

**SPECIFICATIONS, PROPOSAL AND CONTRACT DOCUMENTS**

**Contract No. C0928; 451 Zone Control Valve Facility and  
Control Valve Vault**

**Northshore Utility District**  
King County, Washington

**AUGUST 2024**

**NORTHSHORE UTILITY DISTRICT  
King County, Washington**

District Commissioners

**Suzanne Greathouse, President  
Trudy Rolla, Secretary  
D. Bruce Gardiner  
Thomas D. Mortimer  
Matt Breysse**

General Manager

**Amanda Campbell**

District Office

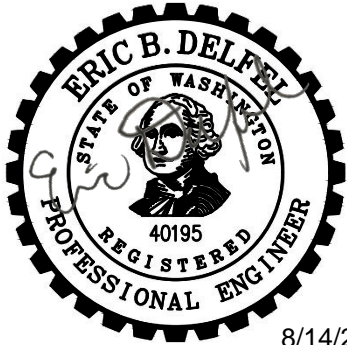
**6830 NE 185<sup>th</sup> Street  
Kenmore, WA 98028  
Phone (425) 398-4400  
Fax (425) 398-4430  
[www.nud.net](http://www.nud.net)**

# **CERTIFICATE OF ENGINEER**



Unless noted otherwise, these Contract Documents have been prepared or assembled by Northshore Utility District under the direction of the following registered professional engineers, licensed in accordance with the laws of the State of Washington, to practice in the State of Washington.

Specification Section(s) listed below were developed by, or under the direct supervision of Eric Delfel, of Gray and Osborne, Inc.



8/14/2024

# **NORTHSHORE UTILITY DISTRICT**

**6830 NE 185<sup>TH</sup> STREET  
KENMORE, WASHINGTON 98028-2684**

## **SPECIFICATIONS, PROPOSAL AND CONTRACT DOCUMENTS**

**FOR  
CONTRACT C0928  
451 Zone Control Valve Facility and Control Valve Vault**

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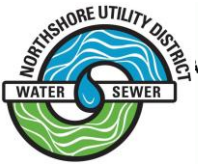
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# NORTHSHORE UTILITY DISTRICT

6830 NE 185<sup>TH</sup> STREET  
KENMORE, WASHINGTON 98028-2684

## CALL FOR BIDS

Notice is hereby given that Northshore Utility District ("District") will receive sealed bids for the following construction project. Bids will be received at the District office, located at 6830 NE 185th Street, Kenmore, Washington, by mail or other courier up to the hour of **10:00 a.m. on Tuesday, September 10, 2024**, after which all bids will be publicly opened and read aloud.

### Project Description

#### **Contract C0928; 451 Zone Control Valve Facility and Control Valve Vault**

Schedule A consists of the following work:

Schedule A - Site 46 - 112th Avenue NE FCV consists of constructing a new partially buried 930± square foot concrete and CMU building whose main function is to house hydraulic control valves, flow meter, and piping that connects to the Seattle Public Utilities Tolt pipeline and directs flows to different pressure zones within the Northshore Utility District water service area. The project also includes a significant amount of site excavation, a soldier pile wall, a new driveway with new connection to existing road, frontage improvements, site piping, right-of-way piping, existing vaults demolition, and both site and right-of-way restoration.

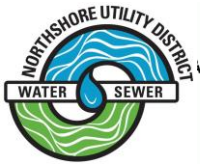
Schedule B consists of the following work:

Schedule B - Site 69 - 451/446 Zone Separation Valve Vault consists of a new underground vault, site piping, and a standalone above ground electrical enclosure with a control panel. The vault will house a electronic control valve and site piping will connect to existing site piping at two locations. Site electrical will connect to an existing transformer nearby in the right-of-way.

Approximate locations of the proposed improvements are shown on the project construction plans.

The engineer's construction cost estimate is \$4,000,000.00 including sales tax.

Free-of-charge access to project bid documents (plans, specifications, addenda, and Bidders List) is provided to Prime Bidders, Subcontractors, and Vendors by going to [www.bxwa.com](http://www.bxwa.com) and clicking on "Posted Projects", "Public Works", and "Northshore Utility District". This online plan room provides Bidders with fully



usable online documents with the ability to: download, view, print, order full/partial plan sets from numerous reprographic sources, and a free online digitizer/take-off tool. It is recommended that Bidders “Register” in order to receive automatic email notification of future addenda and to place themselves on the “Self-Registered Bidders List”. Bidders that do not register will not be automatically notified of addenda and will need to periodically check the on-line plan room for addenda issued on this project. Contact Builders Exchange of Washington at (425) 258-1303 should you require assistance with access or registration.

Bid documents (in PDF format) are also directly available from the District’s website at the following address:

<https://www.nud.net/permits-construction/rfp-posts-list/>

Each bid must be submitted on the “Proposal” forms provided in Section 5 of the “Specifications, Proposal and Contract Documents” and shall be accompanied by a bid proposal deposit in the form of a surety bond, postal money order, cashier’s check or certified check made payable to King County Treasurer, King County, Washington for a sum of not less than 5 percent of the total bid. A bid shall not be considered unless accompanied by such bid proposal deposit.

A Pre-Bid meeting will be held at 10:00 a.m. on Tuesday, August 27, 2024 at 15823 112<sup>th</sup> Avenue NE, Bothell, WA 98011. Attendance is encouraged but not required. No other on-site visits will be allowed unless by appointment and attended by District staff.

## **CONTRACT AWARD**

A contract, if awarded, will be based upon the lowest responsive and responsible bid or bids as defined in more detail in the bid documents.

Northshore Utility District reserves the right to reject any and all bids, to delete portions or all of the work, to substitute alternative bid item prices for base bid item prices, to waive any informality in bidding, and to make the award deemed to be in the best interest of the District.

Proposals received after the time announced for the opening will not be considered. No bidder may withdraw its bid after the time announced for the opening or before the award and execution of the contract(s) unless the award is delayed for a period exceeding sixty (60) calendar days.

Advertised in the Daily Journal of Commerce on Monday, August 19, 2024, and Monday, August 26, 2024.

**NORTHSHORE UTILITY DISTRICT**  
Trudy Rolla, Secretary  
Board of Commissioners



# **INSTRUCTIONS TO BIDDERS**

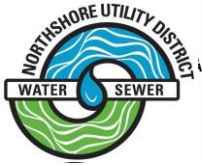


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# Section 1 - Instructions to Bidders

## 1.0 GENERAL

Plans and specifications are on file at:

Northshore Utility District  
6830 NE 185th Street  
Kenmore, WA 98028

Free-of-charge access to project bid documents (plans, specifications, addenda, and Bidders List) is provided to Prime Bidders, Subcontractors, and Vendors by going to Builders Exchange of Washington's web site at the following address: [http://www.bxwa.com/bxwa\\_toc/pub/827.html](http://www.bxwa.com/bxwa_toc/pub/827.html). This online plan room provides Bidders with fully usable online documents with the ability to: download, view, print, order full/partial plan sets from numerous reprographic sources, and a free online digitizer/take-off tool. It is recommended that Bidders "Register" in order to receive automatic email notification of future addenda and to place themselves on the "Self-Registered Bidders List". Bidders that do not register will not be automatically notified of addenda and will need to periodically check the online plan room for addenda issued on this project. Contact Builders Exchange of Washington at (425) 258-1303 should you require assistance with access or registration.

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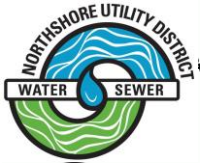
<https://www.nud.net/permits-construction/rfp-posts-list/>

## 1.1 PROJECT DESCRIPTION

Contract C0928; 451 Zone Control Valve Facility and Control Valve Vault  
The project consists of the following work:

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Schedule A - Site 46 - 112th Avenue NE FCV consists of constructing a new partially buried 930± square foot concrete and CMU building whose main function is to house hydraulic control valves, flow meter, and piping that connects to the Seattle Public Utilities Tolt pipeline and directs flows to different pressure zones within the Northshore Utility District water service area. The project also includes a significant amount of site excavation, a soldier pile wall, a new driveway with new connection to existing road, frontage improvements,



site piping, right-of-way piping, existing vaults demolition, and both site and right-of-way restoration.

Schedule B - Site 69 - 451/446 Zone Separation Valve Vault consists of a new underground vault, site piping, and a standalone above ground electrical enclosure with a control panel. The vault will house a electronic control valve and site piping will connect to existing site piping at two locations. Site electrical will connect to an existing transformer nearby in the right-of-way.

## **1.2 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE**

Bidders shall satisfy themselves as to construction conditions by personal examination of the plans, specifications and site of the proposed work and by any other examination and investigation, which they may desire to make as to the nature of the work, estimate of quantities and difficulties to be encountered. Bidders shall consider Federal, State, and local laws and regulations that may affect cost, progress, or performance of the work.

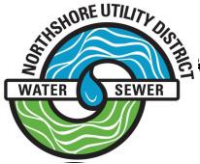
The Bidders are hereby notified that geotechnical investigations were not conducted by the District for this project.

Before submitting a bid, each bidder will, at the bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data which pertain to the physical conditions (surface, subsurface, and underground utilities) at or contiguous to the site or otherwise which may affect cost, progress, or performance of the work in which the bidder deems necessary to determine its bid for performing the work in accordance with the time, price, and other terms and conditions of the Specifications, Proposal and Contract Documents. The bidder shall be responsible for all costs associated with these additional examinations including all restoration work and damages which may be a result of such investigation.

## **1.3 PROPOSALS**

Proposals shall be made on the forms included herewith under the "Proposal" section and shall be provided to the District in a sealed envelope addressed as follows:

Northshore Utility District  
6830 NE 185th Street  
Kenmore, WA 98028  
Attention: Proposal Enclosed



Proposals shall arrive not later than Tuesday, September 10, 2024, at 10:00 a.m., at which time and place they will be opened and publicly read aloud. No proposal may be withdrawn after the time stated above or before award of contract unless said award is delayed for a period exceeding sixty (60) calendar days.

**1.4 BID PROPOSAL DEPOSIT**

As a guarantee of good faith and as required by law, each bid shall be accompanied by a bid proposal deposit in the form of a certified check, cashier's check, postal money order or surety bond payable to the order of the King County Treasurer, King County Washington for an amount not less than five percent (5%) of the total amount of the bid. The deposits of the three low bidders will be retained until a contract has been entered into between the successful bidder and the District and until a performance bond in an amount of 100 percent of the contract price has been filed as required under these contract documents. The deposits of other bidders will be returned as soon as it is determined that they are not one of the three low bidders.

**1.5 BIDDING ERRORS**

The District will not consider a claim of error in a proposal unless such claim is made to the District within eight (8) business hours after the time of bid opening as stated in the "Call for Bids" and unless supporting evidence of such claim, including cost breakdown sheets, is delivered to the District within ten (10) business hours after the time of bid opening as stated in the "Call for Bids."

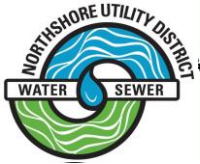
If the District is, at its sole determination, convinced that the bidder has committed an unintentional error, the bidder will be allowed to withdraw, but not correct, its bid.

**1.6 COMPLETION TIME AND LIQUIDATED DAMAGES**

Subject to time lost due to inclement weather and delay in delivery of materials, should such delay not be the result of the Bidder's actions, the Bidder must agree to reach Substantial Completion of the work within 120 working days, and Physical Completion of the work within 130 working days, all beginning with the date of written "Notice to Proceed" with the work.

In summary, the District's intended schedule for the project is as follows:

Contract Award	Monday, September 16, 2024
Execute Contract	Friday, September 27, 2024
Receive & Review Material Submittals	Monday, October 14, 2024



Preconstruction Conference  
Issue Notice to Proceed  
Complete Construction

Wednesday, October 16, 2024  
Monday, October 28, 2024  
Thursday, May 15, 2025

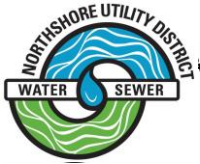
The Bidder agrees to complete the work within the contract time as above-specified plus any Extension as provided for herein ("Completion Time"). Such Extension and events producing them shall not be grounds for claim by the Bidder of damages or for additional costs, expenses, overhead, profit or other compensation. It is the responsibility of the Bidder to complete the work within the Completion Time. The District makes no promise or representation that this can or will be done.

The work zone required for Schedule B is in immediate proximity to a work zone for an on-going WSDOT project. WSDOT has identified March 2025 as a start date for construction in this work zone, so it is required that Schedule B work be completed from December 2024 to March 2025 in order to avoid work area conflicts. The Contractor and subcontractors working in the Schedule B work zone may be required to take a safety course provided by Skanska, Inc. The awarded contractor should plan accordingly.

The District and the Bidder recognize that time is of the essence of this Contract and that the District will suffer financial loss if the work is not completed within Completion Time. They also recognize the delays, expense, and difficulties in proving the actual loss suffered by the District if the work is not completed on time. Accordingly, instead of requiring any such proof, the District and the bidder agree that as liquidated damages for delay (but not as a penalty) the bidder shall pay the District \$1,400.00 for each day that expires after Completion Time.

## **1.7 AWARD OF CONTRACT AND NOTICE TO PROCEED**

A contract will not be awarded until the District is satisfied that (1) the successful bidder is reasonably familiar with the class of work contemplated and has the necessary capital, tools and experience to satisfactorily perform the work within the time stated, (2) the successful bidder meets the mandatory responsibility criteria identified in RCW 39.04.350 (for prime contractors) and RCW 39.06.020 (for first tier subcontractors and subcontractors of any tier that are hired by other subcontractors), and (3) the successful bidder demonstrates its compliance with any Supplemental Bidder Responsibility Criteria or requirements identified herein. Completion of the work within Completion Time is essential and prior commitments of the bidder, failure to complete other work on time, or reasonable doubt as to whether the bidder would complete the work on time, would also be cause for the rejection of any bidder as not responsible.



The right is reserved by the District to waive any immaterial bid errors or irregularities in the bidding and reserves the right to correct arithmetical errors or discrepancies between unit prices and extended amounts if the intended bid is ascertainable from the face of the bid. Bidders are also advised that the District may reject any bid or proposal or all bids or proposals for any or no reason, including (1) any bid or proposal that in the opinion of the District is unbalanced or that contains unit prices that fail to reflect the actual cost of construction, (2) any bid or proposal that lacks necessary detail or specificity or is otherwise found to be non-responsive, and (3) any bid that violates the terms of these instructions. Bidders acknowledge that they are not entitled to any compensation, costs or damages related to bid preparation or resulting from District's decision to cancel the procurement, reject any or all bids or otherwise refuse to execute a contract. District, in its sole discretion, may re-advertise for new proposals or to otherwise carry out the work. The District further reserves the right to delete portions or all of the work or schedules of the work in its sole discretion and thereafter to award a contract to the successful bidder on the remaining portions of the work.

## **1.8 FAILURE TO EXECUTE CONTRACT**

In the event the successful bidder fails to furnish an approved bond and to sign the contract within ten days after notification by the District, an amount equal to 5 percent of the amount of the bid shall be forfeited to the District as liquidated damages. Said liquidated damages shall be paid from the certified check or bid bond submitted with the bid. Other proposals will then be reconsidered for award by the District.

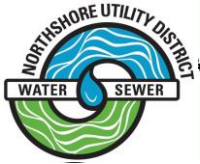
## **1.9 CORRECTIONS, INTERPRETATIONS AND ADDENDA**

Any omissions, discrepancies or need for interpretations or explanations of the Contract Documents shall be in the form of an addendum and no oral statements by the District, District Engineer, District's Consulting Engineer, or other representative of the District shall, in any way, modify these contract documents, whether made before or after letting the contract.

## **1.10 ENGINEER AND NOTICES**

Notices as required shall be mailed to the attention of the project engineer as follows:

Gray & Osborne, Inc.  
Attention: Eric Delfel, P.E.  
1130 Rainier Avenue South, Suite 300  
Seattle, WA 98144



## 1.11 BIDDER RESPONSIBILITY CRITERIA

Bidder must meet the following Bidder Responsibility Criteria (RCW 39.04.350) to be considered a responsible bidder. Bidder will be required to complete and submit the Bidder Responsibility Checklist, included with the "Proposal" section of this document, with the bid. The bidder must:

- (a) Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of bid submittal;
- (b) Have a current Washington Unified Business Identifier (UBI) number;
- (c) Have Industrial Insurance (workers' compensation) coverage for the bidder's employees working in Washington, as required in Title 51 RCW;
- (d) Have a Washington Employment Security Department number, as required in Title 50 RCW;
- (e) Have a Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW.
- (f) Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065(3).

## 1.12 SUPPLEMENTAL BIDDER RESPONSIBILITY CRITERIA

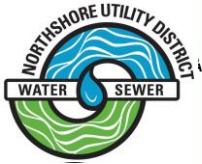
A Bidder will be deemed not responsible if the Bidder does not meet the mandatory bidder responsibility criteria in RCW 39.04.350(1), as amended; or does not meet Supplemental Criteria 1 through 9 in this Section:

The District will verify that the Bidder meets the mandatory bidder responsibility criteria in RCW 39.04.350(1), and Supplemental Criteria 1. Evidence that the Bidder meets Supplemental Criteria 2 through 9 shall be provided by the Bidder as stated later in this Section.

### **a. Criteria 1 – Federal Debarment**

1. Criterion: The Bidder shall not currently be debarred or suspended by the Federal government.
2. Documentation: The Bidder shall not be listed as having an "active exclusion" on the U.S. government's "System for Award Management" database ([www.sam.gov](http://www.sam.gov)).



**b. Criteria 2 – Delinquent State Taxes**

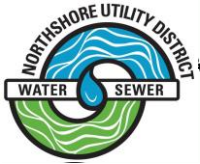
1. Criterion: The Bidder shall not owe delinquent taxes to the Washington State Department of Revenue without a payment plan approved by the Department of Revenue.
2. Documentation: The Bidder shall, if and when required as detailed below, sign a statement (on a form to be provided by the District) that the Bidder does not owe delinquent taxes to the Department of Revenue. If the Bidder owes delinquent taxes, they must submit a written payment plan approved by the Department of Revenue, to the District by the deadline listed below.

**c. Criteria 3 – Subcontractor Responsibility**

1. Criterion: The Bidder's standard subcontract form shall include the subcontractor responsibility language required by RCW 39.06.020, and the Bidder shall have an established procedure which it utilizes to validate the responsibility of each of its subcontractors. The Bidder's subcontract form shall also include a requirement that each of its subcontractors shall have and document a similar procedure to determine whether the sub-tier subcontractors with whom it contracts are also "responsible" subcontractors as defined by RCW 39.06.020.
2. Documentation: The Bidder, if and when required as detailed below, shall sign a statement (on a form to be provided by the Contracting Agency) that the Bidder complies with the subcontractor responsibility requirements of RCW 39.06.020.

**d. Criteria 4 – Claims Against Retainage and Bonds**

1. Criterion: The Bidder shall not have a record of excessive claims filed against the retainage or payment bonds for public works projects in the 3 years prior to the bid submittal date, that demonstrate a lack of effective management by the Bidder of making timely and appropriate payments to its Subcontractors, suppliers, and workers, unless there are extenuating circumstances and such circumstances are deemed acceptable to the District.
2. Documentation: The Bidder shall, if and when required as detailed below, sign a statement (on a form to be provided by the District) that the Bidder has not had claims against claims against retainage and bonds in the 3 years prior to the bid submittal date. If the Bidder has had claims against retainage and bonds in the three years prior to the



bid submittal date, they shall submit a list of the public works projects completed in the 3 years prior to the bid submittal date that have had claims against retainage and bonds and include for each project the following information:

- Name of project
- The owner and contact information for the owner;
- A list of claims filed against the retainage and/or payment bond for any of the projects listed;
- A written explanation of the circumstances surrounding each claim and the ultimate resolution of the claim.

**e. Criteria 5 – Public Bidding Crime**

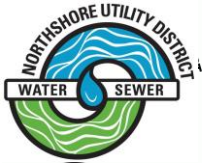
1. Criterion: The Bidder and/or its owners shall not have been convicted of a crime involving bidding on a public works contract in the 5 years prior to the bid submittal date.
2. Documentation: The Bidder, if and when required as detailed below, shall sign a statement (on a form to be provided by the District) that the Bidder and/or its owners have not been convicted of a crime involving bidding on a public works contract.

