit weight (density).
12. Slump.

E. Mix Supplier Requirements: For Batch Plant Prequalification, as identified in Part 3 of this Section, submit one of the following sets of documents:

1. Certification by the National Ready Mix Concrete Association (NRMCA): A copy of the current NRMCA Certificate of Conformance, the concrete mix design(s), along with copies of the truck list, batch plant scale certification, admixture dispensing certification, and volumetric water batching devices (including water meters) verification.

2. Independent evaluation certified by a Professional Engineer: A copy of the Professional Engineer’s stamped and sealed NRMCA Verification of Inspection and Application for Certificate page from the NRMCA checklist, the concrete mix design(s), along with copies of the truck list, batch plant scale certification, admixture dispensing certification, and volumetric water batching devices (including water meters) verification. The independent certification shall be kept current for the duration of the Contract.

3. Inspection conducted by the Plant Manager: Plant Manager certification, prior to the start of a project, and every 6-months throughout the life of the project, meeting the following requirements:

   a. The Agreement to Regularly Check Scales and Volumetric Batching Dispensers page in the NRMCA Plant Certification checklist shall be signed by the Plant Manager and notarized.

   b. The signed and notarized Agreement to Regularly Check Scales and Volumetric Batching Dispensers page and a copy of the NRMCA Plant Certification checklist cover page showing the plant designation, address and Company operating plant shall all be submitted to the Engineer with
the concrete mix design, along with copies of the truck list, batch plant scale certification, admixture dispensing certification, and volumetric water batching devices (including water meters) verification.

c. The NRMCA Plant Certification checklists shall be maintained by the Plant Manager and are subject to review at any time by the Owner.

d. Volumetric water batching devices (including water meters) shall be verified every 90-Days.

F. Concrete Mix Designs: For each Concrete Mix Designation identified in Exhibit Tables, 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: 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: Product data for each type, manufacturer’s written instructions for storage, handling, and use, and manufacturer’s certification that admixture is compatible with all other admixtures used in the mix design.
   g. Fibers: Manufacturer’s product data including product description, chemical and physical properties, and storage and handling instructions.

4. Documentation of Average Compressive Strength as required in Part 3 of this Section.

G. 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.
H. Qualification Certifications: Submit qualifications for the following:
   1. Concrete supplier
   2. Independent Testing Laboratory

I. Quality Program Plan: Section 01 45 00.20, Quality Assurance / Quality Control

1.05 QUALITY ASSURANCE

   A. Concrete Supplier: Current Certificate of Conformance for Concrete Production Facilities from the National Ready Mix Concrete Association.

   B. Independent Inspection and Testing Laboratory: In conformance with ASTM E329.

   C. Quality Program Plan: Develop a Quality Program Plan as defined in Section 01 45 00.20, Quality Assurance / Quality Control, in conformance with the recommendations of ACI 121R.

1.06 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 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 Exhibit Tables.

      2. Supplementary Cementitious Materials


C. Aggregates

1. Portland cement concrete aggregates shall be manufactured from ledge rock, talus, or sand and gravel conforming to ASTM C33, except as modified herein.

2. Conform to City of Seattle Standard Specification Section 9-03.1 or the Washington Department of Transportation Standard Specification Section 9-03.1 as applicable.

D. 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.

E. Water: Clean and potable, free of impurities detrimental to concrete.

F. Macro Synthetic Fibers: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1.5 to 2.5 inches long.

1. Products: Subject to compliance with requirements, provide the following:
   
   a. Grace Construction Products, W. R. Grace & Co.; Strux 90/40

   b. Approved equal

G. Micro Synthetic Fibers: ASTM C1116, Type III, monofilament polypropylene, 0.018 millimeters (mm) (18 µm) diameter.

H. Steel Fibers: ASTM A820, Type 1, cold drawn wire, aspect ratio between 45 and 80, with bent/deformed ends. Average tensile strength not less than 145,000 pounds per square inch (psi).

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
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, and/or project specific mix designs developed to exhibit all characteristics specified in this Section.

B. Existing concrete mix designs that are continuously approved with other agencies [City of Seattle Department of Planning and Development, the Seattle Department of Transportation, or the Washington Department of Transportation] may be proposed for acceptance as long as they fulfill all performance requirements specified in this Section.

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 required performance criteria for concrete placed and cured in accordance with anticipated construction means and methods.

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 shall be prequalified as outlined in Section 3.03.

D. Mix Designs: The concrete mixes shall be designed in accordance with the following:

1. Select mix proportions in conformance with ACI 211.1.

2. Prepare design mixtures for each Mix designation identified in Exhibit Tables, 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 concrete mixes that satisfy the performance criteria, limitations, quantities, and ratios outlined in Exhibit Tables.

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”.

b. Sieve analysis: ASTM C136
6. If trial batch data are used, sample and test concrete in conformance with Section 03 30 00 Cast-In-Place Concrete.

3.03 CONCRETE MIX PREQUALIFICATION TESTING

A. Existing concrete mix designs that are continuously approved with other agencies [City of Seattle Department of Planning and Development, the Seattle Department of Transportation, or the Washington Department of Transportation] are exempt from testing requirements under this Section provided that it is demonstrated that all performance requirements identified in Exhibit Tables are met.

B. Responsibility for Mix Design Prequalification: The Contractor shall be responsible for completing prequalification testing for performance based concrete mix designs.

C. 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 acceptance by the Resident Engineer of laboratory produced concrete shall be made prior to construction. Approval by Sound Transit of the test report shall constitute final acceptance of the specified concrete for use in the Work.

D. 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 Exhibit Tables.

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 testing program and the schedule will be reviewed by Sound Transit and approval of the program will serve as a notice to proceed with Initial Testing.

6. 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.

7. Specimens prepared for acceptable testing of concrete shall comply with ACI 318, Section 5.6.3 and the Source Quality Control section of this specification.

8. 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.

E. Mix Supplier Requirements: All concrete shall be batched in a prequalified manual, semi-automatic, or automatic plant as described in this Section. Batch Plant Prequalification may be obtained through one of the following methods:

1. Certification by the National Ready Mix Concrete Association (NRMCA).
2. Independent evaluation certified by a Professional Engineer using NRMCA checklist. The Professional Engineer shall be licensed under title 18 RCW, state of Washington, qualified in civil engineering.

3. Inspection conducted by the Plant Manager, defined as the person directly responsible for the daily plant operation, using the NRMCA Plant Certification checklist.

F. Prequalification Testing Requirements: These testing requirements are in addition to requirements identified under Section 03 30 00. 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. Complete laboratory tests for each mix performance parameter identified in Exhibit Tables for each Mix Designation.
   c. All laboratory tests shall be completed in accordance with the standards defined in Section 1.02.

2. Final Testing — Field Testing
   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. Complete tests for each mix performance parameter identified in Exhibit Tables for each Mix Designation.
   c. In addition to the prequalification criterion identified in Exhibit Tables, the following shall be measured:
      1) Slump: One test at point of placement for each composite sample. Perform additional tests when concrete consistency appears to change.
      2) Concrete temperature: One test hourly when air temperature is 40 deg F and below or when 80 deg F and above, and one test for each composite sample.
   d. Obtain field samples from the first field placement in accordance with the standards defined in Section 1.02. Samples may be obtained at the truck.
   e. As a Contractor’s option, the first field placement of concrete can be used for either a mock-up of actual construction to be used per Section 03 30 00, Cast-In-Place Concrete, or directly for the first field placement of the mix in the Work.
   f. If the first field placement is used for a mock-up, the mock-up shall meet all the requirements specified under Section 03 30 00, Cast-In-Place Concrete.
   g. If the first pour in the Work is used for final acceptance and fails to meet the stated requirements, the Contractor shall be responsible for all additional testing or removal of the concrete.
h. If the first pour in the Work is used for final acceptance all Field Quality Control requirements specified under Section 03 35 00 must be met.

i. All tests shall be completed in accordance with the standards defined in Section 1.02.

3. Acceptance Criteria: At minimum the following must be met in order to deem a concrete mix design acceptable:

a. The Contractor shall complete Initial and Final Testing of the test samples, for each Mix Designation, in accordance with the approved testing plan and submit the results in accordance with this Section.

b. For each Mix Designation, the test results for each performance parameter shall be within the limits specified in Exhibit Tables.

c. Compressive Strength Tests: Test for compressive strength for each Mix Designation shall be at the age indicated in Exhibit Tables, and shall meet the following:

1) The compressive strength test results for acceptance of each sample shall be the average of the compressive strengths from two specimens tested.

2) If one specimen shows evidence of improper sampling, molding, or testing, discard the specimen and consider the strength of the remaining cylinder to be the test result.

3) If both specimens in a sample show any defects, both specimens shall be discarded.

4) Compressive strength tests shall be considered acceptable if the average compressive strength of all specimens of three consecutive sample tests are equal to or exceed the specified compressive strength, and if no individual specimen compressive strength is more than 300 pounds per square inch below the specified compressive strength.

d. Test Cores: If concrete strength from Final Testing 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.

1) Obtain the test specimens in conformance with ASTM C42. Take three cores from each area as directed by the Resident Engineer.

2) Test cores will be considered acceptable if the average of the three cores is equal to at least 85 percent of the specified compressive strength and no single core is less than 75 percent of the specified compressive strength, at the age indicated in Table 03 05 15-A through Table 03 05 15-D. Locations represented by erratic core strengths may be retested at the direction of the Resident Engineer.

3) Fill core holes in conformance with the requirements of Section 03 30 00 for repair of surface defects.
3.04 EXHIBITS

A. Table – Cast-in-Place Concrete Performance Criteria
B. Table – Post-Tensioned Concrete Performance Criteria
C. Table – Precast Concrete Performance Criteria
D. Table – Miscellaneous Concrete Performance Criteria
Mix Designation Table Notes:
(Applicable to Tables A through D)

1. See structural drawings for additional information on where the different mixes will be used.
2. Concrete mix designs shall be proportioned to meet ACI 318 Chapter 4 unless more stringent performance criteria are defined in these tables.
3. Water/Cement Ratio shall be measured by weight and shall be based on the total cementitious material. Water/Cement Ratio and water content shall be determined by the supplier based on strength, concrete placement, and workability requirements.
4. Mix designs may include either fly ash or GGBF, but are not required.
5. Mix designs shall document the slump value of the mix, and slump shall be measured in the field for all concrete. Field-measured slump shall conform to the submitted mix design, with slump tolerance in accordance with ASTM C 94.
6. Shrinkage control mixes shall be proportioned such that the drying shrinkage does not exceed percentage indicated at 28-days under laboratory conditions.
7. Verify that the concrete is compatible with required finishes prior to placing finishes.
8. Meet requirements of Section 03 30 00, Cast-In-Place Concrete, for mass concrete pour requirements, where applicable.
**TABLE A – CAST-IN-PLACE CONCRETE PERFORMANCE CRITERIA**

<table>
<thead>
<tr>
<th>Concrete Mix Designation</th>
<th>Use</th>
<th>Exposure Class</th>
<th>Minimum 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/cm)</th>
<th>Cement Type</th>
<th>Air Content</th>
<th>28 days Shrinkage Control Limit (% of drying shrinkage)</th>
<th>Permeability</th>
<th>Fiber Dosage pounds per cubic yard (pcy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LM</td>
<td>Lean Mix for soldier pile and secant pile shafts</td>
<td>N/A</td>
<td>800 (min) 1,500 (max)</td>
<td>28</td>
<td>1”</td>
<td>N/A</td>
<td>Type II</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>3.A.1</td>
<td>Utility Support Footings</td>
<td>F0, S0, P0, C0</td>
<td>3,000</td>
<td>28</td>
<td>1</td>
<td>0.50</td>
<td>Type II</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>4.A.1</td>
<td>Excavation Base Slab</td>
<td>F0, S0, P1, C0</td>
<td>4,000</td>
<td>28</td>
<td>1”</td>
<td>0.50</td>
<td>Type II</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>35 (Steel Fiber)</td>
</tr>
<tr>
<td>4.A.2</td>
<td>Tunnel Invert Slab and Walkway Concrete</td>
<td>F0, S0, P1, C0</td>
<td>4,000</td>
<td>28</td>
<td>1”</td>
<td>0.50</td>
<td>Type II</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>35 (Steel Fiber) 3 (Micro Synthetic Fiber)</td>
</tr>
<tr>
<td>4.A.3</td>
<td>Soldier Pile Shafts (Maple Leaf Portal: Shafts below bottom of excavation)</td>
<td>F0, S0, P0, C0</td>
<td>4000</td>
<td>28</td>
<td>1”</td>
<td>0.50</td>
<td>Type II</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>4.A.4</td>
<td>Permanent Concrete Foundations (Maple Leaf Portal: Invert Slab¹, Finish Slab, Retaining Wall Foundations)</td>
<td>F0, S0, P0, C0</td>
<td>4000</td>
<td>28</td>
<td>1 1/2”</td>
<td>0.45</td>
<td>Type II</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Concrete Mix Designation</td>
<td>Use</td>
<td>Exposure Class</td>
<td>Minimum 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/cm)</td>
<td>Cement Type</td>
<td>Air Content</td>
<td>28 days Shrinkage Control Limit (% of drying shrinkage)</td>
<td>Permeability</td>
<td>Fiber Dosage pounds per cubic yard (pcy)</td>
</tr>
<tr>
<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>4.A.5 WSDOT CL40002</td>
<td>Permanent Concrete Structures (Maple Leaf Portal: Walls, Barriers, Soldier Pile Fascia, Struts, Walers)</td>
<td>F2, S0, P0, C0</td>
<td>4500</td>
<td>28</td>
<td>1&quot;</td>
<td>0.45</td>
<td>Type II</td>
<td>4.5% Min 7.5% Max</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>5.A.1</td>
<td>Cast-In-Place SEM Tunnel Lining</td>
<td>F0, S0, P1, C1</td>
<td>5,000</td>
<td>28</td>
<td>1&quot;</td>
<td>0.45</td>
<td>Type II</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>3 (Micro Synthetic Fiber)</td>
</tr>
</tbody>
</table>

**TABLE A NOTES:**

1. For invert slabs at the Maple Leaf Portal, 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.

2. Where a WSDOT Class Designation is indicated, the mix supplied shall also meet the proportioning requirements of the Washington State Department of Transportation Standard Specifications for Road, Bridge, and Municipal Construction, 2012, Section 6-02.
### TABLEB – POST-TENSIONED CONCRETE PERFORMANCE CRITERIA

<table>
<thead>
<tr>
<th>Concrete Mix Designation</th>
<th>Use</th>
<th>Exposure Class</th>
<th>Minimum 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/cm)</th>
<th>Cement Type</th>
<th>Air Content</th>
<th>28 days Shrinkage Control Limit (% of drying shrinkage)</th>
<th>Permeability</th>
<th>Fiber Dosage pounds per cubic yard (pcy)</th>
</tr>
</thead>
</table>

1. Field compressive strength shall be a minimum of 3,000 psi at time of stressing.
2. For elevated slab closure pours, 28 day shrinkage control limit (% of drying shrinkage) shall be 0.02%.
<table>
<thead>
<tr>
<th>Concrete Mix Designation</th>
<th>Use</th>
<th>Exposure Class</th>
<th>Minimum 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/cm)</th>
<th>Cement Type</th>
<th>28 days Shrinkage Control Limit (% of drying shrinkage)</th>
<th>Permeability</th>
<th>Fiber Dosage pounds per cubic yard (pcy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.C.1</td>
<td>Precast Concrete for Temporary Decking and Utilities</td>
<td>F0, S0, P0, C0</td>
<td>4000</td>
<td>28</td>
<td>1&quot;</td>
<td>0.45</td>
<td>Type II</td>
<td>3.5% ±1.5%</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>6.C.2</td>
<td>Precast Concrete Segmental Lining</td>
<td>F0, S0, P1, C1</td>
<td>6,000</td>
<td>28</td>
<td>3/8&quot;</td>
<td>0.45</td>
<td>Type II</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

TABLE C – PRECAST CONCRETE PERFORMANCE CRITERIA
<table>
<thead>
<tr>
<th>Concrete Mix Designation</th>
<th>Use</th>
<th>Exposure Class</th>
<th>Minimum 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/cm)</th>
<th>Cement Type</th>
<th>28 days Shrinkage Control Limit (% of drying shrinkage)</th>
<th>Permeability</th>
<th>Fiber Dosage pounds per cubic yard (pcy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.D.1</td>
<td>Initial Shotcrete for Walls</td>
<td>F0, S0, P1, C1</td>
<td>4,000</td>
<td>28</td>
<td>1&quot;</td>
<td>0.45</td>
<td>Type II</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3,000 1,500</td>
<td>3 1</td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>4.D.2</td>
<td>Final Shotcrete for Walls</td>
<td>F0, S0, P1, C1</td>
<td>4,000</td>
<td>28</td>
<td>1&quot;</td>
<td>0.45</td>
<td>Type II</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3,000</td>
<td>3 1</td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>5.D.1</td>
<td>Initial Shotcrete for SEM Tunnels</td>
<td>F0, S0, P1, C1</td>
<td>5,000</td>
<td>28</td>
<td>1&quot;</td>
<td>0.45</td>
<td>Type II</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4,000 2,000</td>
<td>7 1</td>
<td>1 hour</td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
<td>See Section 31 74 19.05 for steel fiber toughness performance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2,000 100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>5.D.1</td>
<td>Final Shotcrete for SEM Tunnels</td>
<td>F0, S0, P1, C1</td>
<td>5,000</td>
<td>28</td>
<td>1&quot;</td>
<td>0.45</td>
<td>Type II</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3,000</td>
<td>3 1</td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
<td>3 (Micro Synthetic Fiber)</td>
</tr>
</tbody>
</table>

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for the design, construction, and treatment of formwork for cast-in-place 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 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 116R Cement and Concrete Terminology
   b. ACI 117 Specification for Tolerances for Concrete Construction and Materials
   c. ACI 301 Specifications for Structural Concrete
   d. ACI 347 Guide to Formwork for Concrete

2. American Plywood Association (APA)
   a. PS 1 U.S. Product Standard for Construction and Industrial Plywood

3. American Society for Testing and Materials (ASTM)
   a. ASTM D994 Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
   b. ASTM D1751 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
   c. 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)

5. West Coast Lumber Inspection Bureau (WCLIB):
a. WCLIB No. 17 Standard Grading Rules

6. Washington State Department of Transportation (WSDOT)
   a. Standard Specifications for Road, Bridge and Municipal Construction (WSDOTSS).

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. Samples
      1. Formwork facing materials: One sample for each type used, 12 inches by 12 inches or larger in size.
   C. Manufactured Products: For each manufactured product submit:
      1. Manufacturer’s Product Data demonstrating conformance.
      2. Manufacturer’s written instructions for storage, handling, and installation.
   D. Shop Drawings: Submit shop drawings showing:
      1. Overall geometry of formwork, shoring, and reshoring.
      2. Locations and details of:
         a. Expansion joints and construction joints.
         b. Blockouts, openings, and other formed concrete items.
         c. Keys, metal fabrications, waterstops, conduit, form ties and other embedded items.
         d. Form liners and chamfer strips
      3. Procedures for:
         a. Erecting formwork and shoring.
         b. Monitoring formwork movement during concrete placement.
         c. Determining strength of concrete for removal of formwork if other than field-cured cylinders.
         d. Removing formwork and reshoring.
   E. Working Drawings describing formwork, shoring, and deshoring geometry, details, and procedures, sealed by a professional engineer.
   F. Calculations supporting the Working Drawings, sealed by a professional engineer.
   G. Qualifications: Submit company profile and individual bio describing experience including three projects of similar scope and scale for:
      1. Professional Engineer
2. Concrete installer
3. Form liner Manufacturer

1.05 QUALITY ASSURANCE

A. Professional Engineer: Select a licensed professional engineer currently registered in the State of Washington experienced in this type of design.

B. Concrete Installer: Engage an installer with a minimum of five years experience installing vertically formed, architecturally finished, cast in place concrete similar in scope and scale to this project.

C. Form liner Manufacturer: Form liners to be obtained from a manufacturer with a minimum of five years experience creating form liners within finishes similar to this project.

D. Perform work in accordance with ACI 301 and ACI 347.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store and handle form facing materials to prevent distortion, damage, and contamination that could adversely affect the concrete finish.

B. Store and handle manufactured products in conformance with manufacturer’s written instructions.

1.07 PROJECT CONDITIONS

A. Allow sufficient time between erection of formwork and placing of concrete for other trades to properly install concrete reinforcement and embedded items.

PART 2 - PRODUCTS

2.01 FORM FACING MATERIALS

A. Lumber: Graded and grade-marked in accordance with WCLIB No. 17. Provide lumber of required strength, conforming to WCLIB No. 17.

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 (Plyform):


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. Provide surfaces that will not impart corrosion residue to concrete. Include panel framing, reinforcement, and erection accessories.

D. Form Liners:

1. Form liner shall be an Elastomeric/urethane form liner or approved equal, meeting the following technical data requirements:
   
b. Tensile (Stiffness) – ASTM D412 (100%) 212-235
c. Elongation – AASTM D412 – percent 300-350
d. Tear strength – ASTM D624 die C 160-170
e. Tensile Strength (Ultimate) ASTM D412 -970
f. Abrasion – Tabor ASTM H22 -.01

2. Liners to accommodate pressures to a maximum 1000 psf. Comply with manufacturer’s recommendations for support of deep or large patterns which may deform under pressure.

3. Manufacture form liners so that corners are tightly formed via miters and/or keys to enable forms to be assembled at corners providing matched pattern and continuous lines.

4. Provide form liner with plywood embedded reinforcement or epoxy bonded to plywood utilizing manufacturer’s recommended epoxy and method. Allowable tolerance is 1/32” per linear foot.

5. Finishes: per drawings and finish schedule

2.02 MANUFACTURED PRODUCTS

A. Formwork Accessories

1. Form Ties: Rod type with end fasteners which can be removed without spalling the concrete. Provide cones with setbacks equal to the required concrete cover.

2. Form Tie Hole Plugs: Preformed mortar plugs to match the color of the concrete, recessed 1/4 inch. Adhere with a manufacturer approved epoxy adhesive.

3. Chamfer Strips: Extruded vinyl type with or without nailing flange.

4. Polyethylene Sheeting: Single ply 6-mil polyethylene sheeting conforming to ASTM D4397. Provide a compatible tape with equal or better water vapor control characteristics than sheeting.

B. Form Release Agent

1. Commercial formulation, silicone-free, designed for use on all form facing materials used, which will not:
   
a. Bond with, stain, or adversely affect concrete surfaces
b. Impair subsequent treatment of concrete surfaces requiring bond or adhesion
c. Impede wetting of surfaces which will be cured with water, steam, or curing compounds.

2. Provide form liner manufacturer's verification of release agent's compatibility with form liner material.

C. Joint and Seam Sealer: Capable of producing flush, watertight and nonabsorbent surfaces and joints, and compatible with forming material and concrete ingredients.

1. Sealant Compound: Silicone or polyurethane construction sealant conforming to Federal Specification TT-S-1543B.

2. Form Film Tape: Polypropylene plastic treated with waterproof adhesive for joint conditions not exposed to public view.


2.03 CONSTRUCTION JOINTS

A. Provide construction joints as indicated on the Contract Documents.

B. Locate construction joints not indicated on the Contract Documents as follows:

1. In beams and girders and slabs: within the middle third of the span.

2. In walls and columns: at the underside of floors, slabs, beams, or girders and at the top of footings or floor slabs.

3. At maximum spacing as indicated on the Contract Documents.

C. Locate construction joints perpendicular to the primary reinforcement. Continue reinforcement through joint.

D. Provide a roughened joint at all construction joints unless noted otherwise.

E. Construction joints located in exposed walls shall be set horizontal or vertical, unless noted otherwise.

2.04 DESIGN REQUIREMENTS

A. Design, construct, and remove formwork, shores, and reshores in conformance with the recommendations of ACI 347.

B. Design formwork to be removed without damage to adjacent concrete surfaces or materials.

C. Carry loads for formwork of elevated slabs down to the invert slab. Do not use intermediate slabs to carry these loads. Do not use interior walls to carry formwork loads.

D. Do not use earth cuts as forms for vertical or sloping surfaces unless indicated on the contract documents.

E. Tolerances: Design and construct formwork to produce finished concrete surfaces within the tolerances specified at the following locations:

1. Roosevelt Station, U-District Station, and Maple Leaf Portal Temporary Excavation Support: Formwork tolerance shall be as specified in ACI 117 for Cast-In-Place Concrete for Buildings.
2. Maple Leaf Portal Permanent Structures: Formwork tolerance shall be as specified in WSDOTSS Section 6-02.

PART 3 - EXECUTION

3.01 PREPARATION

A. Locate and stake out all forms and establish all lines, levels, and elevations.

3.02 CONSTRUCTION

A. Formwork

1. Construct formwork in conformance with the approved Shop Drawings to produce finished concrete surfaces as indicated and within specified tolerances.

2. Maintain forms clean, smooth, and free from imperfections and distortion.

3. Arrange form panels in symmetrical patterns conforming to general lines of the structure. Unless otherwise indicated, orient panels on vertical surfaces with long dimension horizontal, and make vertical joints plumb and horizontal joints level and continuous. Use largest stock size practicable.

4. Provide positive means of adjustment of formwork. Adjust and secure before concrete placement. Do not adjust formwork after concrete has achieved initial set.

B. Joints

1. Make joints and seams mortar-tight. Install joint and seam sealers in accordance with the manufacturer's written instructions.

2. Align form panels on each side of the panel joint with fasteners common to both panels to provide a continuous concrete plane surface.

C. Edge Forms and Bulkheads

1. Set edge forms, bulkheads, and intermediate screeds for slabs to obtain required elevations and contours in the finished slab surface. Ensure that edge forms and screed strips are sufficient to support the screeds to be used.

2. Carry loads for moving equipment on the formwork or adjacent hardened concrete without resting on the reinforcing steel.

3. Brace bulkheads to prevent warpage or displacement. Set tightly against forms to prevent loss of concrete mortar.

4. Seal edge forms with joint and seam sealers such that neither a fin nor groove is made in the face of the cast concrete.

D. Corners:

1. Provide 3/4” chamfer on all outside corners. Miter chamfer at intersections. Reentrant corners need not have fillets.

2. Provide drip edges at horizontal concrete soffits exposed to weather by installing a 1/2” continuous chamfer strip. Chamfer strip in soffit shall be parallel to overhang corners and located 3” from the adjacent vertical face.
E. Embedded Items: Provide embedded items in conformance with the approved Shop Drawings. Secure to reinforcement or formwork to prevent movement during concrete placement. Fill voids with readily removable material to prevent entry of concrete.

F. Blockouts and Openings
1. Use polyethylene sheeting as a bond breaker between blockouts and invert slab concrete. Securely wrap concrete blockouts with sheeting forming a smooth, tight-fitting surface. Overlap sheeting material at seams a minimum of 6 inches, and tape both sides of sheeting.
2. Provide temporary openings at the base of column and wall formwork and other locations where necessary to facilitate cleaning and inspection. Clean and inspect immediately before concrete is placed.
3. Provide air escape holes in bottom members of blockouts.

G. Form Release Agent
1. Apply form release agent in conformance with manufacturer's written instructions.
2. Coat form contact surfaces with form release agent before reinforcement is placed.
3. 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, embedded items, and hardened concrete.

3.03 REMOVAL OF FORMWORK
A. Maintain formwork supporting concrete weight in place until the concrete has attained the minimum percentage of specified design compressive strength specified in Table 03 11 00.A.

<table>
<thead>
<tr>
<th>Structural Member or Condition</th>
<th>Minimum Compressive Strength for Formwork Removal (Percent of Design Strength)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevated slabs or beams spanning more than 20 feet between supports</td>
<td>90%</td>
</tr>
<tr>
<td>Elevated floor slabs</td>
<td>70%</td>
</tr>
<tr>
<td>Free standing walls over 4 feet tall</td>
<td>70%</td>
</tr>
<tr>
<td>Sides of beams, columns, walls, and footings, and other vertical surfaces not carrying concrete weight</td>
<td>30%</td>
</tr>
<tr>
<td>Cast-in-place final lining for Cross Passages</td>
<td>30%</td>
</tr>
</tbody>
</table>

B. Remove forms without injuring concrete surfaces, overstressing concrete members, or distorting formwork. Do not pry against concrete.

C. Cut nails off flush. Leave surfaces clean and unblemished.

3.04 RESHORING
A. Provide reshoring in conformance with the approved Shop Drawings.
B. Plan reshoring so areas of new construction do not support their own weight.
C. Place reshores in sequence with stripping operations.

D. Prevent construction loads on new construction during reshoring.

3.05 CLEANING AND RE-USING FORMS

A. Clean and repair surfaces of forms to be reused. Apply form release agent as specified for new formwork.

B. Patch holes and defects in forms with materials and methods that will not be reflected in the concrete.

C. Do not reuse forms with split, frayed, delaminated, or otherwise damaged facing material. Remove such material from the site.

3.06 FIELD QUALITY CONTROL

A. Before placing concrete, verify the following:
   1. Lines and levels of erected formwork are correct.
   2. Formed and embedded items are located correctly and secured against movement.
   3. Embedded piping and conduit are free from obstructions.
   4. All loose tie-wire and other debris have been removed from the forms.

B. While placing concrete, verify the following:
   1. Formwork geometry is maintained within specified tolerances.
   2. Cement paste is not lost through joints.

C. Monitor movement during concrete placement. Adjust formwork as necessary to maintain tolerances.

END OF SECTION
SECTION 03 15 00
CONCRETE ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for furnishing and installing joint fillers and sealing compounds for expansion joints, isolation joints, control joints, and contraction joints in concrete 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 11 00, Concrete Forming.

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 Joint Sealants for Concrete Structures

   a. ASTM D994 Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
   b. ASTM D1751 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
   c. ASTM D2628 Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
   d. ASTM D6690 Standard Specification for Concrete Joint Sealer, Hot-Applied Elastic Type

1.03 SUBMITTALS

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

B. Shop Drawings: Submit single-line diagram showing locations of all joints to be filled and sealed.

C. Product Data: Submit manufacturers' product data for products used.

D. Samples: Submit 12-inch long sample of joint filler and one 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 Sealing Compound: Concrete joint sealant, conforming to ASTM D6690 or ASTM D2628. For sealing of expansion (isolation) and contraction (control) joints in slabs and at junctions of slabs and vertical surfaces. Use joint sealant color selected by the Resident Engineer from the manufacturer's standards.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that a minimum of 28 days has elapsed since date concrete was placed, and that joint surfaces are dry.

B. Verify also that ambient and concrete-surface temperatures and humidity are within the ranges recommended by the manufacturer for successful sealant application.

3.02 PREPARATION

A. Prior to sealing joints with hot-poured rubber asphalt or cold applied joint sealer, clean the surfaces of the seams and joints to be 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. Installation/Application Requirements: Install joint fillers and sealing compounds in accordance with the respective manufacturers' installation and application instructions and the applicable requirements of ACI 504R. Coordinate the placement of joint fillers and secure them in position with the work of Section 03 11 00, Concrete Forming.

B. Expansion (Isolation) Joints:

1. Provide premolded joint filler to full depth of slabs, less 1/2 inch, unless otherwise shown. Install joint filler with top edge 1/2 inch below the surface, and tool adjacent concrete edges to a 3/8-inch radius. Use steel pins to hold material in place during placing and floating of concrete. Finished joints to be tight and leakproof.
2. After a minimum of 28 days after slabs have been placed and finished, fill expansion joints with joint sealing compound to 1/8 inch below surface of slabs. Do not permit traffic to travel over sealed joints until sealing compound has properly cured.

C. Contraction (Control) Joints: Fill saw-cut contraction joints and weakened plane joints with joint sealing compound in areas and locations indicated. Fill joints flush to within 1/16 inch of the slab surface.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for waterstops in concrete.

1.02 SUBMITTALS

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

B. Shop Drawings: Submit the following:

   a. For Type A, C, and D waterstops, include locations for shop-fabricated changes in direction, intersections, and transitions, and field-fabricated butt or lap splices.
   b. For Type B waterstops, define extent of the reinjectible hose and the lengths of the solid vent ends. Show the locations of the junction boxes to be installed.

2. Detail drawings:
   a. For Type A, C, and D waterstops, include details of shop fabricated changes in direction, intersections, and transitions, and field fabricated butt or lap splices.
   b. For Type B waterstops, include details of vent ends to be installed in junction boxes and method of protecting vent ends not to be installed in junction boxes.

C. Manufactured Products: For each type of waterstop, submit the following:

1. Manufacturer’s Product Data.
2. Manufacturer’s written instructions for storage, handling, and installation.

D. Product Samples: For each type of waterstop, submit the following:

1. 12-inch long sample, including accessories necessary for installation.
2. Field splice.

E. Construction Work Plan (CWP): Section 01 45 00.20, Quality Assurance/Quality Control, for installing grouting, and cleaning of Type B waterstops. Include grout mix requirements per manufacturer’s recommendations and procedures for preventing damage to the system during installation.

F. Certifications: Manufacturer’s certification for grouting subcontractor.
1.03 QUALITY ASSURANCE
A. Grouting Contractor: Manufacturer certified.

1.04 DELIVERY, STORAGE, AND HANDLING
A. Store and handle manufactured products in conformance with manufacturer’s written instructions.

PART 2 - PRODUCTS

2.01 MATERIALS
A. Type A: Ribbed 350mm PVC with center bulb, Catalog Item 905, manufactured by Greenstreak, or approved equal.
B. Type B:
   1. Reinjectable Hose: Fuko Type 2 Injection Hose, manufactured by Greenstreak, or approved equal.
   2. Single component suspension-based microfine cement: Tricodure SI, manufactured by Greenstreak, or approved equal.
   3. Solvent-free hydrophilic acrylate resin: Duroseal Inject, manufactured by Greenstreak, or approved equal.
C. Type C: Swellstop 3/4-inch by 1-inch, Style Number 594, manufactured by Greenstreak, or approved equal.
D. Type D: Retrofit, Catalog Item 667, manufactured by Greenstreak, or approved equal.
E. Inflatable Grout Seal:
   1. Fabriform Bag, manufactured by Construction Technologies, Inc.
   2. O-Ring Seal, manufactured by Bullflex
   3. Approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION
A. Provide waterstops as indicated on the Contract Documents.
B. Install waterstops in conformance with the manufacturer’s written instructions.
C. Locate accurately and secure against movement during concrete placement.
D. Install waterstops in the longest practicable length.
E. Place and consolidate concrete to ensure a complete bond between the concrete and waterstop. Cement-sand grout slurry may be used where necessary to ensure contact and bond of waterstop and concrete without voids.
3.02 SPLICING

A. Splice waterstops in conformance with the manufacturer's written instructions.

B. Provide only factory-made waterstop fabrications for all changes of direction, intersections, and transitions.

C. Provide only straight butt joint splices in the field.

3.03 GROUTING

A. After final concrete lining has reached its 28-day compressive strength, grout all Type B waterstops as described below.

B. Inject all Type B waterstops with the microfine cement grout. Clean the waterstops immediately to permit reinjection.

C. After the cure time specified by the manufacturer, inspect the final concrete lining for leaks. For the purposes of this activity, a leak is defined as a damp spot, dripping water, or running water.

D. If leaks appear, inject the Type B waterstops in these joints with the hydrophilic acrylate resin grout. Clean the waterstops immediately to permit reinjection.

3.04 FIELD QUALITY CONTROL

A. Joints constructed with waterstops will be subject to inspection by the Resident Engineer for material and installation defects that could reduce the effectiveness of the waterstop.

B. Replace defective waterstops and unacceptable waterstop installations.

C. Grouting shall be done by a manufacturer-certified subcontractor and observed by a manufacturer’s representative.

END OF SECTION
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.

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 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, Cold-Finished, Standard Quality
   b. ASTM A496 Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement
   c. ASTM A563 Standard Specification for Carbons 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 for Austenitic Gray Iron Castings
   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

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: For each post-installed concrete anchor submit:
   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.
B. Weld Procedure Specification: ANSI/AWS D1.4

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 post-installed 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 Shear Connectors and 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.
D. Deformed Bar Anchors: ASTM A496 with fluxed end conforming to ANSI/AWS D1.1.

2.02 POST-INSTALLED CONCRETE ANCHORS
A. Expansion Anchors
1. Hilti Kwik Bolt TZ Anchors, Simpson Strong-Bolt Wedge Anchors, or approved equal. Provide galvanized carbon steel anchors unless noted otherwise.

B. Adhesive Anchors

1. Adhesive: Hilti HIT–RE 500-SD, Simpson SET-XP, or approved equal.

2. Threaded rod: Stainless steel: AISI 304/316

C. Welded Shear Connectors and Welded Headed Studs

1. Nelson Stud Welding S3L Shear Connector, or H4L Concrete Anchor, or approved equal.

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 Shear Connectors or Welded Headed Studs: Weld to structural steel and metal fabrications in conformance with ANSI/AWS D1.1 and manufacturer’s written instructions.

C. Deformed Bar Anchors: 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 noted 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 30 11 00, Concrete Forming

B. Post-Installed Concrete Anchors

1. Furnish anchors as noted on Contract Drawings. Install anchors in conformance with manufacturer’s written instructions.
3.02 FIELD QUALITY CONTROL

A. Post-Installed Concrete Anchors

1. Provide special inspection of concrete anchor placement.

2. Observe and record product description, including product name, adhesive expiration date, anchor or rebar diameter and steel grade, required size of the drill bit, required hole diameter and location, required cleanliness of the hole and required adhesive application.

3. Observe anchor installation for conformance to the approved plans.

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.

1. Welding for reinforcing steel is covered in Section 03 15 25, Anchorage to Concrete.

2. Glass fiber reinforced polymer reinforcing is covered in Section 06 82 00, Glass-Fiber-Reinforced 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 15 25, Anchorage to Concrete

2. Section 03 05 15, Portland Cement Concrete

3. Section 06 82 00, Glass-Fiber-Reinforced 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 A1064 Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

   b. ASTM A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

   c. ASTM A706 Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

   d. ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection and/or Testing

a. ANSI/AWS D1.4 Structural Welding Code – Reinforcing Steel

4. Concrete Reinforcing Steel Institute (CRSI):
   a. Manual of Standard Practice
   b. CRSI Publication, Placing Reinforcing Bars

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 in.
   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.

1.05 QUALITY ASSURANCE

A. Independent Inspection and Testing Laboratory: In conformance with ASTM E329

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, ACI 318, unless otherwise indicated.

B. Welded Wire Reinforcement: ASTM A1064, wire sizes and spacings as indicated.

C. 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.

D. Tie Wire: ASTM A1064, No. 16 gauge or heavier, black or galvanized, soft or commercial grade steel tie wire.

E. Smooth Dowel Bars: ASTM A615 Grade 60.

F. Mechanical Splices:
   1. Capable of being installed in clear space indicated.
   2. Type 1: Capable of developing 125 percent of the yield strength of spliced reinforcing bars.
   3. Type 2: Capable of developing the full tensile capacity of the spliced reinforcing bars.