**f. Criteria 6 – Termination for Cause / Termination for Default**

1. Criterion: The Bidder shall not have had any public works contract terminated for cause or terminated for default by a government agency in the 5 years prior to the bid submittal date, unless there are extenuating circumstances and such circumstances are deemed acceptable to the District.
2. Documentation: The Bidder, if and when required as detailed below, shall sign a statement (on a form to be provided by the District) that the Bidder has not had any public works contract terminated for cause or terminated for default by a government agency in the 5 years prior to the bid submittal date; or if Bidder was terminated, describe the circumstances.

**g. Criteria 7 – Lawsuits**

1. Criterion: The Bidder shall not have lawsuits with judgments entered against the Bidder in the 5 years prior to the bid submittal date that demonstrate a pattern of failing to meet the terms of contracts, unless



there are extenuating circumstances and such circumstances are deemed acceptable to the District.

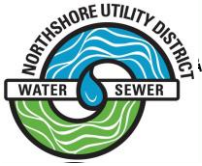
2. Documentation: The Bidder, if and when required as detailed below, shall sign a statement (on a form to be provided by the District) that the Bidder has not had any lawsuits with judgments entered against the Bidder in the 5 years prior to the bid submittal date that demonstrate a pattern of failing to meet the terms of contracts, or shall submit a list of all lawsuits with judgments entered against the Bidder in the 5 years prior to the bid submittal date, along with a written explanation of the circumstances surrounding each such lawsuit. The District shall evaluate these explanations to determine whether the lawsuits demonstrate a pattern of failing to meet of terms of construction related contracts.

#### **h. Criteria 8 – Contract Time (Liquidated Damages)**

1. Criterion: The Bidder shall not have had liquated damages assessed on any projects it has completed 5 years prior to the bid submittal date that demonstrate a pattern of failing to meet Contract Time, unless there are extenuating circumstances and such circumstances are deemed acceptable to the District.
2. Documentation: The Bidder, if and when required as detailed below, shall sign a statement (on a form to be provided by the District) that the Bidder has not had liquidated damages assessed on any projects it has completed within the 5 years prior to the bid submittal date, or shall submit a list of projects with assessed liquidated damages along with District contact information, and number of days assessed liquated damages.

#### **i. Criteria 9 – Capacity and Experience**

1. Criterion: The Bidder shall have sufficient current capacity and the project superintendent assigned to the project shall have experience to meet the requirements of this project. The Bidder and the project superintendent shall have successfully completed at least two projects as the prime contractor, of a similar size, scope, and complexity during the 5-year period immediately preceding the bid submittal deadline for this project. Similar size is defined as a minimum of 70 percent of the bid amount submitted by the Bidder, as well as having elements of earthwork, pipeline installation of depths requiring shoring, building construction, and soldier pile wall construction.

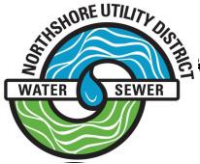


2. Documentation: The Bidder shall, if and when required as detailed below, on a form to be provided by the District, provide the Bidder's gross dollar amount of work currently under contract, the Bidder's gross dollar amount of contracts currently not completed, five major pieces of equipment anticipated to be on the project and whether the equipment is leased or owned, the superintendent assigned to this project and their number of years of experience, and two project references of similar size and scope during the 5-year period immediately preceding the bid submittal deadline for this project. The District may check owner references for the previous projects and may evaluate the owner's assessment of the Bidder performance.

As evidence that the Bidder meets Supplemental Responsibility Criteria 2 through 9 stated above, the apparent two lowest Bidders must submit to the District by 12:00 P.M. (noon) of the second business day following the bid submittal deadline, a written statement verifying that the Bidder meets Supplemental Criteria 2 through 9 together with supporting documentation (sufficient in the sole judgment of the District) demonstrating compliance with Supplemental Responsibility Criteria 2 through 9. The District reserves the right to request further documentation as needed from the low bidder and documentation from other Bidders as well to assess Bidder responsibility and compliance with all bidder responsibility criteria. The District also reserves the right to obtain information from third-parties and independent sources of information concerning a Bidder's compliance with the mandatory and Supplemental Criteria, and to use that information in their evaluation. The District may consider mitigating factors in determining whether the Bidder complies with the requirements of the Supplemental Criteria.

The basis for evaluation of Bidder compliance with these mandatory and Supplemental Criteria shall include any documents or facts obtained by District (whether from the Bidder or third parties) including but not limited to: (i) financial, historical, or operational data from the Bidder; (ii) information obtained directly by the District from others for whom the Bidder has worked, or other public agencies or private enterprises; and (iii) any additional information obtained by the District which is believed to be relevant to the matter.

If the District determines the Bidder does not meet the bidder responsibility criteria above and is therefore not a responsible Bidder, the District shall notify the Bidder in writing, with the reasons for its determination. If the Bidder disagrees with this determination, it may appeal the determination within 2 business days of the District's determination by presenting its appeal and any additional information to the District. The District will consider the appeal and any additional information before issuing its final determination. If the final determination affirms that the Bidder is not responsible, the District will not



execute a contract with any other Bidder until at least 2 business days after the Bidder determined to be not responsible has received the District's final determination.

### **1.13 SUB-CONTRACTORS**

Consistent with RCW 39.30.060, each bidder on a project in excess of \$1,000,000 is required to submit the completed "Proposed Subcontractors" list included in the "Proposal" section either with the bid or within one hour of the required bid submittal time as stated in the Call for Bids or by written addendum. The completed list must identify each subcontractor who will perform heating, ventilation and air-conditioning, or plumbing as described in Chapter 18.106 RCW, and electrical as described in Chapter 19.28 RCW, or the contractor must name itself for the work. The form may be submitted in person or by facsimile (FAX number (425) 398-4430) to:

Northshore Utility District  
Attention: George Matote, P.E.  
6830 NE 185th Street  
Kenmore, WA 98028

Receipt of the form by Northshore Utility District within the time prescribed is the responsibility of the bidder.

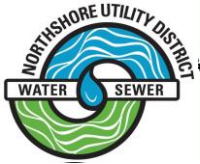
The bidder shall not list more than one subcontractor for each category of work identified, unless subcontractors vary with bid alternates, in which case the bidder must indicate which subcontractor will be used for which alternates.

Failure of the bidder to submit as part of the bid the names of such subcontractors, or name itself to perform such work, or the naming of two or more subcontractors to perform the work, shall render the bidder's bid as nonresponsive and therefore void.

### **1.14 SUBCONTRACTOR RESPONSIBILITY CRITERIA**

To comply with RCW 39.06.020, the following is required:

- (a) The successful bidder shall provide documentation to District demonstrating that the first-tier subcontractor meets the Subcontractor Responsibility Criteria below. The requirements of this subsection apply to all subcontractors regardless of tier.



- (b) At the time of subcontract execution, the successful bidder to whom the Contract is to be awarded shall verify that each of its first tier subcontractors meets the following bidder responsibility criteria:
1. Have a current certificate of registration in compliance with chapter 18.27 RCW, which must have been in effect at the time of subcontract bid submittal;
  2. Have a current Washington Unified Business Identifier (UBI) number;
  3. Have Industrial Insurance (workers' compensation) coverage for the subcontractor's employees working in Washington, as required in Title 51 RCW;
  4. A Washington Employment Security Department number, as required in Title 50 RCW;
  5. A Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;
  6. An electrical contractor license, if required by Chapter 19.28 RCW;
  7. An elevator contractor license, if required by Chapter 70.87 RCW.
  8. Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065 (3).
- (c) Bidder will be required to complete and submit the "Subcontractor Responsibility Criteria" form, included in the "Proposal" section of this document, either with the bid or within two hours of the required bid submittal time.

### **1.15 NON-COLLUSION DECLARATION**

Submit the non-collusion declaration as part of the bid. No person, firm, or corporation shall be allowed to make, file, or be interested in more than one proposal for the same work, unless alternative proposals are invited. A person, firm, or corporation who has submitted a sub-proposal to a bidder, or who has quoted prices on materials to a bidder, is not thereby disqualified from submitting a proposal, or quoting prices to other bidders.

Reasonable grounds for believing that any bidder is interested in more than one proposal for the work will cause the rejection of all proposals in which said bidder is interested. If there is reason to believe that collusion exists among the bidders, none of the participants in such collusion will be considered.

# **SPECIAL PROVISIONS**

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SECTION 2

**SPECIAL PROVISIONS**

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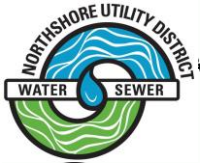
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## Section 2 – Special Provisions

### 2.1 OBSERVATION OF THE WORK

Work will not be allowed on Saturdays, Sundays or legally recognized holidays without written permission from the Engineer. If the Contractor is granted permission for such work, then the District may, at the District’s sole discretion, deduct moneys from the Contractor in the amount of One Thousand Four Hundred Dollars (\$1,400) per day or fraction thereof for reimbursement to the District for its reasonable inspection and engineering fees.

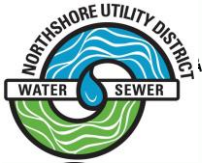
#### District Holidays

- New Year’s Day..... January 1
- Martin Luther King Day..... Third Monday in January
- President’s Day ..... Third Monday in February
- Memorial Day ..... Last Monday in May
- Juneteenth..... June 19
- Independence Day ..... July 4
- Labor Day..... First Monday in September
- Veteran’s Day..... November 11
- Thanksgiving Day..... Fourth Thursday in November
- Day After Thanksgiving ..... Fourth Friday in November
- Christmas Day..... December 25

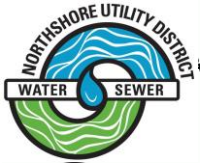
### 2.2 THE CONTRACT PLANS

The Contract Plans consist of the following sheets:

<b>SHEET NUMBER</b>	<b>TITLE</b>
--	COVER, VICINITY MAP AND SHEET INDEX
G-1	LEGEND, ABBREVIATIONS, AND GENERAL NOTES
G-2	TESC NOTES AND DETAILS
G1-1	SURVEY CONTROL PLAN
G2-1	SURVEY CONTROL PLAN
C1-1	EXISTING SITE, DEMOLITION & TESC PLAN
C1-2	EXISTING PRESSURE REDUCING STATION DEMOLITION DETAILS
C1-3	EXISTING PRESSURE REDUCING STATION DEMOLITION PHOTOS
C1-4	PROPOSED SITE AND PIPING PLAN
C1-5	SITE RESTORATION AND GRADING PLAN



<b>SHEET NUMBER</b>	<b>TITLE</b>
C1-6	SITE GRADING SECTIONS
C1-7	PROPOSED PIPE PROFILES
C1-8	PROPOSED SEWER PROFILE
TC1-1	TRAFFIC CONTROL
TC1-2	TRAFFIC CONTROL
C2-1	EXISTING SITE, DEMOLITION AND TESC PLAN
C2-2	PROPOSED SITE AND PIPING PLAN
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CD-1	CIVIL DETAILS 1
CD-2	CIVIL DETAILS 2
CD-3	CIVIL DETAILS 3
CD-4	CIVIL DETAILS 4
CD-5	CIVIL DETAILS 5
M1-1	MECHANICAL PLAN
M1-2	MECHANICAL SECTIONS
M2-1	MECHANICAL PLN & SEC
MD-1	MECHANICAL DETAILS (1)
MD-2	MECHANICAL DETAILS (2)
A1-1	BUILDING NOTES AND SCHEDULES
A1-2	FLOOR PLAN
A1-3	EXTERIOR AND INTERIOR BUILDING ELEVATIONS
A1-4	BUILDING SECTIONS AND DETAILS
H1-1	HVAC DESIGN CRITERIA, NOTES, AND SYMBOLS
H1-2	HVAC SCHEDULES
H1-3	HVAC PLAN
P1-1	PLUMBING, DRAINAGE, AND VENT NOTES, LEGEND, PLAN, AND DETAILS
S-1	GENERAL STRUCTURAL NOTES
S-2	SPECIAL INSPECTION SCHEDULE, STRUCTURAL ABBREVIATIONS & LEGEND
S-3	TYPICAL STRUCTURAL DETAILS
S1-1	FOUNDATION AND FLOOR PLANS
S1-2	CMU WALL AND ROOF FRAMING PLANS
S1-3	DETAILS
S1-4	DETAILS
E-1	ELECTRICAL SYMBOLS, ABBREVIATIONS, SHEET LIST, AND WORK SUMMARY
E-2	PANELBOARD SCHEDULES
E-3	ANALOG LOOP DIAGRAMS
E-4	CABLE AND CONDUIT SCHEDULES
E-5	ELECTRICAL DETAILS



<b>SHEET NUMBER</b>	<b>TITLE</b>
E-6	ELECTRICAL DETAILS
E1-1	SITE ELECTRICAL PLAN AND ONE LINE DIAGRAM
E1-2	BUILDING ELECTRICAL PLAN AND DEVICE TAG LIST
E1-3	BUILDING LIGHTING AND RECEPTACLES
E1-4	BUILDING HVAC AND SECURITY PLAN
E2-1	SITE ELECTRICAL PLAN, ONE LINE DIAGRAM, AND TAG LIST
E2-2	VAULT ELECTRICAL PLAN AND CONTROL PANEL [02 CP 01] ELEVATION

### **2.3 PERMITS, FRANCHISES AND EASEMENTS**

The District has obtained the Building, Grading, Right-of-Way, and Non-Residential Sewer Use Certification permits from the following public agencies:

- City of Bothell: Building, Grading, and Right-of-Way
- City of Kirkland: Right-of-Way
- King County: Non-Residential Sewer Use Certification

The Contractor shall be responsible for acquiring the Traffic Control Permits from the City of Kirkland and the City of Bothell. The Contractor shall also be responsible for acquiring plumbing, mechanical and electrical L&I permits as required.

The District is working to obtain Seattle Public Utilities Tolt Pipeline Right-of-Way permission to facilitate site access and tree removal, but the Contractor should not make any assumptions regarding availability of access from the Tolt Pipeline Right-of-Way for construction equipment.

The Contractor shall confirm that all permits, franchises, and easements have been obtained and are in effect prior to commencing work on the portion of the Project covered by such instruments.

### **2.4 STAKING**

All work done under this Contract shall be done to the lines and grades shown on the Plans. The Contractor shall be responsible for construction staking on the project. See Technical Specification Section 01150 for staking requirements.



## **2.5 CERTIFICATE OF INSURANCE**

The Contractor shall specifically note and comply with the limits of liability amounts, additional insured named and terms of cancellation included in Subsection 8.9 of the General Conditions. Additional insureds shall include Northshore Utility District, its agents and representatives, and the City of Bothell: Building, Grading, and Right-of-Way. All Risk Builders' Risk coverage will be required for this Project.

The Insurance Questionnaire and Endorsement included at the end of this section must be completed in addition to the Certificate of Insurance.

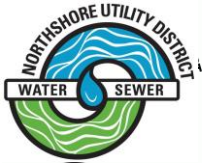
## **2.6 PAYMENT FOR MATERIALS ON HAND**

Payment for Material on Hand will be allowed provided the Contractor with the following conditions:

1. Contractor shall provide invoice documentation as proof for payment.
2. Material must be delivered on-site or proof can be provided that the material is located in a secured, approved off-site location.

## **2.7 WORKING HOURS**

Working Hours for the project will be as identified on the permits for each schedule of work. Work impacting two-way traffic on 112<sup>th</sup> Avenue NE, including lane closures, will be restricted to 9:00 a.m. to 2:00 p.m. Monday through Thursday.



## Insurance Coverage Questionnaire

This Questionnaire must be completed and attached to Certificate of Insurance.

Name of Contractor: \_\_\_\_\_

Contract Number: Contract C0928; 451 Zone Control Valve Facility and Control Valve Vault

Project Owner: Northshore Utility District

Are the following coverage's and/or conditions in effect?

Please circle "yes" or "no" regarding the applicable policy		
This Policy Form is ISO Commercial General Liability form CG 00 01 or CG 00 02 (circle one). If no, attach a copy of the policy with required coverage clearly identified.	Yes	No
Products and Completed Operation Coverage	Yes	No
Cross Liability Clause (or equivalent wording)	Yes	No
Personal Injury Liability Coverage (with Employee Exclusion Deleted)	Yes	No
Broad Form Property Damage with X, C, U Hazards Included	Yes	No
Blanket Contractual Liability Coverage Applying to this Contract	Yes	No
Employers Liability - Stop Gap	Yes	No

	GL	AL	Excess
Deductibles or SIR's			
Insurer's A.M. Best Rating			

This Questionnaire is issued as a matter of information. This questionnaire is not an insurance policy and does not amend, extend or alter the coverage afforded by the policies indicated on the attached Certificate of Insurance.

\_\_\_\_\_  
Agency/Broker

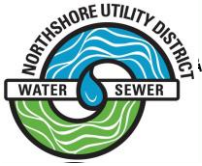
\_\_\_\_\_  
COMPLETED BY (PRINT NAME)

\_\_\_\_\_  
Address

\_\_\_\_\_  
Completed by (signature)

\_\_\_\_\_  
Name of Person to Contact

\_\_\_\_\_  
Phone Number



## Property Owner's Approval of Restoration

CONTRACT \_\_\_\_\_

I, (We), the undersigned Owner(s) of property identified as:

\_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Property Description Or Tax Lot Number: \_\_\_\_\_

do hereby approve and accept the restoration work done on, over and across  
my, (our), property by:

\_\_\_\_\_,the

Contractor for the Contract C0928; 451 Zone Control Valve Facility and Control  
Valve Vault

SIGNED: \_\_\_\_\_ Date: \_\_\_\_\_

SIGNED: \_\_\_\_\_ Date: \_\_\_\_\_

# **ENGINEERING SPECIFICATIONS**

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**DIVISION 1**

**GENERAL TECHNICAL REQUIREMENTS**

## SECTION 01150

### SURVEYS

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes all survey for the project. The Contractor shall provide all construction survey for the Work. The Engineer will provide primary horizontal and vertical control data and monuments, as shown on the Plans.

At the Contractor's request, the Engineer will provide the Plans in electronic format. Electronic files are provided for the Contractor's convenience and are not part of the Contract. Calculations shall be made from the Plans.

During the prosecution of the work, the Contractor shall make all necessary measurements to prevent misfitting, and shall be responsible for the accurate construction of the work.

##### 1.2 DEFINITIONS

The meaning of words and terms used in this provision shall be as listed in "Definitions of Surveying and Associated Terms" current edition, published by the American Congress on Surveying and Mapping, and the American Society of Civil Engineers.

##### 1.3 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01720	Record Drawings

##### 1.4 QUALIFICATIONS

The Contractor shall employ a Professional Land Surveyor (PLS) registered in the State of Washington and acceptable to the Owner. All surveying shall be completed by or under the direct supervision of the PLS.

##### 1.5 SUBMITTALS

The Contractor shall submit the name, address, and license number of the Professional Land Surveyor before starting construction.

## 1.6 QUALITY ASSURANCE

The Contractor shall ensure a surveying accuracy within the following tolerances:

	<u>Vertical</u>	<u>Horizontal</u>
Slope Stakes	±0.1 feet	±0.10 feet
Subgrade Grade Stakes Set 0.04 foot Below Grade	±0.01 feet	±0.5 feet (parallel to alignment) ±0.1 feet (normal to alignment)
Stationing on Roadway	N/A	±0.1 feet
Alignment on Roadway	N/A	±0.04 feet
Surfacing Grade Stakes	±0.01 feet	±0.1 foot (parallel to alignment) ±0.1 feet (normal to alignment)
Roadway Paving Pins for Surfacing or Paving	±0.01 feet	±0.1 feet (parallel to alignment) ±0.05 feet (normal to alignment)
Alignment of sewer and storm manholes and catch basins	±.01 feet	±0.1 feet
Stationing on Structures		±.02 feet
Alignment on structures		±.02 feet
Superstructure elevations	±.01 feet variation from Plan elevation	
Substructure	±.02 feet variation from Plan grades	

When the following items are included in the project, the Contractor shall perform independent checks from different secondary control to ensure that the points staked are within the specified survey accuracy tolerances:

- Piles
- Shafts
- Footings
- Columns

The Owner may spot-check the Contractor's surveying. These spot-checks will not change the requirements for accuracy by the Contractor

## **PART 2 PRODUCTS**

Not Used.