G. 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.

H. Mechanical Anchorages for Future Extension:
   1. Meet requirements of Mechanical Anchorage.
   2. Allow future mechanical splice of same-size bar.

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 correspond to approved placing drawings and schedules.
   3. Use waterproof tags and markings that cannot be removed until steel reinforcement is placed in position.

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, 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: Wherever possible, stagger splices of alternate bars a minimum clear offset of 4 feet between splices.

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 Reinforcement:
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 and not less than 30 times the wire diameter in the direction of lap and also not 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 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 with 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. Mechanical Anchorages and Anchorages for Future Extension
   a. Provide continuous inspection of 100 percent of installed anchorages.
   b. Remove and replace incorrectly installed anchorages.

B. Perform the following inspections with 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.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for conveying placing, finishing, 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 13, Waterstops.
4. Section 03 20 00, Concrete Reinforcing.
5. Section 03 35 00, Concrete Finishing.
6. Section 03 62 00, Non-Shrink Grouting.

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 (WSDOTSS)

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. Product Data 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. Quality Program Plan

E. Construction Work Plan

F. Placement Records: Report the location in the finished work of each concrete class, and the start and completion times of placement 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


B. Construction Work Plan: Section 01 45 00.20, Quality Assurance / Quality Control. Include descriptions of methods, materials, labor, and equipment used in:
   1. Conveying, placing, finishing, 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 00.20, Quality Assurance / Quality Control.

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.
   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. Construction joints located in exposed walls shall be set horizontal or vertically plumb, unless noted otherwise.
   2. Locate construction joints as indicated on the Contract Documents.
   3. Locate construction joints not indicated on the Contract Documents as follows:
      a. In beams and girders and slabs: within the middle third of the span.
      b. In walls and columns: at the underside of floors, slabs, beams, or girders and at the top of footings or floor slabs.
      c. At maximum spacing as indicated on the Contract Documents.
   4. Locate construction joints perpendicular to the primary reinforcement. Continue reinforcement through joint.
   5. Provide a roughened joint at all construction joints unless noted otherwise.
   6. Install waterstops in conformance with Section 03 15 13, Waterstops.
   7. 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.

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 FINISHING FORMED SURFACES

A. After removing forms, finish each formed surface as noted below in conformance with ACI 301.

B. Specified Finishes: For the surfaces specified below, provide the following surface finishes:
   2. Other Surfaces: Finish per Contract Documents and 03 35 00 Concrete Finishes.

C. Unspecified Finishes: for formed surfaces not otherwise specified, provide the following surface finishes:
   1. Concrete surfaces not exposed to public view: Rough-form finish.
   2. Concrete surfaces exposed to public view: Smooth-rubbed finish.

3.04 FINISHING UNFORMED SURFACES

A. Specified Finishes: For the surfaces specified below, provide the following surface finishes:
   2. Bored Tunnel Walkway: Broom or belt finish.

B. Unspecified Finishes: For unformed surfaces not otherwise specified, provide the following surface finishes:
   1. Surfaces intended to receive bonded cementitious materials: Scratched finish.

C. Surface Tolerances: Conform to ACI 301 as follows:
   1. Class A Tolerance: Surfaces exposed to public view.
   2. Class B Tolerance: Surfaces intended to receive plaster, stucco, or wainscoting.
   3. Class C Tolerance: Permanently exposed surfaces where other finishes are not specified.

3.05 CURING AND PROTECTION:

A. 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.

B. Curing Formed Concrete Surfaces
1. Keep absorbent wood forms wet until they are removed.
2. After formwork is removed, apply a curing compound.

C. 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.

3.06 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.
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.

3.07 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: 160 degrees F.

2. Maximum differential temperature between internal concrete and ambient: 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 ambient 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 temperature.

   c. As necessary until trend indicates internal and surface concrete temperatures are converging.

3.08 FIELD QUALITY CONTROL

A. Independent Testing Laboratory: Use an 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 testing agency in obtaining and handling samples at the site.

C. Provide and maintain for the sole use of the testing agency adequate facilities for safe storage and proper curing of concrete test specimens on site for initial curing.

D. Concrete Sampling

1. Obtain at least one composite sample for each 100 cubic yards, or fraction thereof, of each concrete mixture placed in any one day.

2. Obtain composite samples in conformance with ATSM C172. Select the trucks or batches of concrete to be tested on a random basis. Samples may be obtained at the truck.

3. Perform the following tests on each sample:
   a. Slump: ASTM C143.
   b. Air content: ASTM C231.

4. Mold and cure three compressive strength specimens from each sample in conformance with ASTM C31. Record any deviations from the requirements of this Section in the test report.

E. Concrete Testing

1. Conduct compressive strength tests of each sample in conformance with ASTM C39.

2. Test one specimen at 7 days for information and two specimens at 28 days for acceptance, unless otherwise specified.

F. 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 or the design age given in Section 03 05 15.
   b. If one specimen in a sample shows evidence of improper sampling, molding, or testing, discard the specimen and considered 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.

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-4: 2 x 2 scored pattern with light sandblast.
   4. CIP-5: Same as CIP-4 with color added to concrete.
   5. CIP-S1: Clear concrete sealer/densifier for typical interior exposed slabs
   6. CIP-S2: Clear curing sealer for typical exterior concrete flat work.
   7. CIP-S3: Concrete film forming sealer for concrete stair treads and landings, and elsewhere indicated,
   8. PS-1: Finished precast concrete treads and risers.

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.

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; 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. Washington State Department of Transportation (WSDOT)

a. Standard Specifications for Road, Bridge and Municipal Construction (WSDOTSS)

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. Abrasive Grit Sample:
      a. 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.

   2. Pigmented or Clear Concrete Sealer/Densifier Sample:
      a. 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.
      b. 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.
      c. 4”x4” sample of each sealer applied to concrete labeled with manufacturer’s name and color.
      d. Do not begin applying pigmented or clear sealer/densifier until receiving the Resident Engineer’s written approval of the pigmented sealer color samples.
      e. 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 illustrating each exposed concrete wall finish including expansion and control joint; minimum 4’x4’.

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 Finish Compounds – Hardeners, Sealers and Slip-Resistant Treatments

<table>
<thead>
<tr>
<th>FINISH TREATMENT</th>
<th>FINISH TREATMENT DESCRIPTION</th>
<th>FINISH TREATMENT INFORMATION</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<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, Class A.</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>CIP-S4</td>
<td>Pigmented sealer, Washington Gray</td>
<td>Semi-opaque sealer</td>
<td>Per WSDOTSS Section 9-08.3</td>
</tr>
<tr>
<td>CIP-S5</td>
<td>Anti-graffiti treatment</td>
<td>Protectosil Antigraffiti, Evonik Industries, or approved equal</td>
<td>Apply to exposed concrete vertical surfaces</td>
</tr>
</tbody>
</table>
B. Concrete Formwork or Hand Applied Finish: Provide Concrete Finish Materials, Treatments and Product Types as described in table below:

<table>
<thead>
<tr>
<th>CONCRETE FINISH</th>
<th>BASIS-OF-DESIGN PRODUCT TO ACHIEVE REQUIRED FINISH</th>
<th>FINISH &amp; COLOR INFORMATION</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<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 acoustical treatment, sealer 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 sealer and graffiti coating.</td>
<td>Fiberglass or steel forms, basic CIP concrete with forms stripped and major &quot;fins&quot; 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>Steel Troweled</td>
<td>Smooth finish with Light sandblast</td>
<td></td>
</tr>
<tr>
<td>CIP-4</td>
<td>Fractured fin form liner finish</td>
<td>WSDOT standard ¾&quot; deep ribs 1 ½&quot; o.c.</td>
<td>Per WSDOTSS</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 indicted, 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 PENETRATING PIGMENTED OR CLEAR CONCRETE SEALER/DENSIFIER

A. Apply penetrating concrete sealer/densifier at exposed surfaces of concrete structures, typical unless noted or scheduled otherwise. Comply with manufacturer's published instructions and recommendations.

B. Apply penetrating concrete sealer/densifier at exposed surfaces of concrete slabs and curbs, typical unless noted otherwise.

C. All surfaces to receive penetrating sealer/densifier shall receive the finish specified. 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 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 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 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. Prior to repair, review areas and procedures with Resident Engineer and obtain approval.
   2. Remove honeycombed and other defective concrete down to sound concrete. Sawcut 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.
   3. 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.
   4. 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 00.20, Quality Assurance/Quality Control, will inspect finished slabs for flatness.
   2. Walls and vertical surfaces shall be free of fins and voids larger than 1/8” in any dimension unless consistent with the applied form liner finish. All permanently exposed surfaces, unless specifically noted otherwise, shall be free from local bulging. Surface to be free from exposed aggregates except where sandblast finish is specified.
   3. 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.

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 from construction work in progress, impacts or stains.

3.07 APPLICATIONS SCHEDULE

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>CHEMICAL FINISH</th>
<th>CONCRETE FINISH</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIP-S1</td>
<td>CIP-1</td>
<td>CIP-1</td>
<td>Sealed or painted standard plywood or MDO formwork finish</td>
</tr>
<tr>
<td>CIP-S2</td>
<td>CIP-2</td>
<td>CIP-2</td>
<td>Clear sealed smooth fiberglass or steel formwork finish</td>
</tr>
<tr>
<td>CIP-S3</td>
<td>CIP-3</td>
<td>CIP-3</td>
<td>Fluted metal formliner finish</td>
</tr>
<tr>
<td>CIP-S4</td>
<td>CIP-4</td>
<td>CIP-4</td>
<td>Clear sealer</td>
</tr>
<tr>
<td>CIP-S5</td>
<td>CIP-5</td>
<td>CIP-5</td>
<td>Clear sealer</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 03 37 13
SHOTCRETE FOR EXCAVATION WALL FACINGS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for materials, proportioning, and application of shotcrete for excavation wall facings. Unless indicated otherwise, the requirements specified apply to both initial and final wall facings.

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 00.20, Quality Assurance/Quality Control.
2. Section 03 20 00, Concrete Reinforcing.
3. Section 06 82 00, Glass-Fiber-Reinforced-Plastic.
4. Section 31 32 36, Soil Nailing.
5. Section 31 50 00, Excavation Support and Protection.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents:

1. American Concrete Institute (ACI)
   a. ACI 214 Recommended Practice for Evaluation of Compression Test Results of Field Concrete
   b. ACI 506R Guide to Shotcrete
   c. ACI 506.2 Specification for Shotcrete
   d. ACI 506.4R Guide for the Evaluation of Shotcrete
   e. CP-60 Craftsman Workbook for ACI Certification of Shotcrete Nozzleman

   a. ASTM A 185 Specifications for Wire Fabric, Plain, Welded Steel for Concrete Reinforcement
   b. ASTM A 615 Standard Specifications for Bars, Deformed and Plain, Carbon-Steel Bars, for Concrete Reinforcement.
   c. ASTM C 31 Standard Practice for Making and Curing Concrete Test Specimens in the Field.
   d. ASTM C 33 Standard Specification for Concrete Aggregates
e. ASTM C 39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
f. ASTM C 42 Standard Test Methods for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
g. ASTM C 94 Standard Specification for Ready-Mixed Concrete
h. ASTM C 109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in or [50mm] cube Specimen)
i. ASTM C 143 Standard Test Method for Slump of Hydraulic Cement Concrete
j. ASTM C 150 Standard Specification for Portland Cement
k. ASTM C 171 Standard Specification for Sheet Materials for Curing Concrete
l. ASTM C 288 Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
m. ASTM C 309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
n. ASTM C 595 Standard Specification for Blended Hydraulic Cements
o. ASTM C 618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
p. ASTM C 642 Standard Test Method for Density, Absorption, and Voids in Hardened Concrete
q. ASTM C 685 Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
r. ASTM C 803 Standard Test Method for Penetration Resistance of Hardened Concrete
s. ASTM C 989 Standard Specification for Ground Granulated Blast-Furnace Slag for use in Concrete and Mortars
t. ASTM C 1074 Standard Practice for Estimating Concrete Strength by the Maturity Method
u. ASTM C 1116 Standard Specification for Fiber Reinforced Concrete and Shotcrete
v. ASTM C 1140 Standard Practice for Preparing and Testing Specimens from Shotcrete Test Panels
w. ASTM C 1141 Standard Specification for Admixtures for Shotcrete
x. ASTM C 1240 Specification for Silica Fume Used in Cementitious Mixtures
y. ASTM C 1385 Standard Practice for Sampling Materials for Shotcrete
z. ASTM C 1436 Standard Specification for Materials for Shotcrete
1.03 DEFINITIONS

A. Shotcrete: Pneumatically applied mixture of cement, aggregate, and water, conveyed through a hose and projected at high velocity onto a surface. The mixture contains admixtures to provide quick set, high early strength, and satisfactory adhesion.

B. Dry-Mix Shotcrete: Shotcrete in which a pre-mixed blend of dry cement, aggregate, and optional accelerator is propelled through a hose by compressed air to a nozzle. Water is added to the cementitious mixture at the nozzle and the mixed ingredients are projected onto the surface.

C. Wet-Mix Shotcrete: Shotcrete in which all the ingredients, except accelerator, are mixed before introduction into the delivery hose.

D. Rebound: Shotcrete constituents that fail to adhere to the surface to which shotcrete is being applied.

1.04 SUBMITTALS

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

B. Submit at least 30 days prior to commencement of shotcrete application the proposed product data identifying types and quality of materials, including admixtures.

C. Submit at least 30 days prior to commencement of shotcrete application the proposed mix characteristics including:

   1. Name, address and telephone number of the concrete production facility which the contractor intends to engage to design the shotcrete mixes.
   2. Name and qualifications of the proposed concrete technologist.
   3. Mix design signed and sealed by a Civil or Structural Engineer registered in Washington State.
   4. Mix design for each strength and type of shotcrete indicated in the documents or specified.
   5. Water/cement ratio, source, size and amount of aggregates and admixtures, cement type and brand, and water source if other than potable.
   6. Minimum compressive strength, maximum slump and air content percentage.
   7. Locations where each mix design will be used.
   8. Test reports showing that the proposed mixes produce shotcrete with the strengths and properties specified.
   10. Aggregate gradation analysis.

D. Submit preconstruction testing results at least 15 days prior to commencement of shotcrete work.

E. Submit resumes for proposed shotcrete nozzlemen and foremen at least 30 days prior to commencement of shotcrete work.
F. Submit details of shotcrete equipment to be used on the Contract, including brand name, model and capacity of pump and air compressor, at least 30 days prior to commencement of shotcrete work.

G. A description of the proposed curing procedures and protection to be provided to shotcrete.

H. Field testing results.

1.05 QUALITY ASSURANCE

A. Shotcrete Crew Qualifications: Shotcrete crew foremen and nozzlemen shall meet the following requirements.

1. Furnish proof that each shotcrete crew foreman has at least 5 years experience in shotcrete application on projects of a similar character to this Contract along with three references from persons responsible for supervision of these projects. Include name, address and telephone number for all references.

2. Furnish proof that all nozzlemen are certified to CP-60 for application of shotcrete to vertical and overhead surfaces for both wet- and dry-mix shotcrete. Furnish proof that nozzlemen have successfully completed three projects of similar character to this Contract. All nozzlemen must shoot test panels that fulfill the requirements of Article 1.05B below.

B. Preconstruction testing

1. Test Panels: Prepare preconstruction test panels for examination by the Resident Engineer prior to job shotcrete placement. Preparation and testing shall comply with ASTM C 1140, except as modified below:

   a. Test panel size shall be 24 inches by 24 inches minimum, with a minimum depth of 4-1/2 inches. Panels shall be made with sloped sides.

   b. Coring and testing shall be in compliance with ASTM C 42, except that minimum core size shall be 4-inch diameter by 4-1/2 inches deep, trimmed to 4 inches long. Apply ASTM C 42 length-to-diameter correction factors to the compressive strength results.

   c. Cores shall not be taken closer than 4 inches from any edge of the panel.

2. Shotcrete Mix Testing: Produce test panels for each proposed mix.

   a. Provide test panels without reinforcing. Obtain at least six test specimens from each panel.

   b. Test the nonreinforced specimens for compliance with the specified physical properties in accordance with ASTM C 42.

   c. Test admixtures for compatibility with cement in accordance with ASTM C 1141.

   d. Confirm design slump for each wet-mix shotcrete mix.

3. Nozzleman Qualification: Produce test panels for each proposed nozzleman and each anticipated shooting orientation.
a. Provide test panels with reinforcing that reproduces the thickest and most congested area specified for the structure as identified by the Resident Engineer.

b. Test panels shall be shot using the same nozzleman, assistant, and equipment that will be used under the Contract, and with each of the approved concrete mix designs and at orientations to be used under the Contract.

c. Shotcrete used shall be within ±1/2 inch of the design slump.

d. Test panels for nozzleman qualification shall not be shot until the shotcrete mix is approved.

e. Visually grade the reinforced specimens for compliance with specified core grade in accordance with Article 1.05D Shotcrete core grades for test panels and permanent shotcrete.

f. Extract five cores from locations of reinforcing steel in the test panel. If any one core is graded higher than 3 or with more than two of the five cores having a core grade of 3, the entire test panel is rejected.

g. When the prequalification test panel is rejected, a second panel may be shot. When the second test panel is rejected, the nozzleman will not be permitted to shoot on the Contract.

C. Construction testing

1. Produce a material test panel for each mix and each work day. Test panel shall be kept moist and at 70 degrees F +/- 10 degrees F until moved to an Independent Testing Laboratory. Test specimens from test panels in compliance with ASTM C 1140, except as modified below:

a. Test panel size shall be 24 inches by 24 inches minimum, with a minimum depth of 4-1/2 inches. Panels shall be made with sloped sides.

b. Test panels shall be shot at the same orientation and in the same manner as the work.

c. Test panels shall be marked for later identification (mix, location, date, nozzleman).

2. Test specimens from core drilling of in-place shotcrete:

a. Coring and testing shall be in compliance with ASTM C 42, except that minimum core size shall be 4-inch diameter by 4-1/2 inches deep, trimmed to 4 inches long. Apply ASTM C 42 length-to-diameter correction factors to the compressive strength results.

b. Perform core sampling and testing at locations determined by the Resident Engineer up to a maximum of fifty 3-core sets.

c. Fill all core holes with non-shrink grout that has a 28-day compressive strength of 5000 psi minimum. Prepare hole in accordance with grout manufacturer’s instructions and finish flush with the surrounding shotcrete.

d. In-place coring of permanent shotcrete shall not penetrate nor come within 4 inches of the geocomposite drainage board.
e. Cores shall be clearly marked for later identification (mix, location, date, nozzleman).

3. Grade cores that include reinforcement in accordance with Article 1.05D – Shotcrete core grades for test panels and permanent shotcrete.

4. The mean compressive strength of a set of three cores shall equal or exceed 0.85 $f'_c$ with no individual core less than 0.75 $f'_c$.

D. Shotcrete core grades for test panels and permanent shotcrete (Refer to ACI 506.2 for photographs of graded cores):

1. Grade 1: Shotcrete specimens are solid; there are no laminations, sandy areas, or voids. Small air voids with a maximum diameter of 1/8 inch and maximum length of 1/4 inch are normal and acceptable. Sand pockets or voids behind continuous reinforcing steel are unacceptable. The surface against the form or bond plane shall be sound, without a sandy texture, or voids.

2. Grade 2: Shotcrete specimens shall have no more than two laminations or sandy areas with dimensions not to exceed 1/8 inch thick by 1 inch long. The height, width and depth of voids shall not exceed 3/8 inch in any direction. Porous areas behind reinforcing steel shall not exceed 1/2 inch in any direction except along the length of the reinforcing steel. The surface against the form or bond plane shall be sound, without a sandy texture or voids.