## **PART 3 EXECUTION**

The Contractor's PLS shall establish all secondary survey controls, horizontal and vertical, as necessary to assure proper placement of all Work based upon the primary control points provided by the Owner. The Contractor shall be responsible for setting, maintaining, and resetting all alignment stakes, clearing limit stakes, slope stakes, and grades for the Work. Except for the survey control data to be furnished by the Owner, calculations, surveying, and measuring required for setting and maintaining the lines and grades shall be the Contractor's responsibility.

Survey records shall be maintained by the Contractor's PLS, including a description of the work performed on each shift, the methods utilized, and the control points used. The record shall be adequate to allow the survey to be reproduced. A copy of each day's record shall be provided to the Engineer within three working days of Engineer's request.

All surveyed points shall be established by placing hubs and tacks with marked stakes in unpaved areas or P.K. nails with painted markings in paved areas. All surveying stakes shall be marked in accordance with WSDOT Standard Plan A-10.10-00. When stakes are needed that are not described in the Standard Plans, then those stakes shall be marked as ordered by the Engineer. The Contractor's surveyor shall maintain and replace survey hubs, stakes, nails and markings immediately if destroyed, removed, or the Engineer determines the stake or pavement markings are illegible.

The Engineer is responsible for locating and referencing those monuments shown on the Plans that will be removed or destroyed during construction. The Engineer will also prepare all required permit forms with the Department of Natural

Resources (DNR) for those monuments only. The Contractor shall protect all survey markers, monuments and property corners unless shown otherwise on the Plans. The Contractor shall work to preserve the existing monumentation as provided in RCW 58.09.130 and WAC 332-120. The Contractor shall notify the Engineer immediately if it becomes apparent that a survey marker will be disturbed due to construction. The Contractor shall allow 5 working days for the Engineer to acquire adequate information so that the monument, including property corners, may be replaced referenced in its original position prior to disturbance. All cost associated with replacement of monuments that have been disturbed before being referenced due to lack of proper notification by the Contractor shall be deducted from monies due to the Contractor.

**\*\*\* END OF SECTION \*\*\***

## **SECTION 01385**

### **DOCUMENTATION OF EXISTING CONDITIONS**

#### **PART 1 GENERAL**

##### **1.1 SCOPE**

The work specified in this Section includes the video recording requirements for the project.

The Contractor shall provide the Engineer with a computer-readable digital format of the project area prior to and upon completion of all construction. The video recording shall utilize equipment that will visually document an accurate audio-visual description of the existing and post-construction conditions.

The Contractor shall notify the Engineer prior to the recording to allow the Engineer to witness the video recording. The Contractor shall provide preconstruction video recording of the existing conditions for the entire project site.

Upon completion of the work, the Contractor shall provide video recording in the same manner and vantage point as the preconstruction video recordings. The intent of this Specification section is to provide a comparison between existing and post-construction conditions.

The rate of speed the documentation will be video recorded at, the panning rates, and the zoom-in/zoom-out rates will be controlled so that playback will produce a clear television picture of the areas video recorded.

The video recording shall be accomplished during a period of good visibility. Unless otherwise directed by the Engineer, video recording will not be allowed during times of precipitation or poor visibility.

When available light is not sufficient to produce a clear television image, additional lighting shall be supplied by the photographer to ensure good picture quality. The camera crew shall be able to work independent of any power source, utilizing battery power to operate the camera, and lighting.

A legible reader board shall be provided by the photographer to visually document the date, job title, and site identification. The audio portion of the video recording will be used for identification purposes, addresses, and any other audio required or as directed by the Engineer.

**\*\*\* END OF SECTION \*\*\***



## SECTION 01400

### QUALITY CONTROL

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the control tests, test sample collection, required field-testing, and special inspections as specified herein, and indicated on the Plans.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
02300	Earthwork
02700	Gravel Materials
02740	Hot Mix Asphalt
03300	Cast-in-Place Concrete

##### 1.3 PAYMENT

All testing as required by this Section shall be paid for by the Contractor. All costs to prepare and implement the sample and testing program shall be included in the bid prices for the various items associated with the sampling and testing program.

Retesting and reinspection required because of defective work and testing performed for the convenience of the Contractor shall also be paid for by the Contractor.

Testing requirements shall not be cause for claims of delay by the Contractor and all expenses accruing therefrom shall be deemed incidental to the performance of the Contract.

#### PART 2 PRODUCTS

##### 2.1 GENERAL

The Contractor shall be responsible for all material testing specified in the Contract Documents and any applicable permits and codes. The materials testing laboratory shall be accredited for performing the various testing methods either by AASHTO R18, AASHTO 150/IEC 17025 or the American Association for Laboratory Accreditation and further approved by the Owner. The materials testing laboratory shall send test results directly to the Engineer.

## 2.2 EARTHWORK AND GRANULAR MATERIALS

### A. COMPACTION CONTROL

Optimum moisture content and maximum density tests shall be determined by the following method:

ASTM D1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort

### B. IN-PLACE TESTS

In-place density and moisture content tests shall be made by an independent testing laboratory according to the following methods:

ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

## 2.3 AGGREGATES

All aggregates shall be tested in accordance with applicable WSDOT test methods:

<b><u>Title</u></b>	<b><u>Test Method</u></b>
Sampling	AASHTO T2
Sieve Analysis of Fine and Coarse Aggregates	104A
Material Finer than No. 200 Sieve in Aggregates	102A
Percentage of Particles Smaller than 0.025 mm and 0.005 mm	603A
Organic Impurities	111A
Abrasion of Coarse Aggregates by Use of the Los Angeles Machine	101A
Sand Equivalent	109A

## 2.4 CAST-IN-PLACE CONCRETE

Cast-in-place concrete shall be tested in accordance with applicable parts of Chapter 16 of ACI 301. Concrete reinforcement and concrete special inspections shall be performed in accordance with local Building Official and WABO requirements.

## 2.5 HOT MIX ASPHALT

Paving asphalt shall be tested in accordance with the following WSDOT test methods:

<u>Characteristics</u>	<u>Test Method</u>
Tests on Residue from RTFC Procedure	208
Absolute Viscosity at 140 degrees F, poise	203
Kinematic Viscosity at 275 degrees F., cSt, min.	202
Penetration at 77 degrees F., 100 g/5 sec., min. <sup>(1)</sup>	201
Percent of Original Penetration at 77 degrees F, min.	2
Ductility at 45 degrees F., cm, min.	
Flashpoint, (Cleveland Open Cup), degrees F min. (test on original asphalt)	206
Solubility in Trichloroethylene percent, min. (test on original asphalt)	214

(1) Original penetration, as well as penetration after RTFC loss shall be determined by AASHTO Test Method T 49.

### A. COMPLETE EXTRACTIVE OF UNCOMPACTED MIX

Test methods shall be in accordance with the following:

1. AASHTO T68
2. ASTM D2172
3. AASHTO T30

### B. DENSITY OF COMPACTED MIX

Test method shall be in accordance with AASHTO T166.

1. The Contractor shall employ an independent testing laboratory approved by the Owner to conduct complete extraction tests on the uncompacted asphalt concrete pavement mix.
2. The Contractor shall provide the Engineer with an affidavit from the asphalt supplier of the characteristics of the paving asphalt.

The paving asphalt shall be tested in accordance with WSDOT Construction Manual and Standard Specifications, latest editions.

### **PART 3 EXECUTION**

#### **3.1 SAMPLING AND TESTING FREQUENCY**

##### **A. GENERAL**

The Contractor shall provide the following quality control tests at the number and frequency described herein. On-site testing technicians and testing laboratories shall be WABO-certified. The precise location of the tests shall be designated by the Engineer. The Contractor shall cooperate with laboratory personnel employed to conduct the density testing, sampling of material(s), and special inspections. The Contractor shall provide safe access within the work site for laboratory personnel such that density testing and visual inspection can be performed. The Contractor shall provide samples of materials to be tested in the quantities required and herein specified to the appropriate laboratory personnel. The Contractor shall furnish all labor, equipment, tools, and materials necessary to obtain and deliver samples as herein designated. They shall also provide and repair any test holes required in order to facilitate the testing and sampling and to provide for the testing laboratory's exclusive use for storage and curing of test samples until removed to the laboratory.

Any areas tested and further failing compliance with the Specifications shall be recompacted and retested at the Contractor's expense, until a successful density test indicating compliance with these Specifications has been achieved.

##### **B. SOIL TESTING**

The following soil quality control tests shall be completed at the given frequency:

<u>Material</u>	<u>Test</u>	<u>Minimum Sampling &amp; Testing Frequency</u>
Backfill for foundations, walls, trenches and roads	Gradation <sup>1</sup>	One every 500 cy or one per day for quantities exceeding 25 cy. For trenches, one every 750 feet of trench.
	In-Place Density <sup>2,3,4</sup>	One every 500 cy or one per day for each type of soil or fill material with quantities exceeding 25 cy. For trenches, one per day and one every 250 feet of trench.

<u>Material</u>	<u>Test</u>	<u>Minimum Sampling &amp; Testing Frequency</u>
	Moisture-Density Relationship <sup>3</sup>	One prior to start of backfilling operation, one every 20 densities and any time material type changes.
Pipe Bedding	Gradation <sup>1</sup>	One every 750 feet of trench.
Subgrade and Fills	In-Place Density <sup>2,3</sup>	One every 500 cy of each type material.
	Moisture-Density Relationship	One for every 20 densities for each material.
	Gradation	One for every moisture-density.

1. All acceptance tests shall be conducted from in-place samples.
2. Additional tests shall be conducted when variations occur due to the Contractors, operations, weather conditions, site conditions, etc.
3. The nuclear densometer, if properly calibrated, may be used but only to supplement the required testing frequency and procedures. The densometer shall be calibrated and is recommended for use when the time for complete results becomes critical.
4. Depending on soil conditions, it is anticipated that compaction tests shall be required at depths of 2 feet above the pipe and at each additional 5 feet to the existing surface plus a test at the surface.

### C. HOT MIX ASPHALT TESTING FREQUENCY

The following hot mix asphalt quality control tests shall be completed at the given frequency:

<u>Material</u>	<u>Test</u>	<u>Minimum Sampling &amp; Testing Frequency</u>
Mix Design (By Contractor)	Submittal	Design Mix (include test results). Aggregate (each size) – 100 pounds. Asphalt - 1 gallon. Mineral Filler – 10 pounds.
Asphalt (including prime and tack coat)	Sample and Tests	Submit a 1-quart sample and material certification with test results for each shipment or lot of asphalt. A duplicate 1-quart sample shall be retained by the Contractor until the completion of the job.
Aggregates (from bins or source)	Gradation	One test prior to start of paving operation and one every 1,500 tons or 1,000 cy.

<u>Material</u>	<u>Test</u>	<u>Minimum Sampling &amp; Testing Frequency</u>
	Fractured Faces	Same as gradation.
	LA Abrasion	One test prior to start of paving and one test every 10,000 tons thereafter.
	Specific Gravity	Same as gradation.
Hot Mix Asphalt (including Asphalt Treated Base)	Marshall Method Test	One initial test during mix design and one per 3,000 tons thereafter.
	Specific Gravity	One per each Marshall test.
	Compaction	One per 50 Tons

#### D. CONCRETE TESTING

All testing shall conform to applicable portions of ACI. Special inspections of concrete and concrete reinforcement shall comply with WABO requirements.

All concrete must meet the specified requirements for minimum 28-day compressive strength.

All concrete cylinders shall be molded and tested for strength by an independent testing laboratory employed by the Contractor.

The Contractor shall furnish all concrete required for molding of the cylinders. In cases where cylinders are stored at the project site, the Contractor shall provide storage and protection for the cylinders in accordance with ACI requirements.

Concrete tests and testing frequency shall be in accordance with the more stringent of the testing requirements specified in Section 03300-3.17 of these Specifications, and the following table:

<u>Material</u>	<u>Test</u>	<u>Minimum Sampling &amp; Testing Frequency</u>
Coarse Aggregate (for each grading size) <sup>1</sup>	Gradation	One test every 500 cy of concrete.
	Deleterious Substances	One test initially and thereafter when appearance makes the material suspect.

<u>Material</u>	<u>Test</u>	<u>Minimum Sampling &amp; Testing Frequency</u>
Fine Aggregate <sup>1</sup>	L.A. Abrasion	One every 2,000 tons of aggregate.
	Moisture specific gravity and absorption <sup>1</sup>	One initially and every 250 cy thereafter. One moisture to be conducted prior to any batching and more frequently if hauling and storage does not provide a consistent moisture content.
	Gradation and fineness modules	One every 250 cy of concrete.
	Deleterious Substances	(same as coarse aggregate).
Concrete	Moisture, specific gravity and absorption <sup>1</sup>	(same as coarse aggregate).
	Slump	Conduct one test every day of placement and one additional test for every 50 cy placed and more frequently if batching appears inconsistent. Conduct in conjunction with taking concrete cylinders.
	Entrained Air	Conduct with each slump test.
	Ambient and concrete temperatures	Conduct with each slump test.
Concrete	Compressive strength and evaluation of results per ACI 214. (includes unit weight of each cylinder)	For all concrete placement, take one set of four cylinders per day and one additional set of cylinders for every 50 cy of each class of structural concrete. Cylinders shall be 4 inch by 8 inch. Test one cylinder at 7 days and two at 28 days. Fourth cylinder shall be held in reserve. A plot and statistical evaluation shall be maintained in accordance with ACI 214 for compressive strength results. Field cure cylinders shall be made when insitu strengths are required to be known.

- Aggregate moisture tests are to be conducted in conjunction with concrete strength tests for water/cement (w/c) calculations.

E. SPECIAL INSPECTIONS

Contractor shall perform all required Special Inspections per WABO requirements (Chapter 17 of the IBC). Special inspections include, but are not limited to, cast-in-place concrete, concrete reinforcement, structural welded connections, bolted connections, compaction testing for building and structure foundations, concrete masonry units (CMU), and epoxy adhesive bolting.

**\*\*\* END OF SECTION \*\*\***



## **SECTION 01500**

### **TEMPORARY FACILITIES**

#### **PART 1 GENERAL**

##### **1.1 SCOPE**

The work specified in this Section includes the temporary facilities required for this project, but not necessarily limited to:

- A. Temporary utilities such as water, electricity, telephone, off-site staging, and off-site parking.
- B. Temporary piping, pumps, valves, fittings, manholes, vaults, and appurtenances necessary to keep existing facilities fully operational during construction.
- C. Sanitary facilities.
- D. Temporary enclosures such as fences, tarpaulins, barricades, and canopies.

#### **PART 2 PRODUCTS**

##### **2.1 UTILITIES**

###### **A. TEMPORARY ELECTRICITY**

The Contractor shall provide temporary power for construction at the project site. They shall make arrangements with the electrical utility (to obtain temporary power) and shall pay all costs and fees charged by the utility associated with connection of temporary power. The Contractor shall provide all special connections, receptacles, panelboards, etc., which are required for temporary service, and are not provided by the utility.

The Contractor shall furnish and install all temporary wiring and associated equipment required to keep all portions of the existing facilities in operation at all times.

Area distribution boxes shall be furnished, installed, and so located that the individual trades may use their own construction-type extension cords to obtain proper power and artificial lighting at all points where required. The Contractor shall provide a main disconnect on all temporary wiring panels, labeled "MAIN DISCONNECT," to ensure the safety of personnel using extension cords and hand tools. Panels shall also be properly

grounded and equipped with GFCI breakers in accordance with WISHA requirements.

The Contractor shall provide the Engineer single line diagrams of the temporary wiring showing all circuit breakers. These diagrams shall be provided prior to installation of this wiring. These diagrams are necessary to provide information to Owner personnel for off-hours operation.

The Contractor shall pay all demand, consumption, taxes, and fees associated with the temporary electrical service.

## B. WATER

The Contractor shall be responsible for providing water necessary for construction. This includes costs for supplying potable water for hydrostatic pressure leak testing of all water-holding structures and operational testing of all equipment and processes.

## 2.2 TEMPORARY PIPING

The Contractor shall furnish and install all temporary piping and pumping and, upon completion of the work, remove all such temporary piping as required, except as designated on the Plans to remain as a part of the Project. Prior to installation, the Contractor shall submit drawings to the Engineer showing the proposed installation of temporary piping and pumps, including location, type of pipe, fittings, and valves. The Contractor shall obtain the Engineer's approval for temporary piping and pumping plan prior to installation.

Temporary piping and pumping shall be provided as necessary to maintain the existing facilities in operation until the new facilities are constructed, operational. An effort has been made on the Plans and/or Specifications to note instances and locations where temporary piping and/or pumping may be required; however, this in no way limits the temporary piping and pumping to be provided by the Contractor at these locations.

## 2.3 SANITARY FACILITIES

The Contractor shall provide toilet and wash-up facilities for their workforce and the Engineer at the site of work. They shall comply with applicable laws, ordinances, and regulations pertaining to the public health and sanitation of dwellings and camps.

## **2.4 OFF-SITE STAGING AND PARKING**

The Contractor shall note that space is limited throughout the construction site. Employees of the Contractor, all subcontractors, vendors, suppliers, and associated personnel shall not be allowed to park onsite during the course of construction without prior approval from the Owner. It shall be the responsibility of the Contractor to provide sufficient parking facilities in authorized area(s) other than the construction site for the above-mentioned personnel.

The Contractor shall not be allowed to stockpile and store equipment and materials throughout the construction site. The Contractor shall coordinate their schedule so that all equipment and materials shall be brought to the construction site only when they are to be installed/utilized.

The Contractor shall provide storage of equipment and materials at an offsite, bonded warehouse, to be approved by the Engineer. The Contractor shall pay all costs associated with off-site delivery, storage, and transfer to the construction site.

## **2.5 ENCLOSURES**

The Contractor shall furnish, install, and maintain during the project time all required scaffolds, tarpaulins, barricades, canopies, warning signs, steps, bridges, platforms, and other temporary construction necessary for proper completion of the work in compliance with all pertinent safety and other regulations.

## **PART 3 EXECUTION**

All temporary facilities and controls shall be maintained as long as required for the safe and proper completion of the work. The Contractor shall remove such temporary facilities and controls as rapidly as progress of the work will permit or as directed by the Owner.

**\*\*\* END OF SECTION \*\*\***

**SECTION 01720**

**RECORD DRAWINGS**

**PART 1 GENERAL**

**1.1 SCOPE**

The work specified in this Section includes the record drawings, which shall be maintained and annotated by the Contractor during construction.

**1.2 RELATED WORK SPECIFIED ELSEWHERE**

<u>Section</u>	<u>Item</u>
01300	Submittals

**1.3 INFORMATION PROVIDED BY THE OWNER**

The Contractor will be provided with the following items to maintain record drawings for the project:

- A. One full size paper set of Plans.

**PART 2 PRODUCTS**

NOT USED

**PART 3 EXECUTION**

**3.1 GENERAL**

The Contractor shall maintain the following record drawings for the project:

- A. A neat and legibly marked set of Contract Plans showing the final location of piping, equipment, electrical conduits, outlet boxes and cables;
- B. Additional documents such as schedules, lists, drawings, and electrical and instrumentation diagrams included in the Contract Documents; and
- C. Contractor layout and installation drawings.

Unless otherwise specified, record drawings shall be full size and maintained in a clean, dry, and legible condition. Record documents shall not be used for construction purposes and shall be available for review by the Engineer during normal working hours at the Contractor's field office. At the completion of the

work, prior to final payment, all record drawings shall be submitted to the Engineer.

Marking of the drawings shall be kept current and shall be done at the time the material and equipment are installed. Annotations to the record documents shall be made with an erasable colored pencil conforming to the following color code:

- A. Additions - Red
- B. Deletions - Green
- C. Comments - Blue
- D. Dimensions - Graphite

Legibly mark drawings to record actual depths, horizontal and vertical location of underground raceways, cables, and appurtenances referenced to permanent surface improvements.

The Contractor's record drawings (full-size hard-copy) will be reviewed monthly for completeness by the Engineer prior to preparing the progress estimate for payment. If the record drawings do not reflect the work performed, payment for that item of work will not be included in the progress estimate.

**\*\*\* END OF SECTION \*\*\***

## **SECTION 01740**

### **CLEANUP**

#### **PART 1 GENERAL**

##### **1.1 SCOPE**

The work specified in this Section includes the maintenance of the building, structures, and site(s) in a standard of cleanliness throughout the construction period as described herein.

Throughout the construction period, the Contractor shall maintain the cleanliness of the site and structures as described herein. The Contractor is also to maintain access to all existing, operating equipment such that the equipment may be serviced and operated.

Dust of all kinds, including concrete dust produced by construction activities, shall be controlled to avoid damage to existing, operating equipment. Enclosures, ventilation, and air scrubbing may be required where significant potential for damage is determined by the Engineer.

##### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

In addition to standards described in this Section, comply with all requirements for cleaning up when described in other sections of these Contract Documents.

##### **1.3 QUALITY ASSURANCE**

###### **A. INSPECTION**

The Contractor shall conduct daily site inspections, and more often if necessary, to verify that requirements are being met.

###### **B. CODES AND STANDARDS**

In addition to the standards described in this Section, comply with all pertinent requirements of governmental agencies having jurisdiction.

#### **PART 2 PRODUCTS**

##### **2.1 CLEANING MATERIALS AND EQUIPMENT**

Provide all required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

## **2.2 COMPATIBILITY**

Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material or as approved by the Engineer.

## **PART 3 EXECUTION**

### **3.1 PROGRESS CLEANING**

#### **A. GENERAL**

Retain all stored materials and equipment in an orderly fashion allowing maximum access, not impeding drainage or traffic, and providing protection.

Do not allow the accumulation of scrap, debris, waste material, and other items not required for this work.

At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the project site.

Provide adequate storage for all materials awaiting removal from the project site, observing all requirements for fire protection and protection of the environment.

#### **B. SITE**

Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Move these items into a place designated for their storage until disposal becomes available.

Weekly, and more often if necessary, inspect all arrangements of materials stored on the site, restack, arrange, or otherwise service all arrangements to meet the requirements above.

Maintain the site in a neat and orderly condition at all times so as to meet the approval of the Engineer.

#### **C. STRUCTURES**

Weekly, and more often if necessary, inspect the structures and pick up all scrap, debris and waste material. Move these items into a place designated for their storage until disposal becomes available.

Weekly, and more often if necessary, sweep clean all interior spaces. “Clean” shall be interpreted to mean free from dust and other materials that can be swept with a broom using reasonable diligence.

In preparing to install succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material. Use all equipment and materials required to achieve the required cleanliness.

**D. STREETS**

All paved and unpaved streets in the vicinity of the project shall be kept free of material tracked from the project site(s) or dropped from vehicles entering and leaving the site(s). The Contractor shall inspect roads in each active area daily, and all material deposited on the road from the Contractor’s activities shall be removed prior to the end of the workday. This shall include sweeping, as required, to collect any mud, dirt and dust from the surface. All catch basins and culverts in the work area shall be inspected before completion and cleaned as directed by the Engineer.

**3.2 FINAL CLEANING**

**A. DEFINITION**

Except as otherwise specifically provided, “clean” shall be interpreted as meaning the level of cleanliness generally provided by commercial building maintenance equipment and materials.

**B. GENERAL**

Prior to final inspection, remove from the jobsite all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final project cleaning as described below.

**C. STRUCTURES**

**1. Exterior**

Visually inspect all exterior surfaces and remove all traces of soil, waste, smudges, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure. In the event of stubborn stains not removable with



water, the Engineer may require light sandblasting or other cleaning at no additional cost to the Owner.

2. Interior

Visually inspect all interior surfaces and remove all traces of soil, waste, smudges, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. Remove all paint droppings, spots, stains, and dirt from finished surfaces. Use only appropriate cleaning materials and equipment.

3. Glass

Clean all glass inside and outside.

D. TIMING

Schedule final cleaning as approved by the Engineer to enable the Owner to accept a completely clean project, ready for occupancy.

**\*\*\* END OF SECTION \*\*\***

## SECTION 01800

### TESTING, COMMISSIONING, AND TRAINING

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the installation, testing, commissioning, and training for all mechanical, electrical, and instrumentation systems and completed portions of the work.

See also Section 16050 for additional electrical and instrumentation system testing requirements.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01110	Scope of Work
01300	Submittals
01400	Quality Control
01500	Temporary Facilities
15050	Piping Systems
15400	Plumbing
15700	HVAC
Division 16	Electrical

##### 1.3 QUALITY ASSURANCE

###### A. INSTALLATION

All mechanical, electrical, and instrumentation equipment provided under this Contract shall be installed in conformity with the Contract Documents, including the manufacturer's requirements. Should a manufacturer's installation recommendation conflict with specific requirements of this Contract Document, the Contractor shall bring the matter to the attention of the Engineer. Any additional costs arising out of changes authorized by the Engineer to accommodate manufacturer's installation recommendations will be considered extra work. Any costs incurred by the Contractor through failure to timely notify the Engineer of a difference between Contract Document and manufacturer's installation requirements shall be borne by the Contractor.

## B. TESTING

### 1. General Requirements

All equipment and partially complete or fully completed portions of the work included in this Contract shall be tested and inspected to prove compliance with the Contract requirements. Unless otherwise specified, all costs of testing, including temporary facilities and connections, shall be borne by the Contractor. For the purpose of this Section, equipment shall mean any mechanical, electrical, instrumentation, or other device with one or more moving parts or devices requiring an electrical, pneumatic, or hydraulic connection. Installed leakage tests and other piping tests shall be as specified in Sections 10, 15050 and 15400. Installed tests for heating and ventilation systems shall be as specified in Section 15700. Installed tests for electrical and instrumentation devices and systems shall be in accordance with Division 16.

No tests specified herein shall be applied until the item to be tested has been inspected and approval given for the application of such test.

Tests and inspection shall include:

- a. The delivery acceptance test and inspections.
- b. The installed tests and inspections. These tests may be performed with water or the process fluid, as described in the accepted test plan.
- c. The operational testing of completed sections of the facility. These tests may be performed with water or the process fluid, as described in the accepted test plan.
- d. The commissioning of completed sections of the facility by Owner's personnel. The commissioning shall be performed with the process fluid at normal flows.

Tests and inspections, unless otherwise specified or accepted, shall be in accordance with the recognized standards of the industry. The Contractor shall see that scheduling and performance of all tests are coordinated with involved subcontractors and suppliers. The Contractor shall allow for up to two additional setpoint changes during testing. No extra costs or time allowances shall be provided as long as this setpoint allowance is not exceeded.

The form of evidence of satisfactory fulfillment of delivery acceptance test and inspection requirements shall be, at the discretion of the Engineer, either by tests and inspections carried out in their presence or by certificates or reports of tests and inspections carried out by approved persons or organizations. The Contractor shall provide and use forms that include all test information, including specified operational parameters. The content of the forms used shall be acceptable to the Engineer.

A master test log book shall be maintained by the Contractor, which shall cover all tests including piping, equipment, electrical, and instrumentation. The master test log book shall be provided with loose-leaf pages that shall be copied weekly after updating for transmittal to the Engineer. The master test log book shall be transmitted to the Engineer upon completion of the project.

## 2. Delivery Acceptance Tests and Inspections

The delivery acceptance tests and inspections shall be at the Contractor's expense for any equipment specified herein and shall include the following:

- a. Test of items at the place of manufacture during and/or on completion of manufacture, comprising hydraulic pressure tests, electric and instrumentation subsystems tests, performance and operating tests and inspections in accordance with the relevant standards of the industry and more particularly as detailed in individual clauses of these Specifications to satisfy the Engineer that the items tested and inspected comply with the requirements of this Contract. Tests other than those specified shall be in accordance with Section 01400.
- b. Inspection of all items delivered at the site or to any authorized place of storage so that the Engineer may be satisfied that such items are of the specified quality and workmanship and are in good order and condition at the time of delivery. The Contractor shall be prepared to remove all coverings, containers, or crates to permit the Engineer to conduct their inspection. Should the Engineer find, in their opinion, indication of damage or deficient quality of workmanship, the Contractor shall provide the necessary documentation or conduct such tests deemed necessary by the Engineer to demonstrate compliance.

### 3. Installed Tests and Inspections

#### a. General

All equipment shall be tested by the Contractor to the satisfaction of the Engineer before any facility is put into operation. Tests shall be as specified herein and shall be made to determine whether the equipment has been properly assembled, aligned, adjusted and connected. Any changes, adjustments, or replacements required to make the equipment operate as specified shall be carried out by the Contractor as part of the work.

#### b. Procedures

##### i. General

The procedures shall be divided into two distinct stages; preoperation checkout and water test. Testing procedures shall be designed to duplicate, as nearly as possible, all conditions of operation and shall be carefully selected to ensure that the equipment is not damaged. Once the testing procedures have been reviewed and approved by the Engineer, the Contractor shall produce checkout, alignment, adjustment and calibration sign-off forms for each item of equipment to be used in the field by the Contractor and the Engineer jointly to ensure that each item of electrical, mechanical and instrumentation equipment has been properly installed and tested. The Contractor is advised that failure to observe these precautions may place the acceptability of the subject equipment in question.

##### ii. Preoperation Checkout

The installed tests and inspection procedures shall incorporate all requirements of these Specifications and shall proceed in a logical, step-wise sequence to ensure that all equipment has been properly serviced, aligned, connected, calibrated, and adjusted prior to operation. Preoperation checkout procedures shall include, but not necessarily be limited to:

- (1) Piping system pressure testing and cleaning as specified in Division 15.
- (2) Electrical system testing as specified in Division 16.
- (3) Alignment of equipment.
- (4) Preoperation lubrication.

iii. Water Test

Once all affected equipment has been subjected to the required preoperational checkout procedures and the Engineer has witnessed and has not found deficiencies in that portion of the work, individual systems may be started and operated under simulated operating conditions to determine as nearly as possible whether the equipment and systems meet the requirements of these Specifications. Test media for these systems shall either be the intended fluid or a compatible substitute. The equipment shall be operated a sufficient period of time to determine machine operating characteristics, including temperatures and vibration, to observe performance characteristics, including performance throughout the specified range for blowers, and to permit initial adjustment of operating controls. When testing requires the availability of auxiliary systems such as electrical power, compressed air, control air, or instrumentation which have not yet been placed in service, the Contractor shall provide acceptable substitute sources, capable of meeting the requirements of the machine, device, or system, at no additional cost to the Owner. Disposal methods for test media shall be subject to review by the Engineer.

If under test, any portion of the work should fail to fulfill the Contract requirements and is adjusted, altered, renewed or replaced, tests on that portion when so adjusted, altered, removed or replaced, together with all other portions of the work as are

affected thereby, shall, if so required by the Engineer, be repeated within reasonable time and in accordance with the specified conditions. The Contractor shall pay to the Owner all reasonable expenses incurred by the Owner as a result of repeating such tests.

Once simulated operation has been completed, all machines shall be rechecked for proper alignment, realigned, if necessary, and doweled in place. All equipment shall be checked for loose connections, unusual movement, excessive temperature, noise, and/or vibration or other indications of improper operating characteristics. Any deficiencies shall be corrected to the satisfaction of the Engineer. All machines or devices, which exhibit unusual or unacceptable operating characteristics shall be disassembled and inspected. They shall then be repaired or removed from the site and replaced at no cost to the Owner.

Test results shall be within the tolerances set forth in the detailed Specification sections of the Contract Documents. If no tolerances have been specified, test results shall conform to tolerances established by recognized industry practice. Where, in the case of an otherwise satisfactory installed test, any doubt, dispute, or difference should arise between the Engineer, and the Contractor regarding the test results or the methods or equipment used in the performance of such test, then, the Engineer may order the test to be repeated. If the repeat test, using such modified methods or equipment as the Engineer may require, substantially confirms the previous test, then all costs in connection with the repeat test will be paid by the Owner otherwise the costs shall be borne by the Contractor. Where the results of any installed test fail to comply with the Contract requirements for such test, then such repeat tests as may be necessary to achieve the Contract requirements shall be conducted by the Contractor at their expense.

Unless otherwise specified, the Contractor shall provide at no expense to the Owner, all water,

power, fuel, compressed air supplies, labor and all other necessary items and work required to complete all tests and inspection specified herein. The Contractor shall provide, at no expense to the Owner, temporary heating, ventilating, and air conditioning for any areas requiring it in the case where permanent facilities are not complete and operable at the time of installed tests and inspections. Temporary facilities shall be maintained until permanent systems are in service.

#### 4. Operational Testing

After completion of all installed testing and review by the Engineer that all equipment complies with the requirements of the Specifications, the Contractor shall conduct operational testing. All domestic water, oil, fuel, and chemical systems shall be filled with the specified fluid.

The Contractor shall operate the completed facility for a period of not less than that specified in Part 3.4 of this Section during which all systems shall be operated as a complete facility at various loading conditions, as directed by the Engineer. Should the operational testing period be halted for any reason related to the facilities constructed or the equipment furnished under this Contract, or the Contractor's temporary testing systems, the operational testing program shall be repeated until the specified continuous period has been accomplished without interruption. All process units shall be brought to full operating conditions, including temperature, pressure, and flow.

Record drawings of facilities involved must be accepted and ready for turnover to the Owner at the time of operational testing.

All costs for water, fuel, power, and chemicals required during operational testing shall be borne by the Owner.

#### 5. Commissioning

After completion of the operational testing and certifications by the Engineer that the systems meet all performance requirements, commissioning will begin. The commissioning period for all systems shall be 7 days. The Contractor shall remove all temporary piping that may have been in use during the operational testing and shall assist the Owner with the placement of the facility



into its fully operational mode handling potable water. The Owner's operations and maintenance personnel will be responsible for operation of the facility or portion of the facility during this period of time. The facility or portion thereof shall be fully and continuously operational, accepting all normal flow called for in design and performing all functions as designed.

The Contractor shall be available, with all appropriate subcontractors and trades, at all times during commissioning periods to provide immediate assistance in case of failure of any portion of the system being tested. This assistance shall be available, if needed, on a 24-hour basis. The Engineer will not issue a certificate of Substantial Completion until the end of the commissioning period (including training) and then only when all corrections required to assure a reliable and completely operational facility have been complete. The Contractor shall be responsible for all costs in excess of the Owner's normal expected costs of operations during the commissioning period. The Contractor shall bear the costs of all necessary repairs or replacements, including labor and materials, required to keep the portion of the plant being commissioned operational.

The commissioning period will be considered completed when the facility has been continuously operated without major interruption, equipment failure, or system breakdown for the specified commissioning period. A major interruption, failure or breakdown shall be a condition or event that prevents the facility from continuously and adequately handling normal flow, cannot be repaired or corrected immediately by the Contractor, and is not caused by improper operation and maintenance of the facilities by the Owner. An interruption of the commissioning period under these circumstances will require a re-start of commissioning once required repairs and corrections are made by the Contractor. Should the commissioning period be halted for any reason related to the facilities constructed or the equipment furnished under this Contract, the commissioning shall be repeated until the specified continuous period has been accomplished without interruption.

Final O&M manuals for the facilities must be accepted and ready for turnover to the Owner before the start of commissioning.

C. TRAINING

During the phase of water testing of equipment, the Contractor shall make available experienced factory-trained representatives of the manufacturers of all the various pieces of equipment, to train the Owner's personnel in the operation and maintenance thereof. The time required for this training shall be as covered in the specifications for the specific piece of equipment. The Contractor shall notify the Engineer of the time of the training at least 10 days prior to the start time of the training.

**1.4 SUBMITTALS**

A. STARTUP AND TESTING PLAN

Prior to receipt of any progress payments in excess of 60 percent of the Contractor's total bid for the work, the Contractor shall submit to the Engineer five copies of a startup and testing plan with details of the installed tests and inspection procedures he proposes to adopt for testing and startup of all equipment to be operated singly and together.

B. TRAINING OUTLINE

The Contractor shall submit five copies of a detailed outline of training activities to be performed by each manufacturer's representative 10 days prior to the start time of the training. This outline shall indicate how the manufacturer's representative is going to allocate the required specified number of training hours to fulfill these contractual obligations.

**PART 2 PRODUCTS**

**2.1 INSTALLATION**

Materials employed in the installation shall conform to the requirements of the Contract Documents and the recommendations of the equipment manufacturers.

**2.2 TESTING**

A. GAUGES, METERS, RECORDERS, AND MONITORS

Gauges, meters, recorders, and monitors shall be provided by the Contractor as required to supplement or augment the instrumentation system provided under this Contract to properly demonstrate that all equipment fully satisfies the requirements of the Specifications. All devices employed for the purpose of measuring the performance of the facility's equipment and systems shall be specifically selected to be

consistent with the variables to be monitored. All instruments shall be recently calibrated, and the Contractor shall be prepared at all times to demonstrate, through recalibration, the accuracy of all instruments employed for testing purposes. Calibration procedures shall be in accordance with applicable standards of ASTM, ISA, and IEEE. The adequacy of all gauges, meters, recorders and monitors shall be subject to review by the Engineer.

#### B. RECORDS

The Contractor shall provide sign-off forms for all installed and operational testing to be accomplished under this Contract. Sign-off forms shall be provided for each item of mechanical, electrical and instrumentation equipment provided or installed under this Contract and shall contain provisions for recording relevant performance data for original testing and not less than three retests. Separate sections shall be provided to record values for the preoperation checkout, as well as signatures of representatives of the equipment manufacturers, the Contractor, and the Engineer.

#### C. TEMPORARY TEST FACILITIES AND MODIFICATIONS

The Contractor shall provide and install all necessary temporary piping, valves, pumps, tanks, controls, and other facilities and modifications to enable the operational testing of the permanent facility components. Operational testing requiring the recirculation of water or process fluids within the facility shall be performed by the Contractor using temporary facilities, if needed, provided and installed by the Contractor. Temporary facilities shall be removed by the Contractor once the required testing is completed.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

All equipment and apparatus used in testing shall be installed by specialists properly skilled in the trades and professions required to assure first-class workmanship. Where required by detailed Specifications, the Contractor shall cause the installation of specific equipment testing items to be accomplished under the supervision of factory-trained installation specialists furnished by the equipment manufacturers. The Contractor shall be prepared to document the skills and training of all workmen engaged in the installation of all testing equipment furnished either by the Contractor or the Owner.

## **3.2 TESTING**

Testing shall proceed on a step-by-step basis in accordance with the Contractor's written testing procedures. The Contractor's testing work shall be accomplished by a skilled team of specialists under the direction of a coordinator whose sole responsibility shall be the orderly, systematic testing of all equipment, systems, structures, and the complete facility as a unit. Each individual step in the procedures shall be witnessed by a representative of the Engineer.

During the facility operational testing period, all equipment and systems in operation shall be operated to the greatest extent practicable, at conditions, which represent the full range of operating parameters as defined by the Contract Documents.

## **3.3 TRAINING**

Training of the Owner's personnel shall be done by experienced technical manufacturers' representatives. Training shall be provided during a scheduled, dedicated session and shall not be combined with other field services such as equipment testing, startup and check-out. When required by these specifications, the training sessions shall be video and audio-taped by the Contractor and the final DVD delivered to the Owner. These manufacturers' representatives shall follow the outline presented here:

### **GENERAL OUTLINE FOR MANUFACTURER PRESENTATIONS**

#### **A. FAMILIARIZATION**

1. Overview explaining theory of operation.
2. Show catalog, parts lists, drawings, etc., in the shop drawings and O&M manuals. Clearly identify the model or identification number of the equipment for which training is being provided.
3. Check out the installation of the specific equipment items.
4. Demonstrate the unit and show that all parts of the Specifications are met.
5. Answer questions.

#### **B. SAFETY**

1. Point out safety references.

2. Discuss proper precautions around equipment.

#### C. OPERATION

1. Point out reference literature.
2. Explain all modes of operation (including emergency).
3. Check out Owner's personnel on proper use of the equipment. (Let them do it).

#### D. PREVENTIVE MAINTENANCE (PM)

1. Pass out PM list including:
  - a. Reference material.
  - b. Daily, weekly, monthly, quarterly, semi-annual, and annual jobs.
2. Show how to perform PM jobs.
3. Show Owner's personnel what to look for as indicators of equipment problems.

#### E. CORRECTIVE MAINTENANCE

1. List possible problems.
2. Discuss repairs - point out special problems.
3. Open up equipment and demonstrate procedures, where practical.