3. Grade 3: Shotcrete specimens shall have no more than two laminations or sandy areas, with dimensions exceeding 3/16 inch thick by 1-1/4 inches long, or one major void, sand pocket, or lamination containing loosely bonded sand not to exceed 5/8 inch thick and 1-1/4 inches in width. The surface against the form or bond plane may be sandy with voids containing overspray to a depth of 1/16 inch.

4. Grade 4: The core shall meet in general the requirements of Grade 3 cores, but may have two major flaws such as described for Grade 3 or may have one flaw with a maximum dimension of 1 inch perpendicular to the face of the core with a maximum width of 1-1/2 inches. The end of the core that was shot against the form may be sandy and with voids containing overspray to a depth of 1/8 inch.

5. Grade 5: A core that does not meet the criteria of core grades 1 through 4, by being of poorer quality, shall be classified as Grade 5.

E. Evaluation of in-place shotcrete

1. Remove and replace shotcrete that is delaminated, exhibits laminations, voids, or sand pockets exceeding the limits for the specified grade of shotcrete. Remove and replace shotcrete that does not comply with the specified material properties. Repair core holes in accordance with Article 1.05C.2.c above.

F. Acceptance

1. The Resident Engineer has the authority to accept or reject shotcrete work. Shotcrete which does not conform to these Specifications may be rejected either during the shotcrete application process, or on the basis of tests from either test panels or the completed work.

2. Deficiencies observed during the shotcrete application process such as, but not limited to, the following constitute a cause for shotcrete rejection:
a. Failure to properly control and remove build-up of overspray and rebound;
b. Incomplete consolidation of shotcrete behind and around reinforcing steel, mesh and anchors;
c. Incorporation of sand lenses, excessive voids, delaminations, sags or sloughing;
d. Failure to apply shotcrete to the required line, grade and tolerance.

3. Wherever possible perform remedial work to correct deficiencies while shotcrete is still plastic.

4. Hardened shotcrete will be examined by the Resident Engineer for any evidence of excessive plastic or shrinkage cracking, tears, feather-edging, sloughs or other deficiencies. Sounding shall be used to check for delaminations.

5. Extract five cores from locations of reinforcing steel in the test panel. If any one core is graded higher than Core Grade 3 or with more than two of the five cores having a Core Grade of 3, the entire test panel is a failure.

6. If the results of compliance tests from shotcrete test panels, or assessment of the plastic or hardened shotcrete indicate non-conformance of the shotcrete, the Resident Engineer will implement a program of evaluation of the in-place shotcrete. Such evaluation shall include, but not be limited to:

   a. Extraction of cores from in-place shotcrete at locations selected by the Resident Engineer and testing of such cores for compliance.
   b. Checking for delaminations using sounding or other appropriate non-destructive testing procedures.
   c. Bond pull-off testing.
   d. Diamond saw cutting or coring to check adequacy of encasement of reinforcing steel and anchors.

7. Rejected shotcrete shall be removed and the facing rebuilt to the satisfaction of the Resident Engineer, or the facing may be strengthened as approved by the Resident Engineer, all at no cost to Sound Transit. Additional reinforcing or shotcrete may be required as directed by the Resident Engineer at no cost to Sound Transit.

**PART 2 - PRODUCTS**

2.01 CEMENT

   A. Portland cement: ASTM C 150, Type II.

2.02 AGGREGATE

   A. Normal weight aggregate: ASTM C 33. Aggregate not meeting ASTM C 33 may be used provided preconstruction tests demonstrate the shotcrete meets all other specified requirements.

   B. Lightweight aggregate: not permitted.

   C. Maximum aggregate size: 3/4 inch.
D. Additional requirements for permanent shotcrete: Potential reactivity of aggregates: Use only aggregates classified as innocuous in accordance with ASTM C 288.

2.03 REINFORCEMENT
A. Deformed steel reinforcement: ASTM A 615.
C. Fiberglass reinforcement: Refer to Section 06 82 00, Glass Fiber-Reinforced Plastic.

2.04 WATER
A. Clean and potable.
B. Mixing water for shotcrete shall be clean, potable, and free from substances which may be injurious to concrete and steel, and shall meet requirements of ASTM C 94. Water shall be free from elements that cause staining.

2.05 ADMIXTURES
A. Water-reducing and superplasticizer: ASTM C 1141.
B. Retarding: ASTM C 1141.
C. Accelerating: ASTM C 1141. In addition, accelerating admixtures for permanent shotcrete shall meet the following requirements:
   1. Liquid, non-aggressive type accelerator.
   2. Provide a signed statement from certified Independent Testing Laboratory or cement manufacturer that proposed accelerator and dosing is compatible with cement.
E. Fly ash and natural pozzolans: ASTM C 618.
F. Ground granulated blast-furnace slag: ASTM C 989.
G. Silica fume: ASTM C 1240.
   1. Accelerating additives shall be compatible with cement used, be noncorrosive to steel and shall not promote other detrimental effects such as cracking and excessive shrinkage and shall not contain calcium chloride. They are to be used in accordance with manufacturers’ recommendations. Silica fume, if used, shall not exceed 10 percent of the cement weight and shall be an admixture with a minimum of 90 percent SiO2 with a proven record of performance for use in shotcrete.

2.06 CURING MATERIALS FOR PERMANENT SHOTCRETE
A. Curing materials that cause stains on architectural finishes shall not be used.
B. Sheet materials: ASTM C 171.
C. Curing compounds: ASTM C 309, apply as recommended by manufacturers.

2.07 PROPORTIONING
A. Select shotcrete proportions to produce the specified material properties.
B. Shotcrete mix proportions for all shotcrete, including preconstruction test mixes, using normal weight aggregate shall produce the following compressive strengths:

<table>
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<th>LINING</th>
<th>AGE OF SHOTCRETE</th>
<th>$f_c$, PSI</th>
<th>ASTM TEST METHOD</th>
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</thead>
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<tr>
<td>Initial</td>
<td>24 hours</td>
<td>1,500</td>
<td>C1074 or C39</td>
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<tr>
<td>Initial and Final</td>
<td>7 days</td>
<td>3,000</td>
<td>C39</td>
</tr>
<tr>
<td>Initial and Final</td>
<td>28 days</td>
<td>4,000</td>
<td>C39</td>
</tr>
</tbody>
</table>

C. Minimum slump of wet-mix shotcrete shall be 1 inch. Actual value shall be determined from preconstruction trials.

2.08 PRE-BAGGED MATERIALS

A. Pre-bagged materials are allowable with pre-dampening prior to use.

2.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials to prevent contamination, segregation, corrosion, or damage.

B. Store shotcrete materials in a dry place.

C. Store aggregate materials at a minimum temperature of 40 degrees F.

D. Store liquid admixtures to prevent evaporation and freezing. Store admixtures at all times in clearly marked and labeled containers (including admixture name, type, storage requirements, use-before date, instructions for use, safety precautions, and manufacturer’s recommended dosage range).

2.10 EQUIPMENT

A. Use batching equipment that proportions aggregate and cement mixtures by weight. Batching by volume is not permitted.

B. Use an air supply system that delivers air uncontaminated by oil or any other contaminant and that is capable of maintaining a constant pressure.

C. Shotcrete delivery equipment shall be capable of delivering a steady stream of uniformly mixed material to the discharge nozzle at the proper velocity and rate of discharge.

D. Use positive displacement pumps equipped with hydraulic or mechanically powered pistons, with compressed air added at the discharge nozzle, for wet-mix shotcrete application.

E. Monitor air ring at nozzle for signs of blockage of individual air holes. Stop shooting and clean air ring if non-uniform discharge of shotcrete becomes apparent.

F. Clean shotcrete delivery equipment thoroughly at the end of each shift. Regularly inspect and clean air ring and nozzle; replace if required.

G. Provide a separate air hose and blow pipe, capable of simultaneous operation with shotcreting operation, for removal of rebound and dust.
H. Equipment will be subject to approval of the Resident Engineer. Maintain equipment in proper working order. Provide additional test panels and test cores as required by the Resident Engineer to demonstrate that the equipment is functioning properly during shotcreting operation.

I. Provide standby equipment on site and in good working order at all times during shotcreting operations.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that placement and clearance around reinforcement (including wire mesh) is adequate for complete encasement.

B. Verify that surfaces to receive shotcrete have been properly prepared according to the Contract Documents.

C. Remove rebound and any other foreign material from construction joints prior to continuing shotcrete installation.

D. Rebound shotcrete shall not be reused or incorporated into the work.

E. Sequence of shotcrete installation shall be as shown on the Contract Documents. Thickness indicated is the minimum thickness at any point. Use thickness indicators to control and verify thickness.

3.02 BATCHING AND MIXING

A. Weight batching shall comply with the accuracy specified in ASTM C 94.

B. Use batching and mixing equipment capable of proportioning and mixing the required materials.

C. Use feed systems for all materials that are interconnected such that if one feed stops, all feeds stop.

D. Shoot dry-mix shotcrete material within 45 minutes after batching or pre-dampening.

E. Shoot wet-mix shotcrete material within 90 minutes after batching.

F. Dosing of admixture by hand is not permitted.

G. Shotcrete delivered to shotcrete pump with a slump that is outside the confirmed design range will be rejected.

3.03 SURFACE PREPARATION

A. Soils, including ground improved soils: Prepare surfaces to line and grade. Dampen surface immediately prior to shooting.

B. Concrete and Shotcrete: Remove all deteriorated, loose, unsound material or contaminants that may inhibit bonding. Chip areas to be repaired to remove offsets causing abrupt changes in thickness. Taper edges to approximately 45 degrees to eliminate square shoulders at the perimeter of a cavity. Surface shall be saturated surface dry (SSD) immediately prior to placing shotcrete.

C. Structural Reinforcement, including Wire Mesh and Glass Fiber-Reinforced Plastic: The surface shall be free of deleterious materials that inhibit bonding. Reinforcement laps
shall be separated with a clearance of at least three times the diameter of largest aggregate. Reinforcement shall be secured to prevent movement.

D. Water Leaks: Securely attach drainage pipes, drainage board or similar prior and during shotcreting.

E. Geocomposite Drainage Board: Remove loose material, mud, or any other foreign material that will prevent bonding. Clean surface with compressed air. Repair any damage to the drainage board prior to shotcrete application.

3.04 JOINTS

A. Construction Joints: Taper construction joints at a 1 to 1 slope. Surface preparation of joints shall comply with Article 3.03B. Continue reinforcement through construction joint.

3.05 ALIGNMENT CONTROL

A. Install taut ground wires or other means to establish thickness and plane of required surface.

B. Install taut ground wires or other means at corners or offsets not established by forms.

3.06 APPLICATION

A. Shotcrete Placement Technique

1. Provide a platform that permits nozzleman unobstructed access to the receiving surface. Remove rebound and overspray from previously prepared surfaces prior to shotcrete placement.

2. Apply shotcrete from the bottom and continue upwards to avoid the inclusion of rebound in the lining.

3. Spraying shotcrete through more than one layer of reinforcement or mesh is not permitted.

4. Place shotcrete first in corners, recesses, and other areas where rebound or overspray cannot escape easily. Place shotcrete with nozzle held at approximately 90-degree angle to the receiving surface. In corners, direct nozzle at approximately 45-degree angle or bisect the corner angle.

5. Velocity and spraying distance shall be the optimum for maximum shotcrete adherence and compaction.

6. Apply shotcrete so sags or sloughing do not occur. Where movement of shotcrete has occurred adjacent to a slough-off, the shotcrete in question shall be removed.

7. Discontinue shooting or shield the nozzle stream if wind causes separation of ingredients during shooting.

8. Do not reuse rebound or overspray.

9. Remove laitance and any foreign material from shotcrete surfaces to receive additional shotcrete layers. Surface preparation after final set shall comply with Article 3.03B.

10. Prior of shotcrete application, control groundwater inflow and seepage to prevent dissolution of cement and fine aggregates in the fresh shotcrete. Control groundwater as shown on the Contract Documents and specified, or by other
appropriate and approved methods. Do not apply shotcrete on surfaces with standing water.

11. Remove hardened overspray and rebound from adjacent surfaces, including exposed reinforcement.

B. Encasement of Reinforcement, including Wire Mesh and Glass Fiber-Reinforced Plastic: Place shotcrete to completely encase reinforcement. Encase reinforcement by shooting with sufficient velocity and plasticity so material flows around and behind the reinforcement. Front face of reinforcement shall remain clean during encasement. Place shotcrete to provide the cover over reinforcement as shown on the Contract Documents.

3.07 FINISHING

A. Visual Inspection:

1. Smoothness criteria: Do not exceed a depth to wavelength ratio of 1/60 measured with a 10-foot straight edge along the horizontal and vertical directions in the plane of the facing.

2. Thickness indicators: Install appropriate thickness indicators to verify lining thickness.

3.08 CURING

A. Temporary Shotcrete: Natural curing is permitted.

3.09 HOT WEATHER SHOTCRETING

A. Do not place shotcrete when shotcrete material temperature is above 90 degrees F for wet-mix; 100 degrees F for dry mix. Lower temperature of reinforcement and receiving surfaces below 100 degrees F prior to placing shotcrete.

3.10 COLD WEATHER SHOTCRETING

A. Placing shotcrete may proceed when ambient temperature is 40 degrees F and rising. Placing shotcrete shall discontinue when ambient temperature is 40 degrees F and falling unless protective measures are taken to protect shotcrete. Shotcrete material temperature, when placed, shall not be less than 50 degrees F. Applicable procedures used for cold weather concreting may be used for cold weather shotcreting. Protection against frost shall be maintained until the shotcrete has developed a compressive strength of 2,000 psi.

3.11 PROTECTION

A. Protect surfaces not intended for shotcrete placement from deposit of rebound and overspray or impact from nozzle stream.

1. Remove rebound and hardened overspray from final shotcrete surfaces and from areas not intended for shotcrete placement, and dispose in accordance with Section 31 23 01, Excavation Spoils and Muck Disposal.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY:

A. This Section specifies the fabrication and erection of precast concrete components and structures used for utilities and temporary decking structures. Requirements for precast concrete tunnel linings are specified elsewhere.

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 20 00, Concrete Reinforcing.
   3. Section 03 35 00, Concrete Finishing.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents:

      b. ASTM A153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

   2. American Welding Society (AWS):
      a. ANSI/AWS D1.1 Structural Welding Code - Steel
      b. ANSI/AWS D1.4 Structural Welding Code - Reinforcing Steel

1.03 SUBMITTALS

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

B. Shop Drawings:

   1. Installation instructions, product data, and manufactures’ literature

   2. Dimensions, reinforcement, details, mix designs, lifting positions and devices, details of lifting inserts, anchors, connections, connections to structure, accessories, joints, shim arrangement, conduits, pipe sleeves, penetrations, and openings.

C. Working Drawings: Erection Drawings and Procedures - Indicate method and sequence of operations and location of precast sections in the Work with same identification marks used in fabrication.
D. Product Data: Submit manufacturer's product data of standard manufactured precast items, such as utility boxes and vaults. Include manufacturer's detailed drawings and dimensions. Product data need not be submitted for the precast concrete decking panels for the temporary deck structures.

E. Qualifications for Fabricator and Welders.

F. Certificates:
   1. Current plant certification under the PCI Plant Certification Program.
   2. Welding certificates or affidavits attesting to the welders' qualifications to perform the indicated and specified welding.
   3. Certificates need not be submitted for the precast concrete decking panels for the temporary deck structures.

G. Production Records: Retain a record of each day's production.

1.04 QUALITY ASSURANCE

A. Qualifications of Fabricator:
   1. Fabricator of precast concrete products: Approved participant in the PCI Plant Certification Program.
   2. Production facility: Regularly and continuously engaged in the manufacture of precast concrete products.

B. Qualifications of Welders: Prequalified in accordance with AWS D1.1, Chapter 5, or AWS D1.4, Chapter 6.

C. Working Drawings stamped, signed and sealed by a licensed structural engineer registered in the State of Washington.

D. Tolerances: Fabricate and erect precast concrete members within the tolerances recommended by the manufacturers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver precast concrete units to the site in such quantities and at such times as will assure the continuity of the installation.

B. Transport, handle, and store units in a manner that will prevent damage to the members.

C. If storage of precast units at the site is necessary, store units in a manner which will prevent cracking, distortion, staining, or other damage. Support members at their normal support points.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing Steel: Comply with Section 03 20 00, Concrete Reinforcing.

B. Portland Cement Concrete: Comply with Section 03 05 15, Portland Cement Concrete. When not otherwise indicated or specified, provide concrete in accordance with Table C of Section 03 05 15, Portland Cement Concrete.
C. Anchors, Lift Devices, and Accessories: Provide concrete inserts, reglets, anchors, and fasteners as indicated or required for fabrication and installation work. Ensure all items are zinc-coated or galvanized in accordance with ASTM A153 or ASTM A123, as applicable. Select the lift devices, and be responsible for their performance and for damage resulting from the use of faulty or inferior devices. Do not install lift devices on exposed faces of precast members.

D. Bearing pads for Precast Concrete Decking Panels: Bearing pads shall be continuous extruded neoprene strips with a Durometer Hardness of 50. The bearing pads shall be secured with rubber cement that is compatible with the bearing pads.

2.02 FABRICATION

A. Requirements and Standards:

1. Accurately construct forms to produce members to dimension, shape, configuration, and profile indicated. When not otherwise indicated, construct forms to produce smooth concrete.

2. Place and secure concrete reinforcement, lifting reinforcement, and concrete inserts and anchorage devices as required to prevent movement.

3. Place and consolidate concrete to shape, configuration, and dimensions indicated.

4. Steam cure members. Provide a minimum curing cycle for steam for three days or until the specified strength of concrete is attained. Precast concrete decking panels for temporary deck structures need not be steam cured.

B. Finishes:

1. For those items not exposed to public view, such as utility boxes, provide "smooth form finish" as specified in Section 03 35 00, Concrete Finishing.

2. The top surface of the precast concrete decking panels for the temporary deck structures shall be given a final finish surface by texturing with a comb in an orientation that will be perpendicular to the centerline of NE 43rd Street and NE 67th Street, as appropriate, once the decking panels are installed. The comb shall produce striations approximately 0.015 foot in depth at approximately ½-inch spacings in the fresh concrete.

C. Markings: Provide permanent markings in precast units to identify pick-up points and orientation in the structure, conforming to the markings indicated on shop drawings. Imprint the date of casting on each precast unit where it will not show in the finished structure.

2.03 SOURCE QUALITY CONTROL

A. Test concrete for compressive strength as specified in Section 03 05 15, Portland Cement Concrete.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine all parts of the supporting structure and the conditions under which the precast concrete units are to be erected and installed. Verify the locations of anchors to predetermine the accuracy of the installation of each member.
3.02 ERECTION/INSTALLATION

A. Transport and erect precast concrete units as specified herein.

B. Erect precast concrete units and accurately install in place with mechanical hoisting equipment.

C. Maintain precast concrete unit in upright position at all times. Handle unit only by indicated lifting devices or cushioned pads, and in a manner that will not overstress or damage the unit.

D. Erect precast concrete units in accordance with manufacturer’s recommended erection tolerances. Comply with erection sequences per Working Drawings. Position units and structures to avoid eccentric application of forces, and make complete and uniform contact with bearing surfaces.

E. Provide anchorage and attachment welding and bolting, as required.

F. At completion, ensure units are plumb, level, and square, true to line, with angles and edges parallel with related building lines.