#### F. PARTS

1. Show how to use parts list and order parts.
2. Check over spare parts on hand. Make recommendations.

#### G. LOCAL REPRESENTATIVES

1. Where to order parts: Name, address, telephone, fax, e-mail.

2. Service problems:
  - a. Who to call.
  - b. How to get emergency help.

### **3.4 FACILITY OPERATIONAL TESTING**

The systems described below shall be tested to demonstrate the performance of mechanical, electrical, instrumentation and control subsystems together as an integrated system. Where the testing described in this Section conflicts with the testing requirements specified for individual equipment, or the manufacturer's recommended testing procedure, those requirements and procedures shall prevail.

Unless otherwise noted, a time period of 3 days shall be allowed for each facility operational test.

#### **A. HEATING AND VENTILATING**

Testing and balancing of the heating and ventilating systems shall be performed in accordance with Specification Section 15700.

**\*\*\* END OF SECTION \*\*\***

## **SECTION 01900**

### **SALVAGE AND DEMOLITION**

#### **PART 1 GENERAL**

##### **1.1 SCOPE**

The work specified in this Section covers the demolition of existing structures, piping, equipment, and sitework, and the salvage of existing materials and equipment as indicated on the Plans and as specified herein.

All areas and facilities of the existing facility, which are not to be removed, must remain in continuous operation during the work. Demolition and salvage work shall create a minimum of interference with the operation of the facility.

The Plans show the major items to be demolished and removed. In addition to these items, the Contractor shall remove any other incidental above-grade items which are not to be used in the completed project.

##### **1.2 EXISTING FACILITIES**

There now exist along the construction route, and within the boundaries thereof, above-ground and underground improvements. A portion of these, where known, is shown on the Plans. However, whether they are shown on the Plans or later marked in the field, responsibility for damage and repair shall be determined in accordance with RCW Chapter 19.122, Underground Utilities.

The Contractor shall inform each property owner in ample time so that the property owner and the Contractor may take any precautions necessary to facilitate construction in the vicinity and thereby protect existing property and any underground water lines, drain lines, and/or power lines or other utility lines. Where the Contractor is allowed to use private property adjacent to the work, the property so used shall be returned to its original or superior condition. A signed release from the property owner shall be furnished to the District by the Contractor prior to project acceptance. See Special Provisions for the Property Owner's Approval of Restoration form.

Wherever existing drainage channels, culverts or structures are disturbed, the Contractor shall provide suitable means for diverting and maintaining all flows during construction in that area at his expense. After the construction has been completed, all channels, culverts, or structures shall be returned to a condition that is equal to or better than existed prior to construction.

The Contractor shall adequately protect and preserve from damage, destruction, and interference with the use of all property or its appurtenances on or in the

vicinity of the work, which is not ordered or provided for removal or destruction under this contract. This applies to all items occupying the right-of-way, trees, monuments, pipes, conduits, water mains and blocking, underground structures, culverts, bridges, fences, rockeries, docks, bulkheads, and property of all descriptions. Wherever such property is damaged, destroyed or the use thereof is interfered with due to the operation of the Contractor, it shall be immediately restored to its former condition by the Contractor, at the Contractor's expense. No separate payment will be made for the protection and/or repairing of existing facilities and any cost and expense incurred in protection and/or repairing these facilities shall be included in the price bid for the several items as indicated in the proposal.

### **1.3 SALVAGE**

Salvageable equipment and material shall be removed with care so as not to impair future uses and shall include all equipment and material so indicated on the Plans. Salvaged equipment and material not reused or rejected by the Owner shall be cleaned and protected from corrosion and weather and delivered by the Contractor to the Owner at the District Headquarters in Kenmore, Washington.

Reuse of salvageable equipment and material by the Contractor will not be permitted except where specifically indicated on the Plans and in the Specifications or where approved by the Engineer and Owner. Salvageable equipment and materials rejected in writing by the Owner shall become the property of the Contractor and shall be disposed of away from the site without additional cost to the Owner.

### **1.4 DEMOLITION**

The Contractor shall be responsible for compliance with current City, County, State, and Federal codes and regulations related to demolition.

The Contractor shall notify all affected utilities and comply with their respective requirements for abandonment of such utilities including power, telephone, natural gas, water, sanitary sewer, and storm sewer utilities.

The Contractor shall maintain access for the Owner's employees during the demolition period and provide barricades, fences, etc., as required for job site safety.

Demolition of concrete, masonry, roofing, asphalt, and other materials shall be done so as to avoid damage to existing structures intended to remain. Demolition or cutting required to add to or modify existing structures shall be done in such a manner that the appearance and utility of the existing structure is not impaired and so that a neat transition from new to old material may occur.



All piping and appurtenances located less than 4 feet below finished grade shall be removed and hauled to an approved disposal site. All piping and appurtenances located four feet or more below finished grade may be abandoned in place, unless shown otherwise on the Plans, as long as Contractor fully seals all pipe and appurtenance openings with grout.

All waste materials from demolition or cutting shall become the property of the Contractor and shall be removed from the site and hauled to an approved waste disposal site, if declared surplus by the Owner. All materials and equipment, however, are property of the Owner unless declared surplus. Some equipment and materials scheduled for salvage and delivery to the Owner are noted on the Plans.

**\*\*\* END OF SECTION \*\*\***

## **SECTION 01950**

### **TRAFFIC CONTROL**

#### **PART 1 GENERAL**

##### **1.1 SCOPE**

Temporary traffic control refers to the control of all types of traffic, including vehicles, bicyclists and pedestrians (including pedestrians with disabilities). The Contractor, utilizing contractor labor and contractor-provided equipment and materials (except when such labor, equipment, or materials are to be provided by the Owner as specifically identified in the Contract Documents), shall plan, manage, supervise and perform all temporary traffic control activities need to support the work of the Contract.

The Contractor shall provide flaggers, signs, and other traffic control devices not otherwise specified as being furnished by the Owner. The Contractor shall erect and maintain all construction signs, warning signs, detour signs, and other traffic control devices, necessary to warn and protect the public at all times from injury or damage as a result of the Contractor's operations which may occur on highways, roads or streets. No work shall be done on or adjacent to the roadway until all necessary signs and traffic control devices are in place.

The traffic control resources and activities shall be used for the safety of the public, the Contractor's employees, the Owner's personnel and to facilitate the movement of the traveling public. Traffic control resources and activities may be used for the separation or merging of public and construction traffic when in accordance with a specific approved traffic control plan.

Upon failure of the Contractor to immediately provide flaggers; erect, maintain, and remove signs; or provide, erect, maintain, and remove other traffic control devices when ordered to do so by the Owner, the Owner may, without further notice to the Contractor or the Surety, perform any of the above and deduct all of the costs from the Contractor's payment.

The Contractor shall be responsible for providing adequate flaggers, signs and other traffic control devices for the protection of the work and the public at all times regardless of whether or not the flaggers, signs, and other traffic control devices are ordered by the Owner, furnished by the Owner, or paid for by the Owner.

## 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01160	Regulatory Requirements
01300	Submittals

## 1.3 REFERENCES

This Section references the latest revisions to the following documents:

<u>Reference</u>	<u>Title</u>
MUTCD	<i>Manual of Uniform Traffic Control Devices Washington State Modifications to the MUTCD Quality Guidelines for Temporary Traffic Control Devices</i>
ANSI 107	<i>High Visibility Garment Standard</i>

## 1.4 TRAFFIC CONTROL MANAGEMENT

### A. GENERAL

It is the Contractor's responsibility to plan, conduct, and safely perform the work. The Contractor shall manage temporary traffic control with his or her own staff. Traffic control management responsibilities shall be formally assigned to one or more company supervisors who are actively involved in the planning and management of field Contract activities. The Contractor shall provide the Engineer with a copy of the formal assignment. The duties of traffic control management may not be subcontracted.

The Contractor shall designate an individual or individuals to perform the duties of the primary Traffic Control Supervisor (TCS). The designation shall also identify an alternate TCS who can assume the duties of the primary TCS in the event that person's inability to perform. The TCS shall be responsible for safe implementation of approved Traffic Control Plans provided by the Contractor.

The primary and alternate TCS shall be certified as worksite traffic control supervisors by one of the organizations listed herein. Possession of a current TCS card and flagging card by the primary and alternate TCS is mandatory. A traffic control management assignment and a TCS designation are required on all projects that will utilize traffic control.

The Contractor shall maintain 24-hour telephone numbers at which the Contractor's assigned traffic control management personnel and the TCS can be contacted and be available upon the Engineer's request at other than normal working hours. These persons shall have the resources, ability and authority to expeditiously correct any deficiency in the traffic control system.

B. The duties of the Contractor's traffic control management personnel shall include:

1. Overseeing and approving the actions of the Traffic Control Supervisor (TCS) to ensure that proper safety and traffic control measures are implemented and consistent with the specific requirements created by the Contractor's work zones and the Contract. Some form of oversight shall be in place and effective even when the traffic control management personnel are not present at the jobsite.
2. Providing the Contractor's designated TCS with approved Traffic Control Plans (TCPs), which are compatible with the work operations, and traffic control for which they will be implemented.
3. Discussing proposed traffic control measures and coordinating implementation of the Contractor-adopted traffic control plan(s) with the Owner.
4. Coordinating all traffic control operations, including those of subcontractors, suppliers, and any adjacent construction or maintenance operations.
5. Coordinating the project's activities (road closures and lane closures) with appropriate police, fire control agencies, city or county engineering, medical emergency agencies, school districts, and transit companies.
6. Overseeing all requirements of the Contract, which contribute to the convenience, safety, and orderly movement of vehicular and pedestrian traffic.
7. Having the latest adopted edition of the MUTCD including the Modifications to the MUTCD for Streets and Highways for the State of Washington and applicable standards and specifications available at all times on the Project.

8. Attending all Project meetings where traffic management is discussed.
9. Being present onsite a sufficient amount of time to adequately accomplish the above-listed duties.

C. TRAFFIC CONTROL SUPERVISOR

A Traffic Control Supervisor (TCS) shall be on the Project whenever traffic control labor is required or less frequently, as approved by the Owner.

The TCS shall personally perform all the duties of the TCS. The TCS's duties shall include:

1. Inspecting traffic control devices and nighttime lighting for proper location, installation, message, cleanliness, and effect on the traveling public. Traffic control devices shall be inspected each work shift except that Class A signs and nighttime lighting need to be checked only once a week. Traffic control devices left in place for 24 hours or more should also be inspected once during the nonworking hours when they are initially set up (during daylight or darkness, whichever is opposite of the working hours).
2. Ensuring that corrections are made if traffic control devices are not functioning as required. The TCS may make minor revisions to the approved traffic control plan to accommodate site conditions as long as the original intent of the traffic control plan is maintained and the revision has concurrence of the TCM and/or Owner.
3. Attending traffic control coordinating meetings or coordination activities as authorized by the Owner.
4. Ensuring that all needed traffic control devices are available and in good working condition prior to the need to install those devices.
5. Ensuring that all pedestrian routes or access points, existing or temporary, are kept clear and free of obstructions and that all temporary pedestrian routes or access points are detectable and accessible to persons with disabilities as provided for in the approved plans.

6. Having a current set of approved TCPs and applicable contract provisions as provided by the TCM and the latest adopted edition of the MUTCD including the *Washington State Modifications to the MUTCD* and applicable standards and specifications.

## 1.5 TCM AND TCS QUALIFICATIONS

The TCM and TCS shall be certified by one of the following:

The Northwest Laborers – Employers Training Trust  
27055 Ohio Avenue  
Kingston, Washington 98346  
(360) 297-3035

Evergreen Safety Council  
401 Pontius Avenue N.  
Seattle, Washington 98109  
(800) 521-0778 or (206) 382-4090

The TCS and all flaggers shall have a current flagging card from the State of Washington, Oregon, or Idaho.

## 1.6 SUBMITTALS

### A. TRAFFIC CONTROL PLAN

The Contractor shall prepare and submit five copies of a Traffic Control Plan(s). All construction signs, flaggers, spotters, and other traffic control devices shall be shown on the traffic control plans. The Contractor shall designate and adopt in writing the specific traffic control plan or plans required for their method of performing the work. The traffic control plan(s) shall be in accordance with the established standards for plan development as shown in the MUTCD, Part VI.

The Traffic Control Plan shall meet the specific requirements of the franchise agreements and right-of-way permits required for this project. In addition, the Traffic Control Plan shall meet the following requirements:

- Maintain two-way traffic.
- Maintain at least one-way traffic on state highways and through roads.
- Local access and emergency access on local access roads.

The Contractor, at the end of each day, shall leave the Work area in such condition that it can be traveled without damage to the Work, without danger to traffic, and without one-way traffic control.

Enhancements to improve the effectiveness of the accepted traffic control plans to increase safety of work zones will be discussed between the Contractor and the Contracting Agency as needed. Enhancements shall be mutually agreed upon by the Contractor and the Engineer prior to performing any Work to implement the enhancement. Enhancements do not include the use of Uniformed Police Officers or Washington State Patrol, address changes to allowed work hour restrictions or changes to the staging plans in the Contract (if applicable). If allowed by the Engineer, these items will be addressed in accordance with Section 3.04.6 of the General Conditions. The Contractor shall be responsible for submitting any traffic control plan revision to implement the enhancement.

## **PART 2 PRODUCTS**

### **2.1 TRAFFIC CONTROL DEVICES**

Flagging, signs and all other traffic control devices furnished or provided shall conform to the standards established in the latest WSDOT adopted edition of the *Manual on Uniform Traffic Control Devices (MUTCD)* published by the U.S. Department of Transportation and the *Washington State Modifications to the MUTCD*. Requirements for pedestrian traffic control devices are addressed in the MUTCD.

### **2.2 CONSTRUCTION SIGNS**

All construction signs required by the approved traffic control plan(s) as well as any other appropriate signs prescribed by the Owner shall be furnished by the Contractor. The Contractor shall provide the posts or supports and erect and maintain the signs in a clean, neat, and presentable condition until the necessity for them has ceased. All non-applicable signs shall be removed or completely covered with either metal or plywood during periods when they are not needed. When the need for any of these signs has ceased, the Contractor, upon approval of the Owner, shall take down these signs, post, or supports.

Construction signs will be divided into two classes. Class A construction signs are those signs that remain in service throughout the construction or during a major phase of the work. They are mounted on posts, existing fixed structures, or substantial supports of a semi-permanent nature. Sign and support installation for Class A signs shall be in accordance with the WSDOT Standard Plans. Class A signs shall be designated as such on the Traffic Control Plan. Class B

Construction signs are those signs that are placed and removed daily, or are used for short durations which may extend for 1 to 3 days. They are mounted on portable or temporary mountings.

Tripod-mounted signs in place more than 3 days in any one location, unless approved by the Engineer, shall be required to be post-mounted and shall be classified as Class A construction signs. Where it is necessary to add weight to the signs for stability, sandbags or other similar ballast may be used but the top of the ballast shall not be more than 4 inches above the road surface, and shall not interfere with the breakaway features of the device. The Contractor shall follow the manufacturer's recommendations for sign ballasting.

## **PART 3 EXECUTION**

### **3.1 GENERAL**

The Contractor shall provide all labor and equipment to execute the Traffic Control Plan. It is the Contractor's responsibility to plan, conduct, and safely perform the work.

The TCS shall be responsible for safe implementation of approved Traffic Control Plans provided by the TCM.

### **3.2 TRAFFIC CONTROL LABOR**

The Contractor shall furnish all personnel for flagging, spotting, for the execution of all procedures related to temporary traffic control and for setup, maintenance and removal of all temporary traffic control devices and construction signs necessary to control traffic during construction operations.

Vests and other high-visibility apparel shall be in conformance with ANSI 107.

Flaggers and spotters shall be posted where shown on the approved Traffic Control Plan. Flaggers and spotters shall possess a current flagging card issued by the State of Washington, Oregon, or Idaho. The flagging card shall be immediately available and shown upon request by the Owner.

During hours of darkness, flagging stations shall be illuminated in a manner that ensures that flaggers can easily be seen but that does not cause glare to the traveling public. Flagger station illumination shall meet the requirements of the MUTCD.

Flaggers shall be equipped with portable two-way radios, with a range suitable for the project. The radios shall be capable of having direct contact with project management (foreman, superintendents, etc.)



The Contractor shall furnish flagger Stop/Slow paddles conforming to the requirements of the MUTCD, except the minimum width shall be 24 inches.

**\*\*\* END OF SECTION \*\*\***

**DIVISION 2**

**SITWORK**

## SECTION 02050

### LOCATE EXISTING UTILITIES

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the anticipated conflicts, which may exist with existing utilities. A reasonable attempt has been made to locate the existing utilities; however, the exact location, and/or depth are unknown in most instances. Locations and dimensions shown in the Plans for existing facilities are in accordance with available information obtained without uncovering, measuring, or other verification. It shall be the responsibility of the Contractor to locate existing utilities and their depth.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
02250	Temporary Shoring and Bracing
02300	Earthwork

#### PART 2 PRODUCTS

Not Used.

#### PART 3 EXECUTION

##### 3.1 GENERAL

The Contractor shall determine the difficulties to be encountered in constructing the Project and his locate effort based upon the information provided on the Plans, field investigation, and the Contractor's contacts with the existing utility companies. The Contractor shall determine the extent of exploration required to first prevent damage to those existing utilities, and secondly to determine if the proposed improvements are in conflict with existing utilities.

The Contractor shall locate existing utilities sufficiently ahead of construction so that the Engineer can modify the alignment, or grade prior to construction. Where the alignment of the proposed utility cannot be adjusted to miss the existing utility without installation of additional pipe or fittings, the Contractor may be entitled to additional compensation to reroute the proposed utility.

The Contractor shall call the Utility Location Request Center (One Call Center), for field location, not less than 2 nor more than 10 business days before the scheduled date for commencement of excavation that may affect underground utility facilities, unless otherwise agreed upon by the parties involved. A business day is defined as any day other than Saturday, Sunday, or a legal local, State, or Federal holiday. The telephone number for the One Call Center for this project is (800) 424-5555. If no one-number locator service is available, notice shall be provided individually to those owners known to or suspected of having underground facilities within the area of the proposed excavation.

The Contractor is alerted to the existence of Chapter 19.122 RCW, a law relating to underground utilities. Any cost to the Contractor incurred as a result of this law shall be at the Contractor's expense.

No excavation shall begin until all know facilities in the vicinity of the excavation area have been located and marked.

**\*\*\* END OF SECTION \*\*\***

## SECTION 02230

### CLEARING AND GRUBBING

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the clearing, grubbing, and stripping of the proposed project areas in preparation of foundations, embankment construction, and pipeline installation.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
02305	Wet Weather Earthwork
02300	Earthwork
02370	Erosion Control

##### 1.3 DEFINITIONS

“Clearing, grubbing, and stripping debris” as hereinafter used shall be considered as all material removed by the clearing, grubbing, and stripping operations.

#### PART 2 PRODUCTS

Not Used.

#### PART 3 EXECUTION

##### 3.1 DISPOSAL OF CLEARING AND GRUBBING DEBRIS

Clearing and grubbing debris shall be disposed of by hauling to waste and disposal sites approved by the Owner.

##### 3.2 CLEARING AND GRUBBING

Clearing and grubbing shall be performed as required to complete the work shown on the Plans to a minimum depth of 8 inches in order to remove the root zone of existing vegetation.

This work shall include removal and disposal of all trees, logs, brush, stumps, roots, and minor manmade structures to include but not limited to concrete, asphalt abandoned metal and equipment, rubbish and debris to the limits indicated

on the plans or as required and approved by the owner. This work shall be to a depth necessary to remove stumps, large roots and all other objectionable material. This work shall also include the protection from injury or defacement of trees, bushes, shrubs, and other objects designated to remain.

### **3.3 HIGH VOLTAGE POWER**

Removal of trees will require careful planning due to proximity of Puget Sound Energy high voltage power lines. Research with PSE indicates the power lines are transmission and carry over 100kv. Contractor shall be responsible to confirm line ratings, coordinate with PSE, and follow WAC 296-155-428 and other applicable safety standards.

**\*\*\* END OF SECTION \*\*\***

## SECTION 02240

### DEWATERING

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes dewatering excavations of any kind and location, including but not limited to groundwater, surface water, and precipitation, until backfilling has been completed to finished grade.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
02300	Earthwork
02370	Erosion Control

##### 1.3 SUBMITTALS

Prior to the start of construction, the Contractor shall submit a dewatering plan in accordance with Section 01300 containing both a graphical and narrative presentation identifying proposed methods, equipment sizes and contingency plans should dewatering cause settlement of any adjacent facilities. The dewatering plan shall show specific locations, in plan and section, where dewatering is expected as well as a general discussion of methods to be employed should water be encountered in other locations. The plan shall detail the depth, diameter and anticipated flow for dewatering wells, well points or sumps.

Acceptance by the Owner of the method, installation, and operation and maintenance details submitted by the Contractor shall not in any way be considered to relieve the Contractor from full responsibility for errors therein or from the entire responsibility for complete and adequate design and performance of the system in controlling the water level in the excavated areas, and for control of the hydrostatic pressures to the depths specified herein. The Contractor shall be solely responsible for the proper design, installation, proper operation, maintenance, and any failure of any component of the dewatering system.

##### 1.4 REFERENCES

“Rossum J.R., 1954, *Control of Sand in Water Systems*, Journal American Water Works Association, Volume 46, pp. 123-132”

December 14, 2022 Geotechnical Report, Northshore Utility District 451 Zone Control Valve Station, PanGEO, Inc.

## **1.5 QUALITY CONTROL**

It shall be the sole responsibility of the Contractor to control the rate and effect of the dewatering efforts to avoid all objectionable settlement and subsidence. The Contractor shall comply with local codes and ordinances of governing authorities with regard to disposal of water pumped from dewatering operations.

Proposed discharge points shall be approved by the Owner prior to implementation of dewatering. The Contractor shall be responsible for taking all reasonable precautions necessary to ensure continuous, successful operation of the system.

## **PART 2 PRODUCTS**

Dewatering shall be in accordance with the guidance stated in the Geotechnical Report for this Project.

The Contractor shall have sufficient pumping equipment and/or other machinery available onsite before operations begin to assure that the operation of the dewatering system can be maintained. This shall include providing backup pumps of similar capacity and a standby generator of the capacity required to continuously operate the Contractor's dewatering system.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION AND APPLICATION**

During excavation, the installation of piping, conduits and structures and during the placing of backfill, excavations shall be kept free of water, subsurface or otherwise. The Contractor shall furnish all equipment necessary to dewater the excavations and shall dispose of the water so as not to cause a nuisance or menace to the public. The dewatering system shall be installed and operated by the Contractor so that the groundwater level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property. The release of groundwater to its static levels shall be performed so as to maintain the undisturbed state of the foundation soils, prevent disturbance of backfill and prevent movement of all structures and pipelines.

Design implementation and maintenance of any dewatering system shall be the responsibility of the Contractor.



The Contractor shall construct all dewatering wells in accordance with WAC 173-160. The dewatering system shall be sufficient to maintain the groundwater level at an elevation to protect the surface of the trench bottoms, the base of the bedding course or other foundation, and shall be accomplished prior to pipe laying and jointing or placement of reinforcing steel for concrete.

If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering. The dewatering operation, however accomplished, shall be carried out so that it does not destroy or weaken the strength of the soil under or alongside the excavations.

The Contractor shall design filters and screen slot sizes for all sumps, wells and well points which prevents the movement of fines during pumping. The Contractor shall develop the wells such that they produce no more than 10-ppm silica as measured with a Rossum Sand Tester (Rossum, 1954) or equivalent.

### **3.2 MONITORING**

The Contractor shall install water level observation wells in dewatered areas sufficient to determine whether groundwater levels are maintained as per Part 3.1 of this Section.

### **3.3 FIELD QUALITY CONTROL**

A continual check by the Contractor shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation. The Contractor shall test all dewatering discharge using a Rossum Sand Tester or equivalent to determine the silica content of the discharge. The Contractor shall notify the Owner at least 24 hours prior to testing. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement that could develop.

Should settlement be observed, the Contractor shall cease dewatering operations and implement contingency plans as outlined in the Contractor's approved dewatering plan. The responsibility for conducting the dewatering operation in a manner that protects adjacent structures and facilities rests solely on the Contractor. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the Contractor. Permanent piping systems, existing or new, shall not be incorporated into the Contractor's dewatering system.

**\*\*\* END OF SECTION \*\*\***



## **1.5 QUALITY ASSURANCE**

### **A. SHORING CONSULTANT**

The Contractor shall engage the services of a qualified geotechnical engineer and qualified structural engineer registered in the State of Washington to design temporary shoring and bracing when required by applicable regulations.

### **B. SHORING DESIGN**

The Contractor shall provide layout and design drawings and specifications for shoring and bracing when a trench box is inadequate for the purpose or will not be used and trench depth exceeds 4 feet and back sloping will not be used. Temporary shoring and bracing system design and calculations shall be prepared, stamped, and signed by a Professional Engineer registered in the State of Washington.

### **C. REGULATIONS**

The Contractor shall design sheeting, shoring and bracing in accordance with the Washington State Safety Code and any local codes and ordinances of governing authorities having jurisdiction.

## **1.6 SUBMITTALS**

The Contractor shall submit shoring and bracing layout and design drawings, calculations and other backup data to the Owner for review in accordance with Section 01300 prior to the start of construction.

## **1.7 PROJECT CONDITIONS**

### **A. SITE SURVEY**

The background survey information provided on the Plans is shown for clarity only. The Contractor shall determine, before commencing work, the exact location of all existing features that may be disrupted by new construction, including existing underground utilities. The Contractor shall be fully responsible for any and all damages, which might be caused by the Contractor's failure to exactly locate and/or preserve existing site features. Prior to commencing work, the Contractor shall check and verify governing dimensions and elevations.

The Contractor shall survey adjacent structures and facilities, establishing exact elevations at fixed points to act as temporary bench marks to





## **SECTION 02300**

### **EARTHWORK**

#### **PART 1 GENERAL**

##### **1.1 SCOPE**

The work specified in this Section includes the earthwork, including trench excavation and backfill for piping, excavation and backfill for structures, and finish grading.

##### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

<u>Section</u>	<u>Item</u>
01300	Submittals
01500	Temporary Facilities
02230	Clearing and Grubbing
02240	Dewatering
02250	Temporary Shoring and Bracing
02305	Wet Weather Earthwork
02370	Erosion Control
02700	Gravel Materials

#### **PART 2 PRODUCTS**

##### **2.1 GRAVEL MATERIALS**

All gravel materials shall conform to Section 02700.

#### **PART 3 EXECUTION**

##### **3.1 PREPARATION**

Excavation may commence once all erosion control measures are in place in accordance with the Plans and to the satisfaction of the Owner.

##### **3.2 GENERAL REQUIREMENTS**

Excavation, compaction and backfill for structures, pipelines and the final site contours shall be formed by either excavating or compacting fill, as required, to provide the cross-sections as shown on the Plans.

All excavation performed on this Project shall be considered unclassified.  
Excavation shall consist of the removal of any and all material encountered,

including debris, rubble, concrete, metal, topsoil, cutting and removal of existing surfacing, tree stumps, trees, logs, abandoned rail ties, abandoned piping, piling, riprap, etc.

Excavations shall be kept free of water, both surface water and groundwater, during the excavation, installation of pipelines and structures, and the placement of backfill.

The Contractor's attention is also called to the depth of the structures and piping; for this reason, special shoring and bracing may be required. All shoring and bracing or sheeting required to perform and protect the excavation and to safeguard the employees, shall be furnished by the Contractor. For additional requirements see Section 02250.

No timber bracing, lagging, sheathing or other lumber shall be left in any excavation except with permission of the Engineer and in the event such permission is granted, no separate payment shall be allowed for burying such material.

All stockpiles shall be covered with plastic and no stockpile shall be higher than 6 feet above existing grade.

### **3.3 EXCAVATION AND BACKFILL FOR STRUCTURES**

Excavation and backfill for structures shall be in conformance with Section 2-09 of the WSDOT Standard Specifications, and as further described herein. All excavation for structures shall be done to the dimensions and levels indicated on the Plans or specified herein. Excavation shall be made to such width outside the lines of the structures to be constructed as may be required for proper working methods, the erection of forms and the protection of the work.

Excavation shall consist of the removal of any and all material encountered to the elevations shown on the Plans. Excavations for structures shall be continued down to the subgrade which is defined as 12 inches below concrete mat foundations, concrete footings, and slab on grade floors for the installation of foundation gravel material, unless otherwise noted on the Plans.

Fill material placed under structures, including footings and floor slabs, shall be foundation gravel free from debris and organics, as specified in Section 02700.

In the event unsuitable material is encountered below the subgrade shown on the Plans and described herein, the Contractor, as required by the Engineer, shall over-excavate until a suitable foundation is reached. If over-excavation of unsuitable material is required by the Engineer, it will be under the unit price bid item entitled "UNSUITABLE MATERIALS," as described in Section 4 –

Measurement and Payment, in the Proposal. The Contractor shall then replace the material with compacted foundation gravel, as specified in Section 02700. If imported foundation gravel is required; it will be paid under the unit price bid item titled "FOUNDATION GRAVEL", as specified in Section 4 – Measurement and Payment, in the Proposal. Quantities, if any, shall be calculated by neat line measurement to the depth agreed to in the field by the Engineer.

The Contractor shall notify the Engineer when excavation for compacted fill or structures is complete. No forms, reinforcing steel, or concrete shall be placed until the excavation has been inspected by the Engineer.

Backfill for structures shall be Gravel Backfill for Walls as specified in Section 02700.

### **3.4 EXCAVATION AND BACKFILL FOR TRENCHES**

Excavation and backfill for trenches shall be in conformance with Sections 7-08 and 7-09 of the WSDOT Standard Specifications, and as further described herein. The following pipe materials shall be considered flexible:

- PVC
- Polyethylene Tubing
- FRP
- HDPE
- Polyethylene
- Corrugated Polyethylene

All other pipe materials shall be considered rigid.

Upon completion of work each day, all pipeline open trenches shall be completely backfilled, leveled, and temporarily patched or graveled, as herein specified. Under certain conditions, the trench may be left open at the last length of pipe laid during the day to avoid re-excavation the following morning, provided that the opening is adequately plated or covered for vehicle traffic. Special attention shall be given to barricading to keep vehicular traffic away from newly-backfilled trench areas until restored for traffic.

The Engineer reserves the right to restrict the Contractor in the amount of trench for pipeline that can be opened during the working day. Should the Contractor, in the Engineer's opinion, fail to diligently pursue backfilling, an allowable limit of open trench shall be 100 lineal feet and shall be strictly enforced.

The width of the trench at or below a point 12 inches above the top of the outside diameter of the pipe shall be carefully controlled and maintained to ensure the



strength of the pipe and prevent pipe failures. Backfilling shall proceed as follows:

A. SUBGRADE PREPARATION

The subgrade for piping is defined as the elevation of the bottom of the pipe bedding material as shown on the Plans.

In the event unsuitable material is encountered below the subgrade shown on the Plans and described herein, the Contractor, as required by the Engineer, shall over-excavate until a suitable foundation is reached. If over-excavation of unsuitable material is required by the Engineer, it will be paid for under the unit price bid item entitled "UNSUITABLE MATERIALS," as found in the Proposal. The Contractor shall then replace the material with compacted foundation gravel, as specified in Section 02700. Imported foundation gravel is required, it will be paid under the unit price bid item titled "FOUNDATION GRAVEL."

Quantities, if any, shall be calculated by neat line measurement to the depth agreed to in the field by the Engineer.

B. BEDDING FOR RIGID PIPE

Above the foundation material, if any, the bedding material shall be Gravel Backfill for Pipe Bedding, as specified in Section 02700. This material shall be placed in lifts of approximately 8 inches up to a point 12 inches above the pipe. This material shall be hand shoveled in place and carefully worked under and around the pipe.

C. BEDDING FOR FLEXIBLE PIPE

Above the foundation material, if any, Gravel Backfill for pipe bedding, as specified in Section 02700, shall be placed in lifts of approximately 8 inches up to a point 12 inches above the pipe. This material shall be hand shoveled in place and carefully worked under and around the pipe.

D. BACKFILL FOR TRENCHES

Partial backfill to protect the pipe will be permitted immediately after the pipe has been properly laid in accordance with the Plans and these Specifications. Complete backfilling of trenches will not be permitted until the section of pipe installed has been inspected by the Engineer.

From the point 12 inches above the top of the pipe barrel, the backfill material to be used in the trench section shall be Bank Run Gravel, as

specified in Section 02700, except where required or shown on the Plans to use other material. The Contractor shall place backfill in horizontal lifts not to exceed 8 inches in thickness. All backfill shall be free of large rocks, organic matter, stumps, trees, pieces of pavement, broken concrete and other deleterious substances.

The Contractor shall remedy, at their expense, any defects that appear in the backfill prior to final acceptance of the work. Cleanup operations shall progress immediately behind backfilling to accommodate the return to normal use of the trench area.

During placement of the initial lifts, the backfill material shall not be bulldozed into the trench or dropped directly over the pipe with less than 3 feet of backfill material above the top of the pipe.

### **3.5 ROCK EXCAVATION**

It is not anticipated that solid rock will be encountered. Should such material be encountered, however, it will be paid for change order as directed by the Engineer and approved by the Owner. Boulders or broken rock less than 2 cubic yards in volume as measured in the field by the Engineer, will not be classified as rock, nor will so-called "hard-pan" or cemented gravel, even though it may be advantageous to use explosives in its removal if blasting were allowed. For the purpose of this contract, rock excavation shall be defined as mineral matter in place and of such hardness and texture that, when it is encountered, cannot be loosened by three passes of a ripper tooth mounted on the larger of a tracked backhoe of at least 25,000 pounds operating weight and 75 horsepower or the largest backhoe being utilized on the job by the Contractor. Where rocks occur as boulders that are smaller than the larger of: (1) 2 cubic yards in volume, or (2) the volume that can be readily handled by the largest backhoe being utilized on the job by the Contractor, they shall be considered incidental to excavation.

Where removal of a boulder results in a void below the desired elevation of the intended excavation, backfilling of the void shall be handled in the same manner as the replacement of unsuitable excavated material.

### **3.6 REUSE AND DISPOSAL OF EXCAVATED MATERIAL**

No material is anticipated to be reused on this project. Excavated materials shall be hauled to an approved waste site(s), as selected by the Contractor. The Contractor shall submit a list of approved waste haul site(s) to the Owner prior to the commencement of hauling of waste materials. Any permits required for waste haul and disposal shall be the responsibility of the Contractor.

### **3.7 FINAL SITE GRADING**

The site shall be graded consistent with the elevations shown on the Plans. The slopes between elevations shall be uniform or as shown on the Plans. Excavations and backfill shall be to the elevations required for the placement of all surface restorations, such as asphalt, concrete, gravel surfacing, or landscaping. All areas shall be graded to provide proper drainage. The final ground surface shall be smooth, raked free of debris and stones, and prepared for restoration as specified in Section 02900.

### **3.8 STRUCTURE COMPACTION**

The foundation gravel material placed underneath all structures shall be moisture conditioned to within 3 percent of optimum moisture content and shall be placed in loose, horizontal layers. The thickness of layers placed before compaction shall not exceed 8 inches for heavy equipment compactors and shall not exceed 4 inches for hand-operated mechanical compactors. Water settlement is not allowed for compaction.

Layers shall be compacted to a dense state equaling at least 95 percent of the maximum dry density, using the Modified Proctor, per ASTM D1557. Prior to the placement of fill below structures, any and all groundwater and surface water shall be drained or pumped from areas to be filled.

Wall backfill material shall be compacted to at least 90 percent of the maximum dry density, using the Modified Proctor, per ASTM D1557 within 5 feet of all walls and shall be compacted to at least 95 percent of the maximum dry density, using the Modified Proctor, per ASTM D1557 beyond 5 feet of all walls. Any and all compaction within 5 feet of all walls shall be accomplished by means of hand-operated mechanical equipment rather than heavy equipment compactors.

### **3.9 TRENCH COMPACTION**

Trench backfill materials shall be moisture conditions to within three percent of optimum moisture content. Water settlement is not allowed for compaction.

Pipe bedding materials, for both rigid and flexible pipes, shall be compacted to at least 95 percent of the maximum dry density, using the Modified Proctor, per ASTM D1557.

Compaction of the backfill above the bedding material in all trenches in non-structural and non-paved areas shall be performed by using mechanical equipment to at least 90 percent of the maximum dry density, using the Modified Proctor, per ASTM D1557.

Compaction of the backfill above the bedding material in all trenches in structural or paved areas shall be performed by using mechanical equipment to at least 95 percent of the maximum dry density, using the Modified Proctor, per ASTM D1557.

**\*\*\* END OF SECTION \*\*\***

## SECTION 02305

### WET WEATHER EARTHWORK

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the procedures to be followed if earthwork is to be accomplished in wet weather or in wet conditions where control of soil moisture is difficult.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
Sec. 4	Measurement and Payment
01300	Submittals
02300	Earthwork
Sec. 10.4	Erosion Control
02700	Gravel Materials

#### PART 2 PRODUCTS

The size or type of construction equipment shall be selected as required to prevent soil disturbance. In some instances, it may be necessary to limit equipment size or to excavate soils with a backhoe, Gradall, or equivalent type of equipment to minimize subgrade disturbance caused by construction traffic.

Material used as structural fill during wet weather earthwork shall generally consist of clean granular material containing less than 5 percent fines (material passing the U.S. Standard No. 200 sieve), based on wet sieving the fraction passing the 3/4-inch sieve. The fines shall be non-plastic.

#### PART 3 EXECUTION

##### 3.1 WET WEATHER EXCAVATION AND FILL PLACEMENT QUALITY CONTROL

Excavation and placement of fill or backfill material will be observed on a full-time basis by the Owner, to determine that all work is being accomplished in accordance with these Specifications.

### **3.2 WET WEATHER EARTHWORK PROTECTION**

The ground surface shall be sloped away from construction areas to promote the rapid runoff of precipitation and prevent ponding of water.

Earthwork shall be accomplished in small sections to minimize exposure to wet weather. Excavation or the removal of unsuitable soil shall be followed immediately by the placement and compaction of a suitable thickness (generally 8 inches or more if approved by the Owner) of clean foundation gravel.

No soil shall be left uncompacted and exposed to moisture. A smooth drum vibratory roller, or equivalent, shall be used to seal the ground surface after placement of fill or backfill materials.

All wet weather work shall meet local, state and federal codes as specified herein and as indicated on the Plans.

**\*\*\* END OF SECTION \*\*\***

## **SECTION 02370**

### **EROSION CONTROL**

#### **PART 1 GENERAL**

##### **1.1 SCOPE**

The work specified in this Section includes the temporary erosion and sedimentation control (TESC) in and around the site caused by the actions of the Contractor as shown on the Plans and as specified herein.

Work under this Section shall be directed towards site areas disturbed during construction as well as all off-site storage and parking areas maintained by the Contractor.

##### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

<u>Section</u>	<u>Item</u>
01160	Regulatory Requirements
01200	Measurement and Payment
01300	Submittals
02240	Dewatering
02300	Earthwork

##### **1.3 SUBMITTALS**

A. Stormwater Pollution Prevention Plan (SWPPP)

A SWPPP shall be prepared by the CESCL for the project and submittal in accordance with Section 01300 and paragraph 1.5 of this specification section. The SWPPP shall be submitted to the Owner for approval at the preconstruction conference.

##### **1.4 CERTIFIED EROSION AND SEDIMENT CONTROL LEAD (CESCL)**

The Contractor shall designate a Certified Erosion and Sediment Control Lead (CESCL) for this project. The CESCL shall have, for the life of this Contract, a current Certificate of Training in Construction Site Erosion and Spill Control signed by the WSDOT Water Quality Program Manager.

Duties of the CESCL shall include, but are not limited to:

- A. Inspecting temporary erosion and spill control Best Management Practice (BMPs) for proper location, installation, maintenance, and repair. Inspections shall be made as noted on the Plans and after each significant precipitation event, including those that occur during weekends and after working hours. A Temporary Erosion and Spill Control Inspection Report shall be prepared for each inspection and shall be included in the Temporary Erosion and Spill Control file. The inspection report shall include, but not be limited to:
  - 1. When BMPs are installed, removed or changed;
  - 2. Repairs needed or made;
  - 3. Turbidity monitoring results;
  - 4. Observations of BMP effectiveness and proper placement;
  - 5. Recommendations for improving performance of BMPs.
  