3.03 FIELD QUALITY CONTROL

A. The Resident Engineer will observe installation of structures, including preparation of bedding surfaces, installation to required tolerances, and backfilling around the structures.

END OF SECTION
PART 1 - GENERAL

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 05 15, Portland Cement Concrete.
2. Section 03 30 00, Cast-In-Place Concrete.
3. 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

   a. ASTM C157 Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete
   b. ASTM C827 Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
   c. ASTM C881 Specification for Epoxy-Resin-Base Bonding Systems for Concrete
   d. ASTM C1107 Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrinkable)
   e. ASTM D149 Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
   f. ASTM D395 Standard Test Methods for Rubber Property—Compression Set
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: 0.1 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: 2500 psi

c. At seven days: 3500 psi

d. At 28 days: 5000 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**
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 00.20, Quality Assurance/Quality Control
2. Section 03 20 00, Concrete Reinforcing
3. Section 05 50 00, Metal Fabrications: Loose steel lintels
4. Section 08 11 13, Hollow Metal Doors and Frames

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.

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.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.06 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. Special Shapes: Provide non-standard blocks configured for corners, bond beams (if any), lintels, headers, control joint edges, and other detailed conditions.

d. Load-Bearing Units (Typical): ASTM C90, normal or medium weight with a minimum compressive strength as noted on Contract Drawings.

e. Standard, and Exterior Ground and Polished Face Concrete Masonry Units: ASTM C90, Type 1, hollow block.

1) Manufacturer: As listed above.

2) Substitutions: Section 01 25 00, Substitution Procedures.

f. 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) 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.

3) 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.

4) 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.

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.

3. Water: Clean and not detrimental to mortar mixture.

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.
   a. 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 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.

3.08 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.

3.09 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.

3.10 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.

3.11 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.

3.12 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.

3.13 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.

3.14 FIELD QUALITY CONTROL
A. An Independent Testing Laboratory to perform field quality control tests, as specified in Section 01 45 00.20, 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.

3.15 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.
3.16 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. Galvanizing where indicated for steel items.

B. Related Sections:
   1. Section 05 12 00, Structural Steel Framing.
   2. Section 05 50 00, Metal Fabrications.
   3. Section 09 90 00, Painting and Coating

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.
   1. American Architectural Manufacturers Association (AAMA):
      a. AAMA 2604 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
   2. American Hot-Dip Galvanizers Association, Inc. (AHDGA)
      a. AHDGA Inspection Manual for Hot-Dip Galvanized Products
   3. 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
   4. 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.
   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. Galvanizer Certification: Furnish signed certification for the following:
   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.

1.05 QUALITY ASSURANCE
A. Galvanizing Firm:
   1. Engage a galvanizing firm with a current membership in the American Hot-Dip Galvanizers Association Inc. (AHDGA).
   2. Inspect and test galvanized fabrications in compliance with ASTM A123 for the following:
      a. Visual examination of samples and finished products.
      b. Thickness of coating
      c. Adhesion
   3. Mark all galvanized material with the galvanizer's stamp.
B. DELIVERY, STORAGE, AND HANDLING:
C. Deliver, store, and handle galvanized fabrications in a manner that prevents damage to the item and its galvanizing.
1.06 WARRANTY

A. Written warranty for five-year period starting on date of substantial completion stating that shop applied coating will not blister, peel, crack, chalk, change color or have other forms of degradation during the warranty period.

1. In the event that coating failure occurs within the warranty period, replace item indicating coating failure, including full cost of labor and materials for such replacement. Replacement items shall be new and finished with same type coating meeting the requirements of this Section. Replacement items shall match adjacent members.

2. Resident Engineer may, at his 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.

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 PERFORMANCE REQUIREMENTS

A. Finish coating system shall meet or exceed the performance requirements of AAMA 2604 as outlined below. Refer to AAMA 2604 and the cited ASTM test procedures for more complete information on testing and exposure requirements.

1. Gloss: Coatings shall have 25 to 40 percent reflective gloss when tested in accordance with ASTM D523.

2. Dry Film Thickness: 1.6 mils minimum as measured by eddy current meter as defined in ASTM B244 or other equipment of equivalent precision.

3. Hardness: No rupture of coating film at F hardness minimum when tested by ASTM D3363.

4. Adhesion: No removal of coating film or blistering during dry, wet, or boiling water adhesion testing when tested in accordance with AAMA 2604: 7.4.1.

5. Impact Resistance: No removal of coating film when tested in accordance with AAMA 2604: 7.5.1.

6. Abrasion: Minimum abrasion coefficient value of 20, when tested in accordance with ASTM D968 and coefficient calculated in accordance with AAMA 2604.

7. Muriatic Acid Resistance: No blistering, and no visual change in appearance when tested in accordance with AAMA 605.98.

8. Mortar Resistance: Mortar test patches shall dislodge easily from the coating film and any residue shall be removable with a damp cloth or with 10 percent muriatic acid solution. No loss of film adhesion or visual change in coating appearance after removal of test patches when tested in accordance with AAMA 2604: 7.7.2.1.
9. Nitric Acid Resistance: Maximum color change of 5 NBS units between tested and untested areas as calculated in accordance with ASTM D2244, when tested in accordance with AAMA 2604: 7.7.3.1.

10. Detergent Resistance: No loss of adhesion or blistering and no visual change in appearance when tested in accordance with AAMA 2604: 7.7.4.1.

11. Humidity Resistance: Formation of blisters not to exceed "Few" blisters size No. 8, as shown in Figure 4, in ASTM D714 when tested in accordance with ASTM D2247 and AAMA 2604: 7.8.1.1.

12. Salt Spray Resistance: Maximum undercut failure of 1/16 inch at scribed test lines and maximum film failure rate of 2 percent by area due to blistering or other film failures when tested in accordance with ASTM B117 and with AAMA 2604: 7.8.2.

13. Weathering Resistance-Color Retention: Maximum color change of 5 NBS units between tested and untested areas as calculated in accordance with ASTM D2244 after exposure testing in accordance with AAMA 2604: 7.9.1.1.


15. Weathering Resistance-Gloss Retention: Minimum gloss retention of 30 percent when tested and calculated in accordance with ASTM D523 and AAMA 605.98 after exposure testing in accordance with AAMA 2604.

16. Weathering Resistance-Erosion Resistance: Maximum erosion of 10 percent of dry film thickness as measured by eddy current meter as defined in ASTM B244 or other equipment or equivalent precision after exposure testing in accord with AAMA 2604: 7.9.1.1.

B. Minor film scratches and other blemishes in film surfaces that are repaired in accordance with recommended procedures and with recommended touchup materials shall meet or exceed the performance requirements outlined below.

1. Such repairs shall match the original finish for color and gloss.

2. Such repairs shall adhere to the original finish and exhibit no removal of coating film or blistering during dry adhesion testing when tested in accordance with AAMA 2604: 7.4.1.1.

PART 3 - EXECUTION

3.01 PREPARATION FOR GALVANIZING

A. Galvanizing:

1. Complete fabrications to the greatest extent possible prior to galvanizing.

2. 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.

3. Clean all surfaces in compliance with SSPC SP6, Commercial Blast Cleaning.

4. Pickle all surfaces in compliance with SSPC SP8, Pickling.
3.02 APPLICATION

A. Galvanizing:

1. 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.

2. Safeguard against steel embrittlement in compliance with ASTM A143.

3. 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 FIELD QUALITY CONTROL AND REPAIR

A. Galvanized Surfaces:

1. Apply galvanizing repair paint or other methods described in ASTM A 780.

2. 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 welding of structural steel and miscellaneous metalwork, including sheet steel, as indicated. This Section also includes qualification of welders and welding procedures, inspections and tests of welds.

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 05 50 00, Metal Fabrications.

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

   a. ASTM E94  Guide for Radiographic Testing
   b. ASTM E164  Practice for Ultrasonic Contact Examination of Weldments
   c. ASTM E165  Standard Test Method for Liquid Penetrant Examination
   d. ASTM E709  Guide for Magnetic Particle Examination
   e. ASTM E1032  Method for Radiographic Examination of Weldments

3. 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. AWS QCI  Standard for AWS Certification of Welding Inspectors
1.03 SUBMITTALS

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

B. Make submittals in compliance with ANSI/AWS 2.4 and 3.0.

C. Welder Qualifications: Submit current Washington State Building Officials (WABO) welding certification for each welder, valid for each process, method, and position used.

D. Welding Procedures: Submit procedure qualification test records for procedures other than those pre-qualified in accordance with ANSI/AWS D1.1

E. Inspector Qualifications:
   1. Welding Inspector
   2. Personnel Performing Nondestructive Testing

F. Inspection and Test Reports: Forward inspection and test results to the Resident Engineer immediately after results are available. Results must state whether results are conforming or nonconforming.
   1. Visual inspection reports
   2. Ultrasonic test reports
   3. Nondestructive test reports

1.04 QUALITY ASSURANCE


B. Qualification of Welding Procedures: Prequalified or qualified in accordance with ANSI/AWS D1.1.

C. Qualifications of Welding Inspector: ANSI/AWS Certified Welding Inspector (CWI)

D. Qualification of Personnel Performing Nondestructive Testing:
   1. American Society for Nondestructive Testing Certified NDT
   2. Only personnel certified for NDT Level I and working under a NDT Level II person or persons certified for NDT Level II may perform nondestructive testing.

E. Qualification of Stud-Connector Manufacturer: In accordance with ANSI/AWS D1.1, Annex IX, "Manufacturers' Stud Base Qualification Requirements."

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fasteners
   1. High Strength Bolts
      a. Bolt: ASTM A325, Type 1, heavy-hex)
      b. Nuts: ASTM A563 heavy-hex
c. Washers: ASTM F436

d. Finish: Hot-dip zinc coating per ASTM A153

2. Anchor Rods: ASTM F1554, Grade 36

3. Welded Shear Connectors and Welded Headed Studs: ASTM A108, grades 1010 through 1020, headed stud type, cold finished carbon steel, AWS D1.1, Type B.

2.02 EQUIPMENT

A. Welding Rod/Electrodes for structural plate, shapes and bars.


2. Coated rods or wire of size and classification number as recommended by their manufacturers for the positions and other conditions of actual use. Match filler metal requirements in conformance with ANSI/AWS D1.1.

2.03 FABRICATION

A. Welding of reinforcing steel for concrete is specified in Section 03 20 00, Concrete Reinforcing.

B. Shop Welding

1. Perform shop welding as indicated in accordance with ANSI/AWS D1.1, and ANSI/AWS D1.3, as applicable to the work.

2. Mark welder ID adjacent to completed weld using metal stamp, metal engraving, keel, paint stick, or other appropriate marking material.

3. Weld stud shear connectors in conformance with stud manufacturer’s printed instructions.

C. Anchorage to concrete:

1. Refer to Section 05 50 00, Metal Fabrications.

2.04 SHOP WELD QUALITY CONTROL

A. Inspections and Test by the Contractor employed Independent Testing Laboratory

1. Visual Inspection:

   a. Conform to ANSI/AWS D1.1.

   b. Visually inspect 100 percent of welds, for both permanent and temporary work.

2. Quality of welds and standards of acceptance: Conform to ANSI/AWS D1.1.


5. Ultrasonic Testing: ANSI/AWS D1.1, and ASTM E164, as applicable. Test complete joint penetration groove welds as follows:
a. One out of ten (10 percent) with thickness equal to or less than 3/4 inch.

b. One out of two (50 percent) with thickness greater than 3/4 inch and equal to or less than 1-1/2 inches.

c. 100 percent for thickness greater than 1-1/2 inches.

6. Magnetic Particle Inspection: ASTM E709. Inspect complete and partial joint penetration groove welds and fillet welds as follows:

a. One out of five (20 percent) of complete joint penetration groove welds of tee and corner joints.

b. One out of ten (10 percent) of partial joint penetration groove welds and fillet welds.

B. Shop Inspections and Test by the Resident Engineer

1. All welds are subject to inspections and tests by the Resident Engineer. The Resident Engineer will inspect welds at random.

2. The Resident Engineer will make test results available to the Contractor, within 48 hours after inspection and testing.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL BY THE CONTRACTOR-EMPLOYED INDEPENDENT TESTING LABORATORY

A. Inspections and Tests

1. Perform tests of field welds as specified for shop welds in Shop Weld Quality Control article, herein, if applicable.

2. Prior to loading structures (permanent and temporary), successfully perform all required inspections and tests of structures in accordance with Contract Document requirements and notify the Resident Engineer of the results.

3. Allow Resident Engineer access to perform independent verification testing and inspection.

B. Field Welding: Perform field welding as herein specified for shop welding.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for furnishing, fabricating, and erecting structural steel 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 62 00, Non-Shrink Grouting
2. Section 05 05 13 Shop Applied Metal Coatings
3. Section 05 05 23, Metal Fastenings
4. Section 26 05 26 Grounding and Bonding for Electrical Systems
5. Section 26 42 50 Tunnel Corrosion Control at Stations

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Institute of Steel Construction (AISC):
   a. AISC 303 Code of Standard Practice for Steel Buildings and Bridges
   b. AISC 360 Specification for Structural Steel Buildings

   a. ASTM A6 Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and 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 A252 Specification for Welded and Seamless Steel Pipe Piles
   e. ASTM A500 Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
   f. ASTM A572 Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
   g. ASTM A992 Specification for Structural Steel Shapes

a. ANSI/AWS A2.4 Standard Symbols for Welding, Brazing, and Nondestructive Examination

b. ANSI/AWS D1.1 Structural Welding Code-Steel

c. ANSI/AWS D1.8 Structural Welding Code – Seismic Supplement

4. American Petroleum Institute (API)

5. Society for Protective Coatings (SSPC)
a. SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning

1.03 SUBMITTALS

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

B. Shop Drawings:
   1. Submit detailed shop drawings of structural steel work, including erection plans and piece drawings, showing member sizes, details of fabrication and construction, methods of assembly, field welding, spacing and locations of members, hardware, anchors, openings, and accessories, and erection sequence and details. Include procedures for heavy lifts and rigging.
   
   2. 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. Indicate locations of Protected Zones.
   
   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. Identify welds to the SLRS and Demand Critical Welds.
   
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
   
   5. Verify all dimensions and coordinate Work with adjoining Work.

C. Template Drawings and Placement Plans: As required for satisfactory placing of connections and anchorages.

D. Working Drawings and Method Statements:
   1. Investigate stresses caused by the proposed erection procedure.
   
   2. Submit the 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.
   
   3. Submit drawings sealed by a Professional Engineer. Show details of required temporary supports, staying, and bracing. Include descriptive data to illustrate the erection, transportation, and handling procedures, including sequence of erecting and transfer of loads if applicable.
   
   4. Submit calculations sealed by a Professional Engineer supporting the drawings and other descriptive data.
5. Furnish setting diagrams, templates, and directions for the erection of structural framing, anchor bolts, bearing plates, and other embedded items.

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 except for temporary steel struts and wales, and steelwork associated with the temporary decking structures.

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. Records for steel pipe struts verifying fabrication, erection inspection, and nondestructive test conformance.

G. Qualifications

1. Fabricator: AISC certification demonstrating conformance, and current work history.

2. Erector: AISC certification demonstrating conformance, and current work history.

3. Professional Engineer: License number, and current work history.

1.04 QUALITY ASSURANCE

A. Fabricator:

1. Currently certified under the AISC Certification Program, Category STD.

2. Minimum of five years experience with successfully completed structural steel work of similar complexity.

B. Erector

1. Currently certified under the AISC Certification Program, Category CSE

2. Minimum of five years experience with successfully completed structural steel work of similar complexity.

C. Professional Engineer: Licensed professional engineer currently registered in the State of Washington.

D. Welders: Section 05 05 23, Metal Fastenings
E. Welding Procedures: Section 05 05 23, Metal Fastenings

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 cover 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 marked 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.

PART 2 - PRODUCTS

2.01 STRUCTURAL STEEL SHAPES UNLESS NOTED OTHERWISE

A. Wide Flange Shapes (including structural tees): ASTM A992

B. Channels: ASTM A36

C. Angles: ASTM A36

D. Plate:
   1. Unless noted otherwise: ASTM A36
   2. Noted Grade 50: 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.

2.02 PIPE FOR PIPE CANOPY

A. ASTM A53, Grade B, Fy = 35 ksi.
   1. Each pipe shall be furnished with two ½-inch diameter holes (minimum) for grouting with one-way valves spaced every 3 feet along the pipe length. The two holes shall be located at either 3 and 9 o’clock positions or 12 and 6 o’clock positions staggered circumferentially along the pipe length.

2.03 PIPE FOR TEMPORARY STRUTS AND PSD CASING

A. ASTM A252 Grade 3 (modified) with a minimum yield strength of 50 ksi as modified by the following:
   1. Use straight seam welded, seamless, or helical (spiral) welded steel pipe. Make all welds complete joint penetration welds.
   2. Manufacture steel pipe in conformance with the dimensional and fabrication tolerances indicated in API 5L, Chapter 7.
3. Use pipe of carbon equivalency (CE), as defined in AWS D1.1 no greater than 0.45.

4. Use steel pipe with steel sulfur content no greater than 0.05 percent.

B. Fabrication inspection requirements at the manufacturing plant are as follows:

1. For 25 percent of the length of each continuous longitudinal and spiral weld on each pipe, use nondestructive testing by either radiographic, radioscopic, real time imaging systems, or ultrasonic methods that are in conformance with the requirements of AWS D1.1 or API Specification 5L, Section 9.7 for PSL-1 pipe.

2. For 100 percent of the length of each circumferential butt splice weld joining lengths of pipe, use nondestructive testing by either radiographic, radioscopic, real time imaging systems, or ultrasonic methods that are in conformance with the requirements of AWS D1.1 or API Specification 5L, Section 9.7 for PSL-1 pipe.

3. Conform the acceptance and repair criteria to the requirements of AWS D1.1, for tension, cyclically-loaded, non-tubular connections, or API 5L for PSL-1 pipe.

4. If repairs are required in a portion of the weld, perform additional nondestructive testing on both sides of the repair for a length equal to 10 percent of the total length of the weld on the piece of pipe inspected. If additional weld defects are found, perform nondestructive testing on 100 percent of the length of the weld on the steel pipe in conformance with the procedures described above.

5. Be responsible for performing all fabrication and erection inspection at the manufacturing plant. Costs associated with such performance are incidental to furnishing the steel pipe.

6. Allow inspection to be witnessed by the Resident Engineer in conformance with the requirements of API Specification 5L, Appendix H as requested by the Resident Engineer.

7. Submit records verifying that testing was accomplished and tested welds were in conformance with these specifications with the manufacturer’s mill certificates.

2.04 MANUFACTURED PRODUCTS

A. Bolts: Section 05 05 23, Metal Fastenings

B. Welding Electrodes: Section 05 05 23, Metal Fastenings

C. Grout: Section 03 62 00 Non-Shrink Grouting.

2.05 FABRICATION

A. Conform to the applicable requirements of AISC 303 and AISC 360.

B. Prefabricate and preassemble steel members and metal fabrications in the factory or shop as far as practicable. Mark and match-mark materials for field assembly.

C. Form and fabricate the work to meet installation conditions. Include accessories to adequately secure the work in place.

D. Seal joined members exposed to weather by continuous welds. Grind exposed welds smooth as indicated on the Contract Drawings.
E. 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 are cause material rejection. Do not use heat shrunken low-alloy structural steel.

F. 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. For cut edges exposed in the finished work, machine cut, shear, or flame cut, and grind flush in conformance with AISC 360. Maintain all working points.

G. Fabricate bearing stiffeners and stiffeners intended as supports for concentrated loads as indicated. Mill or grind bearing surfaces of these stiffeners.

H. 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.

I. Bolt or weld connections as indicated.

J. 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.

K. 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.

L. 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.

M. Include reinforcing angles, clip angles, plates, punched straps, brackets, and hangers as required to complete the work as indicated.

N. Provide drainage holes in structural components where water may accumulate without escape.

O. Where finishing is required, complete the assembly, including welding of units, before start of finishing operations. Finish surfaces of members exposed in the final structure shall be free of markings, burrs, and other defects.

P. Repair discontinuities within Protected Zones caused by fabrication operations such as tack welds, erection aids, air-arc gouging, and thermal cutting in conformance with AWS D1.8.
2.06 WELDING
   A. Shop Welding and Shop Welding Repairs: Section 05 05 23, Metal Fastenings

2.07 BOLTING
   A. Shop Bolting: Section 05 05 23, Metal Fastenings

2.08 SOURCE QUALITY CONTROL
   A. Fabricator's Facility: Fabricator's shop or facility will be inspected before the start of fabrication work. Notify the Resident Engineer in writing at least ten days before the scheduled start of fabrication work.
   B. Shop Welding Procedures and Personnel: Section 05 05 23, Metal Fastenings
   C. Shop Welding and Weld Repair Testing and Inspection: Section 05 05 23, Metal Fastenings
   D. Shop Bolting Testing and Inspection: Section 05 05 23, Metal Fastenings

PART 3 - EXECUTION

3.01 ERECTION
   B. Prior to erection, verify elevations of concrete and masonry bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements. Proceed with installation only after unsatisfactory conditions have been corrected.
   C. 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.
   D. Temporary Bracing: Provide temporary bracing as required and keep in position until final completion. Brace and carefully handled 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.
   E. Bases and Bearing Plates
      2. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required for correct leveling.
      3. Weld plate washers to top of base plate.
      4. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate.
5. Install high-strength, non-shrink grout in conformance with Section 03 62 00, Non-Shrink Grouting

F. Erection and Assembly: After erection and field assembly, align the various members forming parts of the completed structure and adjust accurately before fastening. Conform to tolerances of AISC 303.

G. Splice members only where indicated. Fasten splices of compression members after bringing abutting surfaces completely into contact.

H. Do not use thermal cutting during erection unless approved by the Resident Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1. Cutting will be permitted only on secondary members which are not under stress, as acceptable to the Resident Engineer.

I. 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.

J. Erection Connections

1. Place holes, plates, or other attachments required by the erector so as not to interfere with or cause any other detrimental effect to structural members or connections.

2. Remove erection bolts and attachments not shown on the Contract Drawings.

3. Fill holes not shown on the Contract Drawings with plug welds and grind smooth at exposed surfaces.

3.02 WELDING

A. Field Welding and Field Welding Repairs: Section 05 05 23, Metal Fastenings

3.03 BOLTING

A. Field Bolting: Section 05 05 23, Metal Fastenings

3.04 PROTECTION AND REPAIR

A. Corrective Measures

1. Report any errors in location or inaccuracies in setting anchor bolts, base plates, bearing plates, or other items of attachment or support for steel work to the Resident Engineer immediately. Correct as directed by the Resident Engineer.

2. Report any fit-up errors due to mis-fabrication to the Resident Engineer immediately, along with a proposed corrective measure. Do not proceed with corrective measures until approved by the Resident Engineer.

3. Correct bolted or welded connections, joints, or fastenings considered defective by the Resident Engineer as approved by the Resident Engineer.

B. Use fire-retardant blankets to completely contain arcs and spatter associated with welding.

C. Protected Zones:
1. Keep Protected Zones free of attachments such as welds, bolts, screwed or shot-in fasteners, limiting connection of perimeter edge angles, light gauge framing, partitions, duct work, piping, and other construction.

2. Repair Protected Zones in conformance with AWS D1.8.

3.05 FIELD QUALITY CONTROL

A. Field Welding Procedures and Personnel: Section 05 05 23, Metal Fastenings

B. Field Welding and Weld Repair Testing and Inspection: Section 05 05 23, Metal Fastenings

C. Field Bolting Testing and Inspection: Section 05 05 23, Metal Fastenings

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. 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 62 00, Non-Shrink Grouting.
3. Section 03 15 25 Anchorage to Concrete.
4. Section 05 05 13, Shop Applied Coatings for Metal.
5. Section 05 05 23, Metal Fastenings.
6. Section 05 12 00, Structural Steel Framing.
7. Section 09 90 00, Painting and Coating.

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)
   g. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2003a.
h. ASTM A 653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009.

2. American Welding Society (AWS)

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. 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.

D. 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. Wide Flange Shapes (including structural tees): ASTM A992
2. Channels: ASTM A36
3. Angles: ASTM A36
4. Plate:
   a. Unless noted otherwise: ASTM A36
   b. Noted Grade 50: ASTM A572, Grade 50

5. Hollow Structural Sections
   a. Rectangular: ASTM A500, Grade B, Fy = 46 ksi.
   b. Round, diameter equal to or less than 20 inches: ASTM A500, Grade B, Fy = 42 ksi.

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: Random Orbital Finish.

D. Grout and Anchoring Cement

1. Non-shrink-non-metallic Grout: Specified in Section 03 62 00, Non-Shrink Grouting.

E. 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: FS FF-S-325 type 1 (internally threaded tubular expansion anchors) and machine bolts in accordance with FS FF B 575 grade 5.
8. Neoprene Washers and Sheet Spacers: Flat, hard neoprene, minimum 1/8-inch thickness or as required to totally separate dissimilar metal materials.

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 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.

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. Toilet Partition and other overhead supports: Anchor supports securely to, and rigidly brace from overhead building structure.
K. Bar Gratings: Comply with NAAMM grating standard for bar sizes, installation clearances, and standard anchoring details.

1. Secure 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.

2. Secure non-removable units to supporting members by welding where both materials are the same; otherwise, fasten by bolting as indicated above.

3. Attach toe plates to gratings by welding at locations indicated.

L. Bollards: Anchor bollards in concrete by means of pipe sleeves preset and anchored into concrete. After bollards have been inserted into sleeves, fill annular space between bollard and sleeve solid with non-shrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's directions.

M. Install items plumb and level, accurately fitted, free from distortion or defects.

N. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

O. Perform field welding in accordance with AWS D1.1.

P. 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.

Q. 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.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for furnishing and installing galvanized steel handrails within the running tunnels.

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 03 62 00, Non-Shrink Grouting.
   3. Section 05 05 13, Shop Applied Coatings for Metal.
   4. Section 05 05 23, Metal Fastenings.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

B. American Society for Testing and Materials (ASTM)
   a. ASTM A36 Specification for Structural Steel
   b. ASTM A53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless

2. National Association of Architectural Metals Manufacturers (NAAMM)
   a. ANSI/NAAMM AMP S21 Pipe Railing Manual

1.03 SUBMITTALS

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

B. Shop Drawings: Detailed drawings of metal handrails and railings, showing sizes, details of fabrication and construction, handrail brackets, locations of hardware, anchors, and accessories, and installation details.

C. Product Data: Manufacturers' Product Data of railing system and railing components, handrails, handrail brackets, accessories, and anchors. Include manufacturer's written instructions for storage, handling, and installation.

D. Fabricator qualifications and experience.

E. Installer qualifications and experience.

F. Source Quality Control inspection tests and reports.

G. Field Quality Control inspection tests and reports.
1.04  QUALITY ASSURANCE

A. Fabricator: Experienced and skilled in the custom fabrication of architectural metal handrails and railings.

B. Installer: Experienced and skilled in the installation of custom architectural metal handrails and railings.

PART 2 - PRODUCTS

2.01  MATERIALS

A. General: Include fittings and components, sleeves, hardware, backing plates, and accessories as required for complete and finished handrail installations.

B. Metal Handrails

1. Steel Pipe: ASTM A53, Type S, Grade A, of diameters and sizes indicated. Instruct pipe manufacturer to furnish Architectural Handrail Grade pipe.

2. Anchor Plates: ASTM A36

3. Welding Rod/Electrodes: Section 05 05 23, Metal Fastenings

4. Bolts: Section 05 05 23, Metal Fastenings

5. Concrete Anchors

   a. Conform to Section 03 15 25, Anchorage to Concrete.

   b. Where cast-in anchors are not included in the concrete construction, provide stainless steel expansion anchors with matching stainless steel bolts or studs with nuts, of sizes as indicated or required.

   c. Use adhesive anchors along a concrete edge or concrete joint to prevent spalling.

   d. Provide washers under bolt heads and nuts.

C. Grout: Section 03 62 00, Non-Shrink Grouting

2.02  FABRICATION

A. General

1. Prefabricate and shop-assemble metal handrails as far as practicable.

2. Make handrails continuous. Where continuous handrails are required to be interrupted by equipment or cross passages, provide horizontal handrail returns to the wall and complete with end caps.

3. Form changes in rail direction by radius elbows.

4. Precision-form bends in rails to a smooth continuous radius. Finish work to a quality true to detail. Create butt joints with an internal pipe sleeve or dowel.

5. Grind and dress welded joints of handrails and railings to smoothly match adjacent surfaces and maintain the shape and profile of the item welded.
6. Cut material square and remove burrs from exposed edges with no chamfer.
7. Make exposed joints butt tight and flush.
8. Close exposed ends of pipe/handrail by use of appropriate end caps.

B. Welding: Section 05 05 23, Metal Fastenings

C. Finishes: Hot-dip galvanize all metal handrail and brackets in conformance with Section 05 05 13, Shop Applied Coatings for Metal.

2.03 SOURCE QUALITY CONTROL

A. Shop Welding: Section 05 05 23, Metal Fastenings

B. Shop Galvanizing: Section 05 05 13, Shop Applied Coatings for Metal

PART 3 - EXECUTION

3.01 INSTALLATION

A. General

1. Install in locations indicated on Contract Drawings.
2. Install in conformance with the approved Shop Drawings and ANSI/NAAMM AMP S21 as applicable.
3. Install concrete anchors in compliance with Section 03 15 25, Anchorage to Concrete.
4. Install metal handrails and accessories as required for complete and finished installation.
5. Erect work square and level, horizontal or parallel to rake of tunnel walkway, and free from distortion or defects detrimental to appearance or performance.
6. Provide expansion joints as needed to allow for thermal expansion or contraction.
7. Grind and polish welds smooth to match adjacent finish surfaces.

B. Field Welding: Section 05 05 23, Metal Fastenings

3.02 REPAIR/RESTORATION

A. Repair damaged galvanized surfaces in conformance with Section 05 05 13, Shop Applied Coatings for Metal.

3.03 FIELD QUALITY CONTROL

A. Field Welding: Section 05 05 23, Metal Fastenings

B. Field Galvanizing: Section 05 05 13, Shop Applied Coatings for Metal

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. Preservative-treated wood materials.
2. Fire-retardant-treated wood materials.
3. Communications and electrical room mounting boards.
4. Concealed wood blocking, nailers, and supports.
5. 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.

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.

3.02 APPLICATION

A. Site-Applied Wood Treatment

1. Apply preservative treatment compatible with factory applied treatment at sitesawn 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
PART 1 - GENERAL

1.01 SUMMARY

A. This section includes specifications for Glass Fiber Reinforced Plastic (GFRP) reinforcement and FRP soil nail tendons. Locations and extent of these elements are as indicated on the Contract Drawings.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.


2. American Concrete Institute (ACI)
   a. ACI 117 Specification for Tolerances for Concrete Construction and Materials
   b. ACI 440.1 Guide for the Design and Construction of Structural Concrete Reinforced with FRP Bars

3. Concrete Reinforcing Steel Institute (CRSI)
   a. Concrete Reinforcing Steel Institute Manual of Standard Practice

1.03 SUBMITTALS

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

B. Manufacturer’s Product Data:

1. Chemical and physical properties

2. Delivery, storage, and handling instructions

C. Manufacturer’s Certified Test Reports:

1. Source quality control testing for chemical and physical properties performed by and independent testing laboratory.

2. Submit reports for each bar size and each type of resin matrix used.
D. Placing Drawings: Include bar lists, schedules, placing details, plans, and elevations as required to delineate this portion of the work.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle GFRP bars in compliance with manufacturer’s published instructions.

B. Do not store GFRP bars directly on the ground. Use blocks to keep bars free of dirt, mud, and other foreign objects.

C. Store GFRP bars under cover to avoid direct sunlight and chemical substances.

PART 2 - PRODUCTS

2.01 MATERIALS

A. GFRP Reinforcement:

1. Surface: Deformed and sand coated.

2. Fiber Reinforcement: Continuous glass fibers with a minimum volume fraction of 65 percent per ASTM D2584. Glass fibers shall be either S or E glass.

3. Tensile Properties: Comply with Table 06 82 00.A. Tensile properties shall be determined in accordance with ASTM D3916 and ASTM D2990.

   **TABLE 06 82 00.A - TENSILE PROPERTIES**

<table>
<thead>
<tr>
<th>Bar Size</th>
<th>Tensile Strength (kilopounds per square Inch (ksi))</th>
<th>Tensile Modulus of Elasticity (ksi)</th>
<th>Ultimate Strain in Tension (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>#2</td>
<td>130</td>
<td>6,700</td>
<td>1.9</td>
</tr>
<tr>
<td>#3</td>
<td>120</td>
<td>6,700</td>
<td>1.7</td>
</tr>
<tr>
<td>#4</td>
<td>110</td>
<td>6,700</td>
<td>1.6</td>
</tr>
<tr>
<td>#5</td>
<td>105</td>
<td>6,700</td>
<td>1.5</td>
</tr>
<tr>
<td>#6</td>
<td>100</td>
<td>6,700</td>
<td>1.4</td>
</tr>
<tr>
<td>#7</td>
<td>95</td>
<td>6,700</td>
<td>1.4</td>
</tr>
<tr>
<td>#8</td>
<td>90</td>
<td>6,700</td>
<td>1.3</td>
</tr>
<tr>
<td>#9</td>
<td>85</td>
<td>6,700</td>
<td>1.1</td>
</tr>
<tr>
<td>#10</td>
<td>80</td>
<td>6,700</td>
<td>1.7</td>
</tr>
</tbody>
</table>

4. Binding material: Composed of vinyl ester resin, which is homogenous throughout the cross section of the bar.

5. Manufacturing Process:
   a. Pultrusion process.
   b. Glass rovings to be drawn through a resin bath, surface undulations and sand to be applied prior to thermoset of the polymer resin.

7. Splicing: For GFRP reinforcement, use lap splices only. The recommended lap splice length is 40 bar diameters.

8. Tie Wire: Fasten GFRP reinforcement with Nylon zip ties.

B. FRP Soil Nail Tendons

1. FRP soil nail elements shall be Durglass – Glasspree flat bar structural elements manufactured by Sireg SpA, or approved equal, meeting the minimum area requirements as shown on the Contract Drawings. At Contractor Option, FRP soil nail elements may also be Carbon Fiber – Carbopree structural elements manufactured by Sireg SpA or approved equal.

2. FRP soil nail heads/blocking system shall be compatible with the selected structural tendon elements.

3. FRP soil nail tendons shall not be spliced.

4. FRP soil nail tendon assemblies shall be designed to meet the minimum ultimate tensile force shown on the Contract Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify Work is ready to receive GFRP bars prior to installation.

3.02 PLACEMENT

A. Unless otherwise indicated, place reinforcing bars in accordance with CRSI Manual of Standard Practice. Conform to placement tolerances allowable limits in ACI 117.

B. Include all reinforcing bar details as required by CRSI when not indicated on the Contract Drawings or explicitly referred to in the Contract Specifications.

C. Securing:

1. Secure bars to prevent displacement by workers and shotcrete.

2. Secure GFRP bars at one-half the distance specified for steel reinforcing.

D. Cleaning: Remove foreign substances from bars before installation.

3.03 FIELD QUALITY CONTROL

A. Field Bending: Do not field bend GFRP bars.

B. Field Cutting:

1. Field cut GFRP bars with a fine blade saw, grinder, carborundum or diamond blade.

2. Do not shear GFRP bars.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies furnishing and installing the permanent waterproofing system for cross passages.

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 31 74 19.05, Shotcrete for SEM Tunnels
3. Section 31 74 19.10, Initial Shotcrete Tunnel Lining
4. Section 31 74 19.20, Final Shotcrete Tunnel Lining

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American Society for Testing and Materials (ASTM)
   a. ASTM D374 Test Method for Thickness of Solid Electrical Insulation
   b. ASTM D568 Test Method for Rate of Burning and/or Extent and Time of Burning of Flexible Plastics in a Vertical Position
   c. ASTM D638 Test Method of Tensile Properties of Plastics
   d. ASTM D1593 Specification for Nonrigid Vinyl Chloride Plastic Sheeting
   e. ASTM D1621 (Mod.) Compressive Properties of Rigid Cellular Plastics
   f. ASTM D1777 Method for Measuring Thickness of Textile Materials
   g. ASTM D1785 Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
   h. ASTM D3776 Test Methods for Mass per Unit Area (Weight) of Woven Fabric
   i. ASTM D3786 Test Method for Hydraulic Bursting Strength of Knitted Goods and Non-woven Fabrics: Diaphragm Bursting Strength Tester Method
   j. ASTM D4533 Test Method of Trapezoid Tearing Strength of Geotextiles
   k. ASTM D4632 Testing Method for Breaking Load and Elongation of Geotextiles (Grab Method)
I. ASTM D4716 Testing Method for Transmissivity

1.03 DEFINITIONS

A. Control and Contact Grouting Pipes: Pipes installed near water barrier intersections. If leakage should occur the pipes are used for remedial grouting.

B. Cross Passage Type: Either typical cross passage configuration or cross passages 21 and 31, low point pump station cross passages, as indicated in the Contract Documents.

C. Double Weld: Machine welded seams achieved by use of automatic hot-double-wedge welding equipment.

D. Geodrain: Composite panel providing a groundwater channel and protection of the synthetic membrane from sharp projections on the surface to which membrane is applied.

E. Geotextile: Non-woven fabric providing groundwater drainage channel and protection of the Membrane from sharp projections of the shotcrete surface to which the Membrane is to be applied.

F. Leakage: Damp spots, water seeping or dripping from the final tunnel lining or tunnel invert.

G. Membrane: Synthetic waterproofing membrane specifically formulated for sealing underground structures against intruding groundwater.

H. Patent Strip: Channel shaped stainless steel bar with pre-punched holes used to achieve a tight fit at waterproofing terminations.

I. Protective Concrete: Concrete placed on waterproofing installed at the tunnel invert to prevent damage.

J. Regroutable Hose: Hose attached to water barriers or to the TBM segment at waterproofing terminations as shown in the Contract Documents which must be grouted, flushed and regrouted with polyurethane grout.

K. Sealant Strip: Polymer swelling gasket strip applied in conjunction with patent strips at waterproofing terminations.

L. Sectioning: Water barriers arranged to seal off individual membrane sections. Used in conjunction with control and contact grouting pipes.

M. Single Weld: Hand welded seam consisting of a tack weld, a thin continuous weld and a rolled end weld. Single seams are sealed with sealant liquid at membrane welds.

N. Temporary Relief Pipe: Temporary groundwater relief pipe installed as needed in the invert or tunnel side walls as needed to relieve groundwater pressure during construction.

O. BA Anchor: Rigid polymer shell with an inside thread and polymer based membrane flange used to aid in creating watertight penetrations through the membrane for temporary steel rod attachment.

P. Water Barrier: A base seal waterstop welded to the membrane.

Q. Waterproofing: Layered system consisting of membrane, geotextile or geodrain, concrete protection layers, water barriers, grouting pipes and regroutable hoses, and various 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 into the finish structure shall be acceptable.