- B. Prepare and maintain a Temporary Erosion and Spill Control file on site that includes but is not limited to:
  - 1. Temporary Erosion and Spill Control Inspection Reports;
  - 2. Contractor's Stormwater Pollution Prevention Plan (SWPPP);
  - 3. Spill Prevention, Control, and Countermeasures (SPCC) Plan;
  - 4. All project permits, including but not limited to grading permits and Hydraulics Project Approval;
  - 5. Manufacturer instructions for all products used for TESC BMPs;
  - 6. Washington State Department of Ecology's Stormwater Management Manual for Western Washington, Chapter 4, Volume II, current edition.

## **1.5 STORMWATER POLLUTION PREVENTION PLAN**

The CESCL Contractor shall be responsible for preparing a Stormwater Pollution Prevention Plan (SWPPP). The intent of the SWPPP is to reflect the Contractor's operations by supplementing the TESC Drawings, details, and notes shown on the Plans to provide comprehensive pollution control at the construction site, staging



areas, stockpiles, and borrow sites. The SWPPP shall be prepared by the CESCL for the project and submittal in accordance with Section 01300. The SWPPP shall be submitted to the Owner for approval at the preconstruction conference. No work shall begin until the Contractor's SWPPP, as approved by the Owner, is implemented. The SWPPP shall address, at least, the following items:

- Identification of construction haul routes and location of BMPs (e.g., stabilized construction entrance, silt fences, storm drain inlet protection).
- Waste disposal methods and locations.
- Detailed construction sequence and schedule, including identifying dates scheduled for BMP installation, removal, clearing, grading, seeding, and landscaping.
- Details for any temporary flow diversions, dewatering systems, and BMPs (in accordance with the current edition of the Washington State Department of Ecology's Stormwater Management Manual for Western Washington) proposed by the Contractor.
- Calculations for temporary sedimentation ponds, if used
- A list of products to be used, including Material Safety Data Sheets.
- Identification of stockpile and staging areas, and BMPs to be implemented at these locations.

The SWPPP shall be prepared in accordance with details shown on the Plans, these Specifications, and Chapter 4, Volume II Chapter 7 – BMPs from the current edition of the Washington State Department of Ecology's Stormwater Management Manual for Western Washington, which are hereby referenced and made a part of the Contract Documents. Only those sections of the Stormwater Management Manual for Western Washington that address preparation, implementation, and maintenance of permanent and temporary erosion and sedimentation control BMPs are applicable.

The SWPP shall include best management practices to control windblown dust.

## **PART 2 PRODUCTS**

### **2.1 SILT FENCES**

Silt fences shall conform to the details shown on the Plans and the fabric shall conform meet the requirements of Geotextile for Temporary Silt Fence of Section 9-33 of the WSDOT Standard Specifications.

### **2.2 STORM DRAIN INLET (CATCH BASIN) PROTECTION**

Storm drain inlet protection shall be with a “silt sack,” as manufactured by ACF Environmental or equal.

### **2.3 EROSION CONTROL BLANKET**

On all disturbed slopes steeper than 2H:1V, an erosion control blanket shall be placed and secured per manufacturer’s recommendation with a biodegradable means.

The erosion control blanket shall be temporary, biodegradable and is to remain in place.

The erosion control blanket shall be “Biomac C” as manufactured by MacCafferri, Inc. or “Curlex II,” as manufactured by American Excelsior Co., or Equal.

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

Site preparation work shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture or other unsatisfactory conditions prevail, the work shall be stopped.

### **3.2 BEST MANAGEMENT PRACTICES (BMPS)**

Silt fences shall be constructed to control erosion and migration of soils disturbed during construction. The fences and dams shall provide temporary protection and shall be removed only upon approval of the Owner.

All areas or drainage ways downstream of the construction site shall have Best Management Practices (BMPs) installed prior to the beginning of any clearing activities. Runoff from cleared or disturbed area shall be directed through the BMPs. Disturbed ground shall be stabilized at the end of each work day. Permanent soil stabilization and erosion and sedimentation control shall be implemented upon reaching finish grade. Slope protection shall be immediately

implemented upon any soils showing signs of erosion. This shall be done in a manner approved by the Owner.

All BMPs shall be inspected, maintained and kept in a condition sufficient to provide effective erosion and sedimentation control at all times. The site shall be inspected to ensure the BMPs are properly located, constructed and operating as designed during the first storm. Any necessary adjustments or repairs shall be made immediately and be approved by the Owner. The BMPs shall be inspected thereafter as noted on the Plans and after all significant storm events. Turbidity monitoring will be held on a weekly basis at a minimum, or more frequently if necessary as determined by the CESCL.

All BMPs shall be removed no later than 30 consecutive calendar days after final site stabilization has been achieved as determined by the Owner. BMPs such as storm drain inlet protection, straw bales, silt fences and supports and plastic coverings shall be removed and properly disposed of offsite by the Contractor. Areas disturbed by removal of these BMPs shall be immediately stabilized in a manner approved by the Owner.

**\*\*\* END OF SECTION \*\*\***

## SECTION 02500

### WATER DISTRIBUTION

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes buried water pipe including pipeline penetrations the building floor, valves, hydrants, blowoffs, fittings and accessories described herein and as required for a complete installation as shown on the Plans.

Process piping and valves inside of Buildings and used for process or system control functions are specified in Section 15050 and 15100.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
01400	Quality Control
02240	Dewatering
02250	Temporary Shoring and Bracing
02300	Earthwork
02511	Connection to Existing System
02510	Disinfection
02300	Earthwork
15050	Piping Systems
15100	Valves

#### PART 2 PRODUCTS

##### 2.1 GENERAL

Pipe sizes are nominal inside diameter unless otherwise noted.

All materials delivered to the job site shall be new, free from defects, and marked to identify the material, class, and other appropriate data such as thickness for piping.

Acceptance of materials shall be subject to strength and quality testing in addition to inspection of the complete product. Acceptance of installed piping systems shall be based on inspection and leakage tests as specified in Part 3 of this Section.

All water piping shall be certified under NSF 61 for potable water use.

## **2.2 DUCTILE IRON PIPE**

All ductile iron water pipe shall be delivered to the site with the ends wrapped or with pipe plugs and these shall remain in place until the pipe is installed in the trench.

Ductile iron pipe shall be centrifugal cast pipe conforming to AWWA C151, Class 52, unless otherwise noted. The exterior shall be bituminous coated and the interior cement mortar lined in accordance with, AWWA C104, lined to a minimum thickness of 1/16-inch meeting NSF standards for potable water. Ductile iron pipe for fire hydrant assemblies shall be Class 53. All flanged spools shall be Class 53.

Each length shall be plainly marked with the manufacturer's identification, year, cast, thickness, class of pipe and weight. The pipe shall be furnished with mechanical joint or push-on joint, except where plans call for flanged ends.

Mechanical joints shall comply with AWWA C111. Flanges shall comply with ANSI B16.1, Class 125. Flange gaskets shall be full face.

Fittings shall be short-bodied, ductile iron and shall comply with AWWA C110 or AWWA C153, bituminous-coated exterior and cement mortar lined, 350-psi minimum pressure.

All pipe and/or fittings shall be provided with restrained joints.

Mechanical Joint restrainer shall utilize the full circumference of the pipe for restraining and utilize standard MJ gasket and bolts. The mechanical joint restraint device shall have a working pressure of at least 350 psi with a minimum safety factor of 2:1. The restrainer shall be Grip Ring as manufactured by Romac Industries, Mega-Lug, EBAA Iron, Inc., or equal.

Restrained joint pipe shall be push-on joint pipe with FIELD LOK 350® or TR FLEX® gaskets as furnished by U.S. Pipe, or equal.

All bolts, buried and unburied, shall be coated with an NSF-61 approved anti-seize compound, SAF-T-EZE, or equal, prior to installation.

## **2.3 MISCELLANEOUS FITTINGS**

### **A. FLANGED COUPLING ADAPTERS**

Flanged coupling adapters shall be Smith-Blair Type 912 Dresser Style 127, or equal.

### **B. ADAPTER FLANGES**

Adapter flanges for ductile iron pipe shall be manufactured of high strength ductile iron, ASTM A536, Grade 65-45-12. Flange dimensions shall be in accordance with ANSI B16.1, 125-pound pattern. Gasket shall be Buna-N. Setscrews shall be AISI 4140, high strength, low alloy steel. The adapter flanges shall be Uni-Flange Series 400, or equal.

### **C. RESTRAINED FLANGED COUPLING ADAPTERS**

Restrained flanged coupling adapters shall comply with AWWA C219 and shall be manufactured of high-strength ductile iron, ASTM A536, Grade 64-45-12. Gaskets shall be compounded for water service in accordance with ASTM D2000. Restrained flanged coupling adapters shall be Smith-Blair Type 911, Romac RFCA, or equal.

### **D. DIELECTRIC INSULATED UNIONS**

Dielectric insulated unions shall be used to connect dissimilar metals. They shall separate the metals so that the passage of more than one percent of the galvanic current, which would exist with metal to metal contact, is prevented. Unions shall be of the same material as the pipe to which attached, and pressure and temperature ratings shall be no lower than that of the piping system in which it is installed.

### **E. SHACKLE RODS**

Shackle rods shall be 36 KSI 3/4-inch diameter steel threaded rod per ATSM F1554, Grade 36. Shackle rod restraints equally spaced around the circumference of the pipe over the length of piping as shown. Shackle rods shall be fastened at mechanical joint fittings with 3/4-inch 90° eye bolt meeting AWWA C111 and minimum yield strength of 45 KSI per ASTM A588, Grade A.

## **2.4 GATE VALVES**

Gate valves shall be ductile iron body valves with resilient wedge conforming to the latest revision of AWWA Standard C515 and shall be NSF 61 approved. Valves shall have epoxy coating fusion bonded to all internal and external surfaces of the valve body and bonnet in compliance with AWWA C550. The wedge shall be fully encapsulated in rubber. The valves shall be non-rising stem, open to the left, equipped with standard 2-inch square operating nuts and O-ring seals at all joints. Minimum working pressure shall be 350 psi. Resilient wedge gate valves shall be American Flow Control Series 3500, Mueller 2360 series, Kennedy, or approved equal.

## **2.5 BUTTERFLY VALVES**

Butterfly valves shall be ductile iron body of the tight closing rubber seat type with rubber seat either bonded to the body or mechanically retained in the body with no fasteners or retaining hardware in the flow stream. The valves shall be epoxy coated inside and outside. The valves shall meet the full requirements of AWWA C504, class 150 B, except the valves shall be able to withstand 200 psi differential pressure without leakage. The valves shall be equal to Pratt “Groundhog” or Mueller Lineseal III.

Butterfly valves to be installed underground shall have sealed mechanical operators and 2-inch standard square operating nuts. Complete manufacturer’s Specifications for the valves proposed for use shall be submitted to the District for approval.

## **2.6 VALVE BOXES**

Valve boxes shall be two-piece, cast iron, East Jordan Iron Works:

- Valve box cover, 06800209
- Valve box top, 85557016U
- Valve box bottom, 85556036U

## **2.7 FIRE HYDRANTS**

Fire hydrants shall conform to AWWA Standard Specification C502 and be one of the following types:

- Mueller Super Centurion
- American Darling B-62-B
- Clow Medallion
- M&H 129 or 129S
- East Jordan Iron Works WaterMaster 5CD250

They shall be a rising stem compression-type which opens counterclockwise and closes with the pressure. The minimum main valve opening diameter shall be 5-1/4-inch unless otherwise specified. The hydrant seat and hydrant seat retaining ring shall be bronze. All external bolts, nuts and studs shall be cadmium plated in accordance with ASTM A165 Type HS or rust proofed by some other process approved by the District. Gaskets shall be of rubber composition.

Fire hydrants shall be equipped with one 4-inch pumper nozzle connection (Seattle Standard Thread) with Storz Adapter (integral or non-integral) as required by those jurisdictions shown on the Standard Details. The hydrant shall include two 2-1/2-inch NST hose ports. Pentagon nuts or caps and operating stem shall measure 1-1/4-inch point to flat and shall open by turning to the left. Nozzle shall be fitted with renewable bronze nipples locked in place. Fire hydrants shall be set plumb and ports shall be oriented as directed by the Fire Protection District having jurisdiction over said area.

Fire hydrant piping from the main line valve to the hydrant base shall be restrained joint pipe or shall be restrained with stainless steel shackle rods and nuts.

The hydrants shall be coated with enamel paint in accordance with the Standard Details.

See the Standard Detail for additional requirements.

## **2.8 TRACER WIRE**

All water mains and water services installed shall have blue 14-gauge solid copper wire with polyethylene insulation. Wire shall be placed in the trench on top of the water main and the ends brought into the valve boxes, per the Standard Detail. Tracer wire shall also be wrapped around the water service line and brought up into the meter box. All connections or splicing shall be made with District approved split-bolt wire connectors.

## **PART 3 INSTALLATION**

### **3.1 PIPE HANDLING**

All types of pipe shall be handled in a manner that will prevent damage to the pipe, pipe lining, or coating.

Pipe and fittings shall be loaded and unloaded using hoists and slings in a manner to avoid shock or damage, and under no circumstances shall they be dropped, skidded, or rolled against other pipe. If any part of the coating or lining is



damaged, repair thereof shall be made by the Contractor at no additional expense to the Owner and in a manner satisfactory to the Owner. Damaged pipe shall be rejected, and the Contractor shall immediately place damaged pipe apart from the undamaged and shall remove the damaged pipe from the site within 24 hours. Methods of pipe handling and storage shall be corrected by the Contractor should the Owner determine that these methods are damaging to the pipe.

Pipe shall be stacked in such a manner as to prevent damage to the pipe, to prevent dirt and debris from entering the pipe, and to prevent any movement of the pipe. The bottom tiers of the stack shall be kept off the ground on timbers, rails, or other similar supports.

Pipe shall not be strung across driveways, in ditches, or in the construction zone without specific on-site Owner approval.

Valves and fittings shall be stored on pallets or similar materials to keep them off the ground and prevent dirt and debris from entering them.

### **3.2 EXCAVATION**

All earthwork, excavation, bedding, backfill and compaction shall meet the requirements of Section 02300.

### **3.3 DEWATERING**

Dewatering of excavations, if necessary, shall meet the requirements of Section 02240.

### **3.4 TEMPORARY SHORING AND BRACING**

Temporary shoring and bracing, including trench excavation safety systems, shall meet the requirements of Section 02250.

### **3.5 PIPE INSTALLATION (BELL AND SPIGOT)**

All bell and spigot connections shall be made up in strict compliance with the manufacturer's recommendations and all pipe manufacture and handling shall meet or exceed the AWWA recommended specifications, current revisions.

Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations, and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned, and relayed. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the Engineer to ensure cleanliness inside the pipe.

Pipe handling after the gasket has been affixed shall be carefully controlled to avoid disturbing the gasket and knocking it out of position, or loading it with dirt or other foreign material. Any gaskets so disturbed shall be removed, cleaned, relubricated if required, and replaced before the rejoining is attempted.

Care shall be taken to properly align the pipe before joints are entirely forced home. During insertion of the tongue or spigot, the pipe shall be partially supported by hand, sling or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.

Sufficient pressure shall be applied in making the joint to assure that it is home, as described in the installation instructions provided by the pipe manufacturer. Sufficient restraint shall be applied to the line to assure that joints once home are held so, until fill material under and alongside the pipe has been sufficiently compacted. Restrained joint pipe and fittings shall be installed in accordance with the manufacturer's recommendations to provide the degrees of flexibility in the joint following installation.

### **3.6 CUTTING PIPE**

Whenever it becomes necessary to cut a length of pipe, the cut shall be made by abrasive saw or by a special pipe cutter. Pipe ends shall be square with the longitudinal axis of the pipe and shall be reamed and otherwise smoothed so that good connections can be made. Oxyacetylene torch cutting of ductile iron pipe shall not be allowed.

The Contractor shall have the approval from the Owner and notification shall be given to the Owner before any pipe cutting on existing water mains will be allowed. The Contractor shall comply with all the conditions established by the Owner. The Contractor shall give the Owner a minimum notice of 48 hours before cutting any water main. No pipe cutting will be allowed on holidays or weekends, unless specifically agreed to by the Owner.

### **3.7 CONNECTION TO EXISTING SYSTEM**

Connection to existing system work shall be as specified in Section 02511.

The Owner shall notify (i.e., door hangers) all of the Owner's customers who will experience a scheduled service interruption. In order to provide adequate notice to customers, the Contractor shall provide the Owner 10 working days notice prior to a scheduled shut down. Shut downs shall not be scheduled on Mondays or Fridays.

### **3.8 CONCRETE THRUST BLOCKING**

Fittings shall be adequately “blocked” with poured-in-place concrete, poured within wooden forms shaped to establish a firm minimum bearing area, against an undisturbed earth wall as shown on the Plans. Timber blocking or dry blocking will not be permitted.

Concrete thrust and/or anchor blocking, as indicated on the Plans, shall be placed at bends, tees, dead ends, crossed, and as designated by the Engineer. Blocking shall be 3,000 psi concrete mix cast in place.

In special cases, precast thrust blocks may be allowed. Precast blocks shall require a stamped structural submittal and Engineer approval prior to installation.

All concrete thrust blocking configurations and sizes shall be per the Plans. The poured in place concrete thrust and/or anchor blocks shall be in place at least 24 hours before beginning the pressure test, to allow the concrete to set. Longer durations may be required to insure adequate curing has been established to conduct the necessary testing. All blocking dimensions shown on the Plans are considered as minimums with the ideal trench excavation results, and consideration shall be given to unusual circumstances, soil conditions, and topography.

All valves and all fittings requiring a concrete block shall first be covered with 4-mil Visqueen plastic sheets, before concrete is poured. At no time shall the concrete be allowed to cover joints, bolt heads, or nuts.

### **3.9 MECHANICAL JOINT PIPING**

Mechanical joint piping shall be installed in best trade practice with torque wrenches used to avoid overstressing bolts. Piping shall be installed using recommended procedures outlined in “Handbook of Cast Iron Pipe” as published by Cast Iron Research Association which in part requires that all contact surfaces of rubber seal with pipe be wire brushed, spigot be centrally located in bell. When tightening bolts, it is essential that the gland be brought up toward pipe flange evenly, maintaining approximately same distance between gland and face of flange at all points around socket.

### **3.10 VALVES**

All valves shall be inspected in the field to ensure proper working order before installation. Valves shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connecting ends furnished.

Valves shall have the interiors cleaned of all foreign matter and shall be inspected both in open and closed position prior to installation. Valves and valve boxes shall be set plumb.

All valves with operating nuts located more than 3-feet below finished grade shall be equipped with extension stems to bring the operating nut to within 18 inches of the finished grade. The extension stem of the length required to meet field conditions shall be a manufactured unit with a 1-inch-diameter mild steel rod. At the top of the extension stem there shall be a 2-inch standard operating nut complete with a centering flange.

### **3.11 VALVE BOXES**

The lower casting of the unit is installed first, in a manner as to be supported by a minimum backfill or by a Styrofoam collar not less than 2 inches in thickness. The casting shall not rest directly upon the body of the valve or upon the water main. Backfill shall be carefully tamped around the valve box to a distance of 3 feet on all sides or to the undisturbed face of the trench if it is closer. The cast iron valve box cover shall be set flush with the roadbed or finished paved surface.

The flared end of the valve box shall be set at the bottom elevation of the 2-inch operating nut to allow space for rocks to be moved laterally from the operation nut.

The valve box shall be placed over the valve or valve operator in such a manner that the valve box does not transmit shock or stress loads to the valve. The casting shall not rest directly upon the body of the valve or upon the water main.

The axis of the valve box shall be common with the projected axis of the valve stem. The tops of the adjustable valve boxes shall be set to the existing or established grade, whichever is applicable.

Valve boxes shall be set such that the slots in the boxes and/or ears in the valve box lid are in-line with the run of the pipe being installed.

In areas where the valve box is not in concrete or asphalt, a 24-inch-diameter by 4-inch cement concrete block shall be installed around the valve box at finished grade. The valve box shall be flush with the top, and centered.

### **3.12 HYDRANT ASSEMBLIES**

Hydrants shall be installed where shown on the Plans. In addition, a minimum 3-foot radius unobstructed working area shall be provided around all hydrants. The sidewalk flange shall be set 2 inches above finished grade.

All hydrants shall be set on concrete blocks as shown in the Plans. The hydrant barrel drain shall waste into a pit of porous gravel material situated at the base of the hydrant as shown on the Plans.