1.05 SUBMITTALS

A. Qualifications including a resume listing applicable project experience, position held, duration and project description.

   1. Waterproofing installer
   2. Waterproofing 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. Water barrier
   5. BA anchor
   6. Patent strip
   7. Sealant strip
   8. Perforated pipe
   9. Remedial grout
   10. 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 for each type of cross passage. Include splice locations and types of welds.
   3. Build-up of layered waterproofing in invert and at initial shotcrete tunnel lining.
   4. Layout of water barriers for sectioning including location of control and contact grouting pipes and regroutable hoses.
   5. Layout of regroutable hoses and junction boxes with labeling system to identify each hose and its location as well as fixing and termination of hoses.
   6. Waterproofing terminations at the TBM tunnels.
   7. Waterproofing at penetrations including but not limited to electrical ducts, mechanical pipes, and sleeves.
   8. Waterproofing at corners,
9. Rebar support at reinforced tunnel sections.
10. Attachment assembly.
11. Control and contact grouting pipe assembly including protection from concrete, shotcrete, and grout intrusion during concrete pours, shotcrete application, and contact grouting.

D. Waterproofing Protection Plan, narrative and details describing the procedures to prevent damage during construction operations such as installation of formwork, reinforcement and embedded items, placement of concrete, application of shotcrete.

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. Attachment assembly: Three each.
5. Water barrier: One foot length welded to membrane.
6. Control and contact grouting pipe: One foot length (including flange).
7. Silicone paste: Two four ounces jars.
8. BA Anchor: One each (including threaded rod).
10. Polymer sealant strip: One foot length.
11. Remedial grout: Two four ounces jars.
12. Regroutable hose: One foot length.

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. Test (including Re-Tests) and Repair Reports
I. As-built drawings:
   1. Control and contact grouting pipes:
      a. Location and elevation of control and contact grouting pipes.
      b. Date of pipe installation.
      c. Date of concreting.
      d. Names of workers and supervisors for respective work.
      e. Water barriers: Location and elevation of water barriers and size of sections.
   2. 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 through a completed cross passage lining.
   2. Include product data for all material 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. 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.
   D. READINESS REVIEW MEETINGS:
      1. Before installation of waterproofing and concrete final lining 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, 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 Baseline Report

B. Provide sufficient access to Resident Engineer during installation of waterproofing system, to allow for inspection of the work.

C. Install waterproofing at shotcrete 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.

D. Prior to waterproofing installation, prove the absence of any continuing and significant deflection or increase of stress.

E. Prior to geotextile installation, place a four foot wide strip of geodrain at low point of invert to allow water seepage through shotcrete, and construction water to drain to pump sump.

F. Collect all seepage through shotcrete with geodrain of required width and connect to geodrain placed in invert.

1.09 WARRANTY

A. The Contractor shall 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 D 1777</td>
</tr>
<tr>
<td>Unit Weight</td>
<td>22 oz./sq yd.</td>
<td>ASTM D 3776</td>
</tr>
<tr>
<td>Grab Tensile Strength</td>
<td>285 lbs.</td>
<td>ASTM D 4632</td>
</tr>
<tr>
<td>Elongation</td>
<td>85 percent</td>
<td>ASTM D 4632</td>
</tr>
<tr>
<td>Trapezoid Tear Strength</td>
<td>135 lbs.</td>
<td>ASTM D 4533</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>Burst Strength</td>
<td>400 psi</td>
<td>ASTM D 3786</td>
</tr>
<tr>
<td>Chemical Resistance</td>
<td>pH-value 2 to 13</td>
<td></td>
</tr>
</tbody>
</table>

a. 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 D 3776</td>
</tr>
<tr>
<td>Compressive Strength</td>
<td>15,000 psi</td>
<td>ASTM D 1621 (Mod.)</td>
</tr>
<tr>
<td>Flow Capacity</td>
<td>15 gpm/ft.</td>
<td>ASTM D 4716</td>
</tr>
</tbody>
</table>

C. Membrane: Polyvinyl chloride (PVC), polyolefine (FPO) waterproofing membrane or approved equal, of uniform thickness and surface texture. PVC membrane non-reinforced with the following minimum physical properties under respective testing methods:

<table>
<thead>
<tr>
<th>PHYSICAL PROPERTIES</th>
<th>VALUES</th>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>80 mil</td>
<td>ASTM D 374</td>
</tr>
<tr>
<td>Ultimate Tensile Strength</td>
<td>2200 psi</td>
<td>ASTM D 638</td>
</tr>
<tr>
<td>Ultimate Elongation</td>
<td>230 percent</td>
<td>ASTM D 638</td>
</tr>
<tr>
<td>Low Temperature Impact</td>
<td>pass @ -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 D 568</td>
</tr>
</tbody>
</table>

D. 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 min. 1-1/4 inch nails.

E. Water Barrier: Continuous PVC strip weldable to membrane with embedment ribs of the following minimum dimensions:

1. 16-inch width with six ribs of 1.0-inch minimum rib height (including base).
2. Intersections pre-fabricated on site or by manufacturer.

F. Control and Contact Grouting Pipes: 1-inch nominal pipe size polyvinyl chloride (PVC) pipe schedule 40; ASTM D1785, length as shown on the Contract Drawings. Where visible in public areas provide with inside thread and removable cap.

G. BA Anchor:

1. Rigid polymer shell with inside thread and 12 inches diameter compatible flange for attachment to waterproofing membrane.

2. Rigid polymer shell minimum 8-inches long with outside grooves and 5/8-inch diameter inside thread for application of threaded steel rod.

H. Epoxy resin: Compatible with BA Anchor, and suitable for use in grouting it in place prior to attachment to membrane.

I. Protective Concrete: Refer to Section 03 05 15 Portland Cement Concrete, Table 03 05 15.A – Class 3000A.

J. Temporary Relief Pipe: 1-inch to 8-inch nominal size polyvinyl chloride (PVC) pipe Schedule 40, ASTM D 1785; each with fitted cap.

K. Patent Strip: 14 gage channel shaped stainless steel bar, 1 inch wide, pre-punched one inch on center, used at membrane termination.

L. 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.

M. Perforated Pipe: 4-inch nominal diameter, flexible, corrugated, perforated pipe with circumferential perforations, Type N12 by Advanced Drain Systems, Incorporated or approved equal.

N. Regroutable Hose: FUKO Type II, by BBZ USA, Inc. or approved equal.

1. Minimum 3/4-inch outside diameter, consisting of a solid core with lateral openings covered by neoprene strips and the entire system wrapped with a wide 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.

O. 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.

P. Remedial grout: Duroseal Inject 2000 by BBZ, 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. Repair all joints, offsets, voids, cracks and spalled areas which are greater than one half inch in width or depth with quick setting grout, mortar, or approved equal.

3. Remove all loose shotcrete, concrete, and debris.

4. Cut off and patch all projecting portions of dowels, flush with the face of the shotcrete surface and remove temporary supports and hangers installed in shotcrete lining for construction purposes. Any protrusions of more than ½ inch shall be covered with shotcrete, quick setting grout, or mortar such that no sharp edges are observed.

5. Cover embedded elements in concrete and shotcrete with a minimum 1 inch of shotcrete prior to installing geotextile and membrane.

6. Cover steel fiber reinforced shotcrete (if used) with plain shotcrete with a minimum thickness of 2 inches prior to waterproofing installation.

7. Prepare shotcrete surface in accordance with smoothness criteria specified in Section 31 71 23, Tunnel Excavation by Sequential Excavation Method, and shown in the Contract Drawings with the exception of the invert, where a level surface has to be provided to avoid standing water.

8. Repair damaged or spalled surfaces, voids, and cracks having depths greater than one half inch with shotcrete, quick setting grout, mortar, or equal.

9. Place a four foot wide strip of geodrain at low point of cross passage invert to allow water seepage through shotcrete and construction water to drain to pump sump.

10. Collect seepage through shotcrete with geodrain connect to geodrain placed in invert.

B. Surface Inspection and Acceptance:

1. Inspect all surfaces to which waterproofing will be applied to, in the presence of the Waterproofing Installer and the 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 installation, and obtain the waterproofing supervisor, waterproofing installer engineer, and Resident Engineer’s signatures on the Surface Acceptance Form.

4. Distribute signed Surface Acceptance Forms in accordance with Specification Section 01 45 00.20, Quality Assurance / Quality Control.
3.02 INSTALLATION

A. Install waterproofing at shotcrete surfaces only after Surface Acceptance Form has been signed by the Resident Engineer.

B. Install Waterproofing as soon as practical following completion of Surface Acceptance Form, and prior to any work which might damage the membrane.

C. Installation of geotextile, geodrain, and membrane:
   1. Attachment:
      a. Place attachment assemblies in surface depressions to achieve tight fit of geotextile.
      b. Provide attachments on side walls and roof of cross passages at maximum 2-foot centers horizontally and vertically. At inverts, provide attachment as required. Provide a uniformly snug fit to receiving surfaces.
   2. Geotextile and geodrain
      a. Place geotextile prior to the installation of waterproofing membrane.
      b. Place continuous 4-foot wide panels of geodrain at the following locations prior to the installation of geotextile:
         1) At cross passage invert centerline to allow seepage and construction water to drain to pump sump after membrane and protective concrete are in place.
         2) At longitudinal wall/invert joints.
         3) At radial joint invert joints (if used).
         4) At all locations in arch where significant seepage is noticeable, for baseline purposes, assume one seepage location per Cross Passage.
   3. Membrane:
      a. Install membrane with sufficient overlap for welding. Trim overlap if necessary to achieve snug fit.
      b. Use radial seams for cross passage walls and arch.
      c. Use longitudinal seams within invert and at arch/invert splice.
      d. Provide double wedge welded seams unless otherwise approved.
      e. Test all welds as specified.
   4. Installation of water barriers for sectioning:
      a. Install at locations and elevations indicated on the Contract Drawings.
      b. Weld to membrane with one single weld on each side.
      c. Clean from dirt, debris, concrete, and shotcrete.

D. Installation of control and contact grouting pipes:
1. Install as shown on the Contract Drawings prior to concrete lining placement.
2. Arrange location of control and contact grouting pipes to avoid interference with rebar or embedments.
3. Protect control and contact grouting pipes during concrete lining pour from damage.

E. Installation of regrouotable hoses:
1. Install regrouotable Hoses in the horizontal and radial water barriers as shown on the Contract Drawings.
2. Fasten regrouotable hose with membrane straps to hold the hose in place during application of concrete or shotcrete.
3. Install junction boxes near the tunnel cross passage interface to receive and hold regrouotable injection hoses and ventilation ends of hoses, as indicated.
4. Protect junction boxes and the hoses associated with them from damage during concrete pours.
5. Provide a labeling system for regrouotable hoses and maintain written records of their locations for inclusion on the As-Built drawings.

F. Protect membrane during installation and concrete lining:
1. Protect invert waterproofing by placing protective concrete over it as soon as practical after installation.
2. Do not drill holes through concrete that has been placed over membrane.
3. Where reinforcement is required, utilize BA anchors to affix or otherwise stabilize reinforcement prior to concrete placement, and provide a 2-inch minimum continuous spacing between membrane and rebar.
4. Relieve water build-up behind membrane through use of drainage pipes or and pumps, prior to concrete pours.
5. Check integrity of waterproofing during installation of rebar, formwork, and during pouring concrete and application of shotcrete.
   a. Note location of any breach, damaged areas, or potentially damaged membrane on as-built drawings.
   b. Repair immediately any damage to membrane, prior to placement of concrete over it.
6. Do not penetrate waterproofing 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.

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. Seam direction and layout as shown on shop drawings.
6. Number and layout of attachments.
7. Overlap of membrane at seams for welding.
8. Application of welds as specified.
9. Penetrations are performed as shown on shop drawings.
10. Location, type, and elevation of water barriers. Provide as-built documentation as specified.
11. Location and elevation of grouting pipes. Provide as-built documentation as specified.
12. Location and elevation of regroutable hoses and junction boxes. Provide as-built documentation as specified.
13. Installation of protective layer.

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 every time an installation section is completed. Retain 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 weld 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 sealant liquid:
      1) Run a rounded probe 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.
3) Replace or repair sections of the membrane determined to be defective.

3.04 GROUTING

A. Grout all regroutable hoses after final tunnel lining has obtained the required 28-day strength and after contact grouting has been performed.

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.

3.05 REPAIR/RESTORATION

A. LEAK REMEDIATION

1. Observe structure interior and control and contact grouting pipes by regular inspection for water leakage until the final contract completion date.

2. If structure arch, invert, joints, or control and contact grouting pipes indicate dripping or seeping water perform remedial measures consisting of:

   a. Grout first through regroutable hoses in the water barriers (if they exist) and then through control and contact grouting pipes using suitable remedial grout within the section that indicates the leak.

   b. Determine injection pressure by means of an 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 the Resident Engineer.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for general building insulation that is installed at the Contract site as separate elements rather than as components of prefabricated or field-assembled systems.

1. Rigid board insulation at exterior walls and at other locations as indicated on the Drawings.
2. INSUL-1, INSUL-2: Fiberglass batt insulation at locations as indicated on Drawings.
3. INSUL-3: Spray-applied acoustical insulation at wall and roof assemblies as indicated on the Drawings.
4. INSUL-4: Acoustical semi-rigid glass fiber duct liner board insulation attached to concrete and protected with WWF mesh as indicated on Drawings.
5. INSUL-5: Spray-applied cementitious acoustical insulation at locations indicated on Drawings.
6. INSUL-6: Tapered and flat, rigid insulation to be installed below standing seam metal roofing system (not required for insulation value) and in metal-framed stud walls at locations indicated on Drawings.
7. INSUL-7: Injected foam insulation for filling cavities between cast concrete columns and metal column wrap at MTL-5 materials.
8. INSUL-8: Faced, semi-rigid fiberglass board insulation mechanically-attached at ceilings and trainways.

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 29.10, Hazardous and contaminated substance Health and Safety Program.
2. Section 05 40 00, Cold-Formed Metal Framing: Supporting construction for batt insulation.
3. Section 05 75 00, Architectural Decorative Metal: MTL-5 column wrap to receive foamed-in-place insulation.
4. 07 25 10, Air and Weather Barriers: Separate air barrier materials.
5. Section 07 41 13, Metal Roof Panels: Tapered, rigid roof insulation to be installed below standing seam metal roofing system.
6. Section 07 42 13, Metal Wall Panels: Insulation behind metal wall panels and cladding.

7. Section 07 54 00, Thermoplastic Membrane Roofing: Tapered board insulation specified as part of membrane roof system (Not required as insulation).

8. Section 07 84 00, Firestopping.

9. Section 09 21 16, Gypsum Board Assemblies: Batt insulation as referenced.

10. Section 09 84 00, Firestopping.

1.02 REFERENCES

A. This Section incorporates by reference the following documents.

1. American Society for Testing and Materials International (ASTM)

2. National Fire Protection Associations (NFPA)

1.03 SUBMITTALS

A. Procedures: See Section 01 33 00, Submittal Procedures.
B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1. Tested R or U values for each product specified.
2. Fire-Test-Response characteristics for each specified product including:
   a. Flame spread and smoke contribution ratings.
   b. Fire resistance ratings.
   c. Combustion characteristics.

C. Manufacturer’s Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

D. Manufacturer’s Certificate: Certify that products meet or exceed specified requirements.

1.04 PROJECT CONDITIONS

A. Environmental Requirements:

1. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.05 SEQUENCING

A. Sequence work to ensure fireproofing and firestop materials are in place before beginning work of this section.

1.06 COORDINATION

A. Coordinate the work with Section 07 25 10, Air and Weather Barriers, for installation of air seal materials.

1.07 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products in accordance with test method indicated below by UL or another Independent Testing Laboratory acceptable to authorities having jurisdiction. Identify all materials with appropriate markings of applicable testing and inspecting agency.


1.08 DELIVERY, HANDLING AND STORAGE

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer’s written instructions for handling, storing, and protecting during installation.
PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approved manufacturers indicated below:
   5. Substitutions: See Section 01 25 00, Substitution Procedures.

2.02 MATERIAL APPLICATIONS

A. Insulation below Standing Seam Roofing: Tapered extruded polystyrene board.

B. Insulation on Inside of Concrete and Concrete Masonry Exterior Walls: Glass fiber board or batt as detailed on Drawings.

C. Insulation in Metal Framed Walls: Batt insulation with separate vapor retarder membrane.

D. Insulation above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.

2.03 BATT INSULATION - INSUL-1:

A. Thermal Batt Insulation: ASTM C 665; preformed batt; friction fit, conforming to the following:
   1. Material: Rock or slag fiber. Glass fiber not allowed.
   2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E 84.
   3. 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.
   4. Combustibility: Non-combustible, when tested in accordance with ASTM E 136.
   5. Formaldehyde Content: Zero.
   8. Manufacturers:
   9. Substitutions: See Section 01 25 00, Substitution Procedures.
2.04 BATT INSULATION - **INSUL-2**:  
A. Thermal Batt Insulation: ASTM C 665; preformed batt; friction fit, conforming to the following:  
   1. Material: Rock or slag fiber. Glass fiber not allowed.  
   2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E 84.  
   3. 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.  
   4. Combustibility: Non-combustible, when tested in accordance with ASTM E 136.  
   5. Formaldehyde Content: Zero.  
   8. Manufacturers:  
   9. Substitutions: See Section 01 25 00, Substitution Procedures.  

2.05 ACOUSTICAL INSULATION - **INSUL-3**:  
A. Spray-applied Acoustical Cellulose Insulation: ASTM C 739, treated cellulose fiber insulation, white color, conforming to the following characteristics:  
   1. Thermal Conductivity - K factor: 0.22 K, when tested in accordance with ASTM C 177.  
   2. Density: 2 lb/cu ft, when tested in accordance with ASTM D 1622.  
   3. Noise Reduction Coefficient (NRC): 0.75 for 1 inch thickness.  
   5. Flame Spread Index: 10 or less, when tested in accordance with ASTM E 84.  
   6. Smoke Developed Index: 0 when tested in accordance with ASTM E 84.  
   8. Manufacturers:  
      a. International Cellulose: www.spray-on.com  
   9. Substitutions: See Section 01 25 00, Substitution Procedures.
B. Acoustical Cellulose Insulation Accessories:

1. Primer: As required by acoustical insulation manufacturer.

2. Insulation Surface Sealer: Clear, latex base.

2.06 GLASS FIBER DUCT LINER BOARD - **INSUL-4**:

A. Semi-rigid glass fiber board, ASTM C 612; top surface coated with 28 pounds per square asphalt and Kraft paper, insulation with the following characteristics:

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E 84.

2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E 84.


4. Board Thickness and R-Value: Minimum of 1 inch, and as indicated on Drawings.


7. Maximum Density: 8.0 pounds per cubic foot.


9. Combustibility: Except for facing, if any, non-combustible when tested in accordance with ASTM E 136.

10. Application: Can be applied directly to clean, bare steel, clean galvanized steel, unpainted concrete, cement board and other clean substrates.

11. Manufacturers:


12. Substitutions: See Section 01 25 00, Substitution Procedures.

2.07 ACOUSTICAL INSULATION - **INSUL-5**:

A. Spray-applied Acoustical Portland Cement/Exfoliated Vermiculite Spray-applied Insulation: conforming to the following characteristics:


2. Asbestos Content: No asbestos or mineral fiber when tested in accordance with EPA 400/4M-82-020.

3. Compressive Strength: 90 PSI, when tested in accordance with ASTM E 751.

4. Density: 30 lb/cu ft, when tested in accordance with ASTM D 1622.

5. Noise Reduction Coefficient (NRC): 0.75 for 1 inch thickness in accordance with ASTM C423.
6. Moisture Absorption: Maximum 5 percent by weight.

7. Flame Spread Index: 0 when tested in accordance with ASTM E 84.

8. Smoke Developed Index: 0 when tested in accordance with ASTM E 84.


10. Color: Integral, as selected by Resident Engineer from manufacturer’s standard color assortment. May also be field-painted where scheduled for paint.

11. Manufacturers:

12. Substitutions: See Section 01 25 00, Substitution Procedures.

B. Acoustical/Fireproofing Insulation Accessories:

1. Primer: As required or recommended by acoustical insulation manufacturer.

2.08 EXTRUDED TAPERED POLYSTYRENE BOARD INSULATION - INSUL-6:

A. Extruded flat and tapered polystyrene board with natural skin with drainage channels one face; with the following characteristics:

1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E 84.

2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E 84.

3. Board Size: 48 x 96 inch or 48 x 48 inch.

4. Board Edges: Square or tapered.

5. Board Thickness: Flat or varying thickness boards in thicknesses as required to provide minimum slopes at roofing assemblies as indicated on Drawings.

6. Thermal Conductivity (k factor) at 25 degrees F: 0.18.

7. Compressive Resistance: 15 pounds per square inch (psi).

8. Board Density: 1.3 pounds per cubic foot.

9. Water Absorption, maximum: 0.3 percent, volume.

10. Manufacturers:

11. Substitutions: See Section 01 25 00, Substitution Procedures.
2.09  INJECTED FOAM INSULATION - **INSUL-7**:

A. Injected Foam Insulation (low density); expanded-in-place, injected, site-mixed or pre-packaged in cans, with the following characteristics:

1. Flame Spread Index: 50 or less, when tested in accordance with ASTM E 84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E 84.
3. Thermal Conductivity (k factor) at 25 degrees F: 0.18.
5. Water Absorption, maximum: 0.3 percent, volume.
6. Manufacturers:
   d. ACH Foam Technologies, LLC, 111 W. Fireclay Ave., Murray, UT 84107
7. Substitutions: See Section 01 25 00, Substitution Procedures.

2.10  SEMI-RIGID FIBERGLASS INSULATION - **INSUL-8**:

A. Semi-rigid glass fiber board insulation INSUL-8A: ASTM C 612; 2 inch thick unfaced fiberglass insulation with the following characteristics:

1. Basis-of-Design Product and Manufacturer: Owens Corning Series 705 Unfaced Fiberglass Insulation or equal approved by Resident Engineer.
2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E 84.
3. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E 84.
5. Board Thickness: 2.0 inches.
6. R-Value: 8.7.
8. Density: 6.0 pounds per cubic foot.
10. Application: Apply directly to clean, bare, unpainted concrete with approved construction adhesive. Apply over stick-pins (without clips) prior to installation of INSUL-8B described below.
11. Accepted Manufacturers:

12. Substitutions: See Section 01 25 00, Substitution Procedures.

B. Semi-rigid glass fiber board insulation INSUL-8B: ASTM C 612, 2 -1/2 inch thick, ASJ-faced fiberglass insulation with the following characteristics:

1. Basis-of-Design Product and Manufacturer: Owens Corning Series 705 Unfaced Fiberglass Insulation or equal approved by Resident Engineer.
2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E 84.
3. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E 84.
5. Board Thickness: 2.5 inches.
8. Density: 6.0 pounds per cubic foot.
10. Facing: White ASJ (all-service jacketed) Facing with all surface seams taped with white vinyl tape by insulation manufacturer.
11. Application: Apply over approved stick-pins after installation of INSUL-8A. Stagger upper boards over lower and mechanically attach with approved washers and stick-pin clips.
   a. Stick pin clips shall be minimum 2-1/2-inch” diameter, swaged-on at end of pins and with excess pin length clipped off.
   
   b.

12. Accepted Insulation Manufacturers:

13. Accepted Stick-Pin Manufacturer:
   a. Gemco Corp.; www.gemco.com

14. Substitutions: See Section 01 25 00, Substitution Procedures.

2.11 INSULATION ACCESSORIES

A. Sheet Vapor Retarder: Specified in Section 07 25 10, Air and Weather Barriers (at interior side of walls).
B. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

C. Protective Boards: Cementitious, 1/4 inch thick.

D. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION

A. Install boards horizontally on walls at locations indicated or detailed on Drawings.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Place 6 inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames. Tape seal in place to ensure continuity of vapor retarder and air seal.

3.03 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.

F. Retain insulation batts in place with spindle fasteners at 12 inches on center below slabs.

G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

H. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.

I. Tape seal tears or cuts in vapor retarder.

J. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

K. Coordinate work of this section with requirements for vapor retarders specified in Section 07 25 10, Air and Weather Barriers.
3.04 SPRAYED INSULATION INSTALLATION

A. Spray-install insulation in accordance with manufacturer's instructions.

B. Install in ceiling or wall spaces at required thickness without gaps or voids.

C. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

D. Monitor air for unacceptable contamination due to air-born particles as specified in Section 01 35 29.10, Hazardous and Contaminated Substance Health and Safety Program.

E. Coordinate the work of this section with requirements for vapor retarders specified in Section 07 25 10, Air and Weather Barriers.
   1. Do not permit installed insulation to be damaged prior to its concealment.
   2. Protect installed insulation to remain exposed to view from damage by work of other trades. Repair any such visible damage prior to Substantial Completion.

3.05 INJECTED FOAM INSULATION INSTALLATION

A. Injection-installed foam insulation installation to be in strict accordance with manufacturer's instructions and recommendations.

B. Install in indicated cavities or spaces at required thickness without gaps or voids.

C. Monitor air for unacceptable contamination due to air-born particles as specified in Section 01 35 29.10, Hazardous and Contaminated Substance Health and Safety Program.

D. Coordinate the work of this section with requirements installation of MTL-5 column wraps.
   1. Confirm full fill to specified compressive strength.
   2. Infill holes made in metal to allow injection of foam in manner approved by Resident Engineer.

3.06 FACED SEMI-RIGID FIBERGLASS INSULATION INSTALLATION

A. Semi-rigid fiberglass panel insulation installation to be in strict accordance with manufacturer's instructions and recommendations.

B. INSUL-8A Application: Apply directly to clean, bare, unpainted concrete with approved construction adhesive. Apply over stick-pins (without clips) prior to installation of INSUL-8B.

C. INSUL 8B Application: Apply over approved stick-pins after installation of INSUL-8A.
   1. Stagger upper boards over lower and
   2. Mechanically-attach with approved washers and stick-pin clips:
      a. Option One: Stick pins shall be cast into concrete substrate above with fastener design as approved by Resident Engineer.
      b. Option Two: Stick pins shall have 4-inch by 4-inch perforated base plates attached to horizontal concrete with approved epoxy adhesive plus minimum of one powder-actuated fasten per pin.
c. Stick pin clips shall be minimum 2-1/2-inch diameter, swaged-on at end of pins and with excess pin length clipped off.

d. Stick pins shall be installed at 12-inches on-centers each way.

3. All insulation facing seams, cuts and joints shall be seamed with white vinyl facing tape provided by insulation manufacturer.

END OF SECTION
SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

1. This Section includes specifications for fire-rated steel doors and frames, and accessories for the cross passage and University of Washington TBM retrieval shaft utility room doors in Contract N125.

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 25 00, Substitution Procedures.
2. Section 01 33 00, Submittal Procedures.
3. Section 08 71 00, Door Hardware.
4. Section 09 90 00, Painting and Coating.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. American National Standards Institute (ANSI)
   b. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
   c. ANSI/SDI 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.

4. 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 (NFPA)

6. Underwriters Laboratories Incorporated (UL)
   a. UL 10C – Standard for Positive Pressure Fire Tests on 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 any 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 three years documented experience.

B. 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. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:
   1. Ceco Door Products.
   2. Steelcraft.
   3. Members of the Steel Door Institute and of the National Association of Architectural Metal Manufacturers, subject to compliance with the specified requirements.
   4. Substitutions: See Section 01 25 00, Substitution Procedures.
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.
   g. Finish: Factory primed, for field painting.

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.

3. Door and frame shall withstand static wind loads of 50 psf positive and negative when tested in accordance with ASTM E330.

B. Steel Doors

1. Doors, Fire Rated:
   a. Grade: ANSI/SDI 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.
   c. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C.

      1) Provide units listed and labeled by UL.
      2) Attach fire rating label to each fire rated unit.

C. Steel Frames

1. General:
   a. Comply with the requirements of grade specified for corresponding door.
      1) ANSI/SDI 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 or to be grouted.

d. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2. Door Frames: Face welded, seamless with joints filled.

   a. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.

   b. Weather-stripping: See Section 08 71 00, Door Hardware.

   c. Finish: Factory primed, for field finishing.

   d. Fire Rating: Same as door, labeled.

D. Accessory Materials

1. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.

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/SDI A250.10.

2. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

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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. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.

E. Coordinate installation of all hardware.

F. Coordinate installation of all electrical connections to electrical hardware items.

G. Touch up damaged factory finishes.

3.04 CONSTRUCTION

A. Erection Tolerances
   1. Clearances between Door and Frame: As specified in ANSI/SDI 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.

B. Refer to Section 08 71 00, Door Hardware.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for all hardware items for cross passage and University of Washington TBM retrieval shaft utility room doors in Contract N125 as indicated, including fasteners and miscellaneous materials.

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 25 00, Substitution Procedures.
2. Section 01 33 00, Submittal Procedures.
3. Section 01 78 23, Operation and Maintenance Data
4. Section 08 11 13, Hollow Metal Doors and Frames

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. National Fire Protection Agency (NFPA)
   a. NFPA 80 Standard for Fire Doors and Windows
2. American National Standards Institute (ANSI)
   a. ANSI 156.18 Materials and Finishes

1.03 SUBMITTALS

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

B. Catalogue cuts for each item of hardware

C. Finish Hardware Schedule:

1. Six copies of the completely detailed Hardware Schedule.
2. List for each door opening separately, using a vertical format in accordance with the sample hardware set below:
**Door No. CP40-N**

<table>
<thead>
<tr>
<th>HW1</th>
<th>One single door CP40-N Northbound tunnel to Cross passage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40 LHR 90 deg</td>
</tr>
<tr>
<td>3 ea. Butts</td>
<td>CB1900 US26D 4-1/2 x 4-1/2</td>
</tr>
<tr>
<td>1 ea. Lockset</td>
<td>ML2051 LWA 630 SA114 M17</td>
</tr>
<tr>
<td>1 ea. Closer</td>
<td>DC2200 689 M54 M72 M74</td>
</tr>
<tr>
<td>1 ea. Kickplate</td>
<td>K0050 10 x 34 630</td>
</tr>
<tr>
<td>1 ea. Wall stop</td>
<td>WC9X 626</td>
</tr>
<tr>
<td>3 ea. Silencers</td>
<td>64</td>
</tr>
</tbody>
</table>

D. Special Tools: Two sets of all special tools required for maintenance and installation.

E. Operations and Maintenance Data: Maintenance manuals in accordance with Section 01 78 23, Operation and Maintenance Data. Include:

1. As-built Hardware Schedule
2. Catalog cuts
3. Template lists with template information.
4. Warranty Certificates

F. Parts data for exit devices, locksets & closers, and catalog cuts of all electrical hardware, including manufacturer's name.

1.04 QUALITY ASSURANCE

A. Hardware Supplier Qualifications

1. Distributor shall have 5 years minimum experience supplying hardware for projects similar in type and scope.

2. Employ Architectural Hardware Consultants and licensed locksmiths who can be made available at all reasonable times during the course of hardware installation to meet with the Resident Engineer and Contractor for hardware or keying consultation.

B. Door hardware on fire rated openings: NFPA 80.

C. Substitutions: Section 01 25 00, Substitution Procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Tag each item or package to clearly identify the item and its intended location.

B. Package in containers clearly marked with hardware set number.

C. Inventory hardware jointly with the Contractor's installation staff and the supplier's representative until both the Contractor and the Contractor's hardware supplier's representative are satisfied that the count is correct.

D. Check, sort, and store hardware in a dry, lockable storage space.
1.06 WARRANTY

A. The finish hardware shall carry a limited warranty against defects in workmanship and operation for a period of one year from date of Substantial Completion. Door closers shall have a 10 year limited warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide products listed in the Hardware Schedule in sufficient quantities to complete the job requirements. Items by alternate manufacturers are subject to review and acceptance by the Resident Engineer to ensure that they meet the specified requirements. Make requests for substitution in accordance with Section 01 25 00, Substitution Procedures.

B. Acceptable Manufacturers

1. Butts & Hinges: Bommer
   a. Acceptable substitutions: Stanley, Hager, McKinney
2. Exit Devices: Von Duprin
   a. Acceptable substitutions: Corbin Russwin, Sargent
3. Mortise Locksets: Corbin Russwin
   a. Acceptable substitutions: Sargent, Schlage
4. Cylinders & Permanent Cores: BiLock
   a. Acceptable substitutions: None
5. Surface Closers: Corbin Russwin
   a. Acceptable substitutions: Norton, Sargent, LCN
6. Gasketing & Thresholds: Pemko
   a. Acceptable substitutions: Reese, Zero
7. Flush Bolts and Accessories: Rockwood
   a. McKinney, Trimco
8. Electrified Hardware: GE/Sentrol
   a. Acceptable substitutions: Securitron

C. Furnish any Item listed in the Hardware Schedule but not listed in this Section as shown in the Hardware Schedule unless otherwise approved by the Resident Engineer in accordance with Section 01 33 00, Submittal Procedures.

2.02 FINISHES

A. Finish hardware materials as follows, unless noted otherwise in the Hardware Schedule:

1. Butts: 630
2. Locksets: 630
3. Closers: Aluminum
4. Exit Devices: 630
5. Thresholds: Aluminum
6. Misc. Items: 630

B. The designations used for the hardware finishes are those listed in ANSI/BHMA A156.18.

2.03 BUTTS
A. Type: As scheduled
B. Size: 3 feet wide and narrower - 4-1/2 inches by 4-1/2 inches. 3 feet 1 inch wide and over - 5 inches by 4-1/2 inches. Provide wide throw hinges where required due to trim applications or other conditions.
C. Quantity: Three each up to and including 90 inches in height. Add one additional hinge for every additional 30 inches or fraction thereof. Provide Dutch doors with a minimum of two pair of hinges. For unusual size or weight doors, furnish type, size, and quantity recommended by manufacturer.

2.04 DOOR CLOSERS, SURFACE
A. Furnish drop plates or other mounting plates where required. Provide closer of proper size and mounting style for each opening.
B. Furnish sex nuts and bolts for all doors.
C. Provide as specified in hardware groups.

2.05 GASKET AND THRESHOLD
A. Types as specified in hardware groups.
B. Provide material of proper size and configuration for the specified opening.

2.06 PRESSURE RESISTANCE
A. Hinges and locksets shall withstand static wind loads of 50 psf positive and negative when tested in accordance with ASTM E330.

PART 3 - EXECUTION
3.01 PREPARATION
A. Hardware Conference
   1. After receiving approved Hardware Schedule, arrange a meeting to be attended by the hardware supplier, Contractor, and Resident Engineer. Review and confirm all lockset function and electrical operations and conditions affecting the access controls and other electronic operators and controls. Obtain from the hardware supplier six complete copies of the keying schedule and explanations of the operation of the electronic hardware for distribution to the appropriate parties. Include in this document riser diagrams and point to point wiring diagrams to facilitate the correct installation of the material.

B. Templates:
1. After receiving approved Hardware Schedule, supply templates or physical hardware to fabricator of factory prepared doors, frames, and other work affected.

3.02 INSTALLATION

A. Perform installation by skilled craftspersons, experienced in the installation of commercial builders hardware, and in accordance with the approved shop drawings of Section 08 11 13, Hollow Metal Doors and Frames.

B. Install according to manufacturer's standard locations except as otherwise directed by the Resident Engineer. Where cutting and fitting are required to install hardware onto or into surfaces that are later to be finished, coordinate removal, storage and reinstallation with finishing work. Do not install surface mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Weather-stripping and Seals: Comply with manufacturer’s instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.03 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. Return to the installation during the week prior to Substantial Completion and make a final check and adjustment of all hardware items with the Resident Engineer. Clean and adjust operating items as necessary to restore proper function and finish of hardware and doors. Clean all adjacent surfaces soiled by hardware operation.

3.04 HARDWARE SCHEDULE

A. Refer to door schedule and related information concerning the following hardware groups. Quantities indicated in any instance are for supplier convenience only and are not guaranteed. NOTE: Electrical items are indicated by **///** for coordination with electrical subcontractor. Example: 1 each Magnetic holder FM998 **///**

B. Hardware Schedule by Group:

<table>
<thead>
<tr>
<th>HW1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinges</td>
<td>BB5006</td>
</tr>
<tr>
<td>1 Exit Device</td>
<td>9875L-F x 996L-BE</td>
</tr>
<tr>
<td>1 Closer</td>
<td>DC6210</td>
</tr>
<tr>
<td>1 Floor Stop</td>
<td>1211</td>
</tr>
<tr>
<td>1 set Smoke Seal</td>
<td>S88GR</td>
</tr>
<tr>
<td>3 Door Silencers</td>
<td>608</td>
</tr>
<tr>
<td>1 Threshold</td>
<td>1715A</td>
</tr>
<tr>
<td>1 Door Bottom</td>
<td>29324CNB</td>
</tr>
<tr>
<td>1 set Door Position Switch</td>
<td>2507A-L <strong>///</strong></td>
</tr>
<tr>
<td>HW2</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>---</td>
</tr>
<tr>
<td>Hinges</td>
<td>BB5006</td>
</tr>
<tr>
<td>1 set Auto Flush Bolts (HM)</td>
<td>1842</td>
</tr>
<tr>
<td>1 Dust Proof Strike</td>
<td>570</td>
</tr>
<tr>
<td>1 Coordinator</td>
<td>1600 Series</td>
</tr>
<tr>
<td>1 Lock (Storeroom)</td>
<td>ML2057 PSA</td>
</tr>
<tr>
<td>1 Permanent Core</td>
<td>PL2301QC</td>
</tr>
<tr>
<td>1 Mortise Cylinder</td>
<td>5361QC x CC (verify cam)</td>
</tr>
<tr>
<td>2 Closers</td>
<td>DC6210 A11</td>
</tr>
<tr>
<td>1 Astragal x Gasket</td>
<td>357SS x S88GR</td>
</tr>
<tr>
<td>1 Gasket</td>
<td>S88GR (head and jambs)</td>
</tr>
<tr>
<td>2 Door Silencers</td>
<td>608</td>
</tr>
<tr>
<td>2 Door Position Switch</td>
<td>2507A-L <strong>//</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HW3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinges</td>
<td>BB5006</td>
</tr>
<tr>
<td>1 Lock (Storeroom)</td>
<td>ML2057 PSA</td>
</tr>
<tr>
<td>1 Permanent Core</td>
<td>PL2301QC</td>
</tr>
<tr>
<td>1 Mortise Cylinder</td>
<td>5361QC x CC (verify cam)</td>
</tr>
<tr>
<td>1 Closer</td>
<td>DC5210</td>
</tr>
<tr>
<td>1 Floor Stop</td>
<td>1211</td>
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<tr>
<td>1 set Smoke Seal</td>
<td>S88GR</td>
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<tr>
<td>3 Door Silencers</td>
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</tr>
<tr>
<td>1 set Door Position Switch</td>
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