After installation, hydrants, auxiliary gate valves, and other appurtenances shall be subjected to a hydrostatic test and disinfection procedures as specified herein.

After all installation, flushing, and testing is complete, the exposed portion of the hydrant shall be field painted with two coats of paint following the manufacturer's recommendations. Paint shall be national standard yellow.

Any hydrant not in service shall be identified by covering with a burlap or plastic bag properly secured.

### **3.13 PRESSURE TESTING**

All pipelines shall be tested and disinfected prior to acceptance of work. All pumps, gauges, plugs, saddles, corporation stops, double check valve assemblies miscellaneous hose and piping, and measuring equipment necessary for performing the test shall be furnished, installed and operated by the Contractor. The Contractor shall provide an oil-filled pressure gauge with a range of 0 to 400 psi.

All temporary connection to the existing water lines for filling or flushing new pipe lines shall be equipped with double check valve assemblies to prevent backflow into the existing waterline.

Buried pipe shall be pressure tested prior to pouring facility foundation slab and shall include vertical pipe stub-outs that will penetrate the foundation slab. The pipeline shall be backfilled sufficiently to prevent movement of the pipe under pressure. All thrust blocks shall be in place and time allowed for the concrete to cure before testing.

All piping systems shall be tested to demonstrate leak tightness prior to acceptance. The Contractor shall provide all equipment and labor necessary to perform all testing required herein. Gauges used in testing shall be certified by an approved laboratory.

All water lines and appurtenances shall be tested at a pressure of 300 psi. Testing is to be done in sections between valves with no back pressure against the valves to ensure water tightness of the valves in either direction.

The pipeline shall be backfilled sufficiently to prevent movement of the pipe under pressure. All thrust blocks shall be in place for at least 24 hours to allow concrete to cure before testing.

Prior to the acceptance test, the lines shall be filled and allowed to stand under pressure for a sufficient length of time to allow the escape of entrapped air and to allow any pipe lining to absorb water.

Testing will be done by pumping up the line to 300 psi and closing a valve between the pump and the line. The line shall be pumped back up to 300 psi at 15-minute intervals. The test shall be conducted for a period of 2 hours. Due to the small volume of water required for the test, no leakage loss will be allowed.

All leaks shall be repaired or defective material replaced and the test repeated as directed by the Engineer.

The Contractor shall be responsible for repair of any damage resulting from or caused by leak testing.

### **3.14 FLUSHING**

Flushing shall be done through hydrants or temporary taps. Water for flushing will be available from the Owner's system.

The pipes shall be flushed at a minimum velocity of at least 2.5 fps for a sufficient time to insure a minimum of three turnovers of water through the pipe.

The Owner shall be responsible for all flushing and disposal of treated water. The Contractor shall provide the Owner with 10 working days notice to allow for scheduling and coordination of flushing activities.

### **3.15 WATER PIPE DISINFECTION**

Before pipelines are placed into service, the water mains and appurtenances shall be disinfected in accordance with AWWA C651 and in conformance with the requirements of the State of Washington Department of Health.

The Contractor shall install a Washington State approved double check valve type backflow prevention device to protect the potable water supply while filling, flushing, and disinfecting the water main.

Before being placed into service, all new and modified potable water pipe and appurtenances shall be sterilized and a satisfactory bacteriological report obtained in accordance with Section 7-09.3(24) of the WSDOT Standard Specifications, latest edition.

During the process of sterilizing, all valves, hydrants, and/or other appurtenances shall be operated to insure complete contact.

All closure fittings shall be swabbed with a very strong chlorine solution at least as strong as liquid household bleach (5 to 6 percent chlorine).

Following chlorination, all pipes shall be flushed to remove any solids until a test shows no more than 0.1 parts per million available chlorine. If no hydrant is installed at the end of the main, then a tap shall be provided large enough to develop a velocity of at least 2.5 fps in the main.

Before placing the lines into service, a satisfactory report shall be received from the local or state health department on samples collected from representative points in the new pipe after the 24-hour sterilization period has elapsed.

Should the initial treatment result in an unsatisfactory bacteriological test or should corrective work be required because of testing, then the chlorination procedure shall be repeated by the Contractor at his own expense until satisfactory results are obtained. These repeat procedures shall follow Section 7-09.3(24) of the WSDOT Standard Specifications, as appropriate and as necessary for the addition of chlorine. The cost of disposal of water used for disinfection shall be borne by the Contractor.

Only the Owner's staff will be allowed to operate existing and new tie-in valves. The Contractor's personnel are expressly forbidden to operate any valve on any section of line which is part of the Owner's potable water system.

**\*\*\* END OF SECTION \*\*\***







## SECTION 02530

### UTILITY STRUCTURES

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes precast concrete vaults, manholes, catch basins, castings, and steps for a complete installation as shown on the Plans and specified herein.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
02300	Earthwork
08310	Access Hatches

#### PART 2 PRODUCTS

##### 2.1 GENERAL

The exterior finish of all precast concrete utility structures shall be smooth with no imperfections larger than 1/8 inch in diameter. The interior finish of all precast concrete utility structures shall be smooth and sacked with non-shrink cementitious materials and epoxy bonding agent. No bug holes, fins, projections, or other defects are acceptable.

##### 2.2 PRECAST VAULTS

Precast concrete vaults shall be cast in an established precast yard. Precast vaults shall be designed for H-20 loads. Submit design calculations and shop drawings for review and approval prior to fabrication. Shop drawings shall detail wall thickness, concrete strength, reinforcing requirements, and shall include all appurtenances, such as access hatches, floor drains, and other items called for on the Plans.

All vaults shall be constructed with a minimum of 4-inch-thick solid walls.

The access hatches shall be as specified in Section 08310.

## **2.3 PRECAST CONCRETE CATCH BASINS**

Precast components shall conform to the requirements of ASTM C478. All Portland cement used in the manufacture of the precast sections shall conform to the requirements of ASTM C150 and shall be Type II or Type V.

Thickness of a Type 1 catch basin shall be 4 inches minimum and reinforced with welded wire fabric having a minimum area of 0.12 square inches per foot. Welded wire fabric shall comply with ASTM A497. “Knockouts” shall be free of welded wire fabric and provided on four sides to accommodate the pipe size, invert elevations, and direction as shown on the Plans.

Standard precast riser sections shall consist of rectangular sections to accommodate a Type 1 catch basin. Reinforcement shall be in accordance with ASTM C497. Minimum height of a riser section shall be 6 inches. The height of riser and base sections shall be arranged so no pipes pass through the joining surfaces.

Standard precast riser sections shall consist of circular sections in standard nominal inside diameter as shown on the Plans. Reinforcement shall be in accordance with ASTM C478. Minimum height of a riser section shall be 1 foot. The height of riser and base sections shall be arranged so no pipes pass through the joining surfaces.

Openings for pipe shall be circular, tapered toward the inside of the section, and shall be of the minimum size possible to accommodate the size of pipe to be inserted and to effectively seal the joint.

## **2.4 FRAMES AND GRATES**

Castings for catch basin and inlet frames shall be gray-iron conforming to the requirements of ASTM A48/AASHTO M105, Grade 30B. Grates or solid covers shall be ductile iron conforming to ASTM A536, Grade 80-55-06. All frames and grates or covers shall be of uniform quality, free from blowholes, porosity, shrinkage, distortion, cracks, or other defects. Repair of defects shall not be permitted. All mating surfaces shall be seated properly to prevent rocking of the grate/cover. The frames, grates, and covers shall have a design wheel load conforming to AASHTO/ASTM A16 design loading HS20-44.

The frames and grates/covers shall be made by East Jordan Iron Works, Olympic Foundry, Inc., D&L Foundry, or Neenah.

## **PART 3 EXECUTION**

### **3.1 PRECAST VAULTS**

Precast vaults shall be installed as shown on the Plans and in accordance with the manufacturer's recommendations.

### **3.2 CATCH BASINS**

Catch basin installation shall be as shown on the Plans. Precast sections with damaged joint surfaces or with cracks or damage that would permit infiltration shall not be installed.

Precast base sections shall be set on a prepared bedding material. Before the precast base is set, the gravel shall be carefully leveled to provide full bearing for the entire base slab.

The frame shall be set carefully to the established surface grade in a full bed of cement grout. The catch basin rim elevation shall be set flush with the pavement or improved areas.

### **3.3 FINAL ADJUSTMENT AND CLEANUP**

After installation is complete, the Contractor shall cleanout all precast structures prior to placing the new facilities into service. The adjustment of castings shall be done in a manner satisfactory to the Owner. Adjustment shall be done only with precast grade rings. Bricks are unacceptable. Grouting and final adjustment of castings shall be done with non-shrink grout.

**\*\*\* END OF SECTION \*\*\***

## SECTION 02534

### STORM SEWERS

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes pipe, fittings, and accessories described herein and as required to completely install storm sewers as shown on the Plans.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
01400	Quality Control
02240	Dewatering
02250	Temporary Shoring and Bracing
02300	Earthwork
02530	Utility Structures

#### PART 2 PRODUCTS

##### 2.1 GENERAL

All materials delivered to the job site shall be new, free from defects, and marked to identify the material, class, and other appropriate data such as thickness for piping.

Acceptance of materials shall be subject to strength and quality testing in addition to inspection of the complete product. Acceptance of installed piping systems shall be based on inspection and leakage tests as specified in Part 3 of this Section.

##### 2.2 PVC PIPE AND FITTINGS

Solid wall PVC storm sewer pipe and fittings shall comply with ASTM D3034, SDR 35 for pipe sizes up to 15 inches. Solid wall PVC storm sewer pipe and fittings shall comply with ASTM F 679 using a minimum pipe stiffness of 46 psi in accordance with Table 1 for pipe sizes from 18 inches to 48 inches. Pipe and fittings shall be furnished with bells and spigots, which are integral with the pipe wall and with a rubber gasket securely locked in place in the bell. Pipe joints

shall conform to ASTM D3212 using flexible elastomeric gaskets conforming to ASTM F477.

### **2.3 CORRUGATED POLYETHYLENE PIPE**

Corrugated polyethylene pipe (CPEP) and fittings shall conform to the requirements of AASHTO M-252 and AASHTO M-294, Type S. Fittings shall be as shown on the Plans and as required to provide a complete piping system and meet the same requirements as the CPEP.

### **2.4 CALDER-TYPE FLEXIBLE COUPLINGS**

Flexible couplings shall be Calder-type where specifically indicated on the Plans. Calder-type flexible couplings shall consist of all elastomeric PVC sleeve secured to the pipes with stainless steel clamping bands. Adapter couplings shall be furnished for transitions between piping of different outside diameters as necessary.

Calder-type flexible couplings shall be as manufactured by Calder Co., Fernco, Romac 501, or equal.

## **PART 3 INSTALLATION**

### **3.1 PIPE HANDLING**

All types of pipe shall be handled in a manner that will prevent damage to the pipe.

Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations, and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned, and relayed. A clean whiskbroom shall be used for this purpose and for brushing to remove foreign matter prior to joining of pipe ends. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the Owner to ensure cleanliness inside the pipe.

Pipe shall be stacked in such a manner as to prevent damage to the pipe, to prevent dirt and debris from entering the pipe, and to prevent any movement of the pipe. The bottom tiers of the stack shall be kept off the ground on timbers, rails, or other similar supports.

### **3.2 DEWATERING**

Dewatering of excavations, if necessary, shall meet the requirements of Section 02240.

### **3.3 EXCAVATION**

All earthwork, excavation, bedding, backfill and compaction shall meet the requirements of Section 02300.

### **3.4 TEMPORARY SHORING AND BRACING**

Temporary shoring and bracing, including trench excavation safety systems, shall meet the requirements of Section 02250.

### **3.5 BELL AND SPIGOT PIPING**

All bell and spigot connections shall be made up in strict compliance with the manufacturer's recommendations and all sewer pipe manufacture and handling shall meet or exceed the ASTM and SPAW recommended specifications.

Pipe handling after the gasket has been affixed shall be carefully controlled to avoid disturbing the gasket and knocking it out of position, or loading it with dirt or other foreign material. Any gaskets so disturbed shall be removed, cleaned, re-lubricated if required, and replaced before the rejoining is attempted.

Care shall be taken to properly align the pipe before joints are entirely forced home. During insertion of the tongue or spigot, the pipe shall be partially supported by hand, sling or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.

Sufficient pressure shall be applied in making the joint to assure that it is home, as described in the installation instruction provided by the pipe manufacturer. Sufficient restraint shall be applied to the line to assure that joints once home are held so, until fill material under and alongside the pipe has been sufficiently compacted.

### **3.6 CPEP PIPE JOINING**

CPEP piping shall be joined per the manufacturer's recommendations.

### **3.7 LOW PRESSURE AIR TEST**

Low pressure air tests shall be performed on all new storm sewers. The low pressure air test shall be per Section 7-04.3(1) of WSDOT Standard Specifications.

**\*\*\* END OF SECTION \*\*\***



## SECTION 02535

### SANITARY SEWERS

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes pipe, fittings, and accessories described herein and as required to completely install sanitary sewers and side sewers by open trench excavation as shown on the Plans.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
01400	Quality Control
02240	Dewatering
02250	Temporary Shoring and Bracing
02300	Earthwork
02530	Utility Structures
15050	Piping Systems

#### PART 2 PRODUCTS

##### 2.1 GENERAL

All materials delivered to the job site shall be new, free from defects, and marked to identify the material, class, and other appropriate data such as thickness for piping.

Acceptance of materials shall be subject to strength and quality testing in addition to inspection of the complete product. Acceptance of installed piping systems shall be based on inspection and leakage tests as specified in Part 3 of this Section.

##### 2.2 PVC SEWER PIPE AND FITTINGS (ASTM D3034)

All PVC pipe and fittings shall be integral wall bell and spigot, rubber gasket joint, unplasticized polyvinyl chloride (PVC) pipe in conformance with ASTM D3034 and shall have a maximum SDR of 35. PVC pipe shall have a minimum "pipe stiffness" of 46 psi at 5 percent deflection when tested in accordance with ASTM Designation D2412 and a minimum impact strength of 210 foot-pounds based upon ASTM D3034.

All pipes shall be clearly marked with the manufacturer's identification, year, and class of pipe.

All fittings and accessories shall be manufactured and furnished by the pipe supplier, or shall be District approved equal.

Pipe joints shall use flexible elastomeric gaskets conforming to ASTM D3212.

Connections for side sewer stubs shall be 6 inches inside diameter tee fittings. Wye branches shall be used where the sewer line size is less than 8-inch inside diameter.

### **2.3 SEWER CLEANOUTS**

Sewer cleanout rings, covers and accessories shall be as shown on the Plans.

## **PART 3 INSTALLATION**

### **3.1 PIPE HANDLING**

All types of pipe shall be handled in a manner that will prevent damage to the pipe.

Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations, and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned, and relayed. A clean whiskbroom shall be used for this purpose and for brushing to remove foreign matter prior to joining of pipe ends. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the Owner to ensure cleanliness inside the pipe.

Pipe shall be stacked in such a manner as to prevent damage to the pipe, to prevent dirt and debris from entering the pipe, and to prevent any movement of the pipe. The bottom tiers of the stack shall be kept off the ground on timbers, rails, or other similar supports.

### **3.2 SEWER PIPE INSTALLATION**

Unless specified otherwise, a 10-foot horizontal separation and an 18-inch vertical separation must be maintained between all sanitary sewer mains and water mains in accordance with the Department of Ecology criteria. Maximum distance between manholes shall not exceed 400', or as approved by the District.

A. PLUG(S) FOR EXISTING SYSTEM

The Contractor shall furnish and install a plug at the time the project is connected to the District's sewer system. The plug(s) must remain in position to prevent debris and water from entering the existing sewer system until such time as the sewer system within the project has been accepted by the District for maintenance and operation. A \$2,000.00 fine will be levied against the Contractor when a sewer mainline plug is removed at any time during the work. The Contractor will also be accountable for all expenses incurred to clean and flush sanitary sewer mainlines as a result of said plug removal.

B. PIPE LAYING

The sewer pipe, unless otherwise approved by the District, shall be installed upgrade from point of connection on the existing sewer or from a designated starting point to line and grade per approved plans. The sewer pipe shall be installed with the bell end forward or upgrade. When pipe laying is not in progress, the forward end of the pipe shall be kept tightly closed with an approved temporary plug.

3-inch wide, green metallic sewer detector tape shall be laid 24-inch above the pipe bedding, for the entire length of the sewer main between manholes.

Identification on the tape shall include the words "Sanitary Sewer."

C. PIPE JOINTING

All extensions, additions, and revisions to the sewer system, unless otherwise indicated, shall be made with sewer pipe joined by means of a flexible gasket which shall be fabricated and installed in accordance with these specifications.

All joints shall be made up in strict compliance with the manufacturer's directions and all sewer pipe manufacturing and handling shall meet or exceed the current revisions of the ASTM recommended specifications.

Pipe handling after the gasket has been affixed shall be carefully controlled to avoid disturbing the gasket and knocking it out of position or loading it with dirt or other foreign material. Any gaskets so disturbed shall be removed, cleaned, relubricated, if required, and replaced before the rejoining is attempted.

Care shall be taken to properly align the pipe before joints are entirely forced home. During insertion of the tongue or spigot, the pipe shall be partially supported by hand, sling, or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned.

Sufficient pressure shall be applied in making the joint to assure that it is home, as described in the installation instructions provided by the pipe manufacturer.

The maximum bend permissible at any one fitting shall not exceed 45°. Bends exceeding 45° with any combination of two fittings shall have a straight pipe of not less than 2 feet in length installed between such adjacent fittings, unless one of such fittings be a wye branch with a cleanout provided on the straight leg.

### **3.3 SEWER SERVICE OUTAGE AND REINSTATEMENT**

The Contractor shall coordinate all sewer interruption with North Utility District.

### **3.4 EXCAVATION**

All earthwork, excavation, bedding, backfill and compaction shall meet the requirements of Section 02300.

### **3.5 DEWATERING**

Dewatering of excavations, if necessary, shall meet the requirements of Section 02240.

### **3.6 TEMPORARY SHORING AND BRACING**

Temporary shoring and bracing, including trench excavation safety systems, shall meet the requirements of Section 02250.

### **3.7 TESTING**

Shall be performed per Northshore Utility District's 2023 Engineering Specifications, Methods of Construction section 10.7.

**\*\*\* END OF SECTION \*\*\***

## SECTION 02700

### GRAVEL MATERIALS

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the various types of granular materials that are to be used in trenches and other excavations as shown on the Plans and as specified herein.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
Sec. 4	Measurement and Payment
01300	Submittals
02300	Earthwork
02305	Wet Weather Earthwork

##### 1.3 SUBMITTALS

The Contractor shall provide certificates of laboratory tests in accordance with Section 01300, indicating particle size distribution for review for each type of granular material furnished and proctor test reports for all material to be placed as pipe bedding material, trench backfill, backfill under and around structures and underneath crushed surfacing and asphalt concrete pavements.

The certificates and proctor test reports shall be provided to the Owner at least 5 calendar days prior to placement.

#### PART 2 PRODUCTS

##### 2.1 FOUNDATION GRAVEL

Foundation gravel shall be Class A Gravel Backfill for Foundations in conformance with Section 9-03.12(1)A of the WSDOT Standard Specifications.

##### 2.2 GRAVEL BACKFILL FOR PIPE BEDDING

Gravel backfill for pipe bedding shall meet the requirements of Section 9-03.12(3) of the WSDOT Standard Specifications.

### **2.3 STRUCTURAL FILL**

Structural fill shall consist of clean, non-plastic, free-draining sand and gravel free from organic matter or other deleterious materials, in conformance with Section 9-03.14(1) of the WSDOT Standard Specifications. The material shall contain particles less than 4 inches maximum dimension with less than 7-percent passing the U.S. No. 200 size sieve.

During period of wet weather the allowable fines content of the structural fill materials shall be no more than 5 percent by weight passing the 0.75-inch sieve. Alternatively, crushed surfacing base course, in conformance with Section 9-03.9(3) of the WSDOT Standard Specifications may be used.

### **2.4 BANK RUN GRAVEL FOR TRENCH BACKFILL**

Bank run gravel for trench backfill shall be free from organic matter or other deleterious materials and in conformance with Section 9-03.19 of the WSDOT Standard Specifications.

### **2.5 GRAVEL BASE**

Provide gravel base in paved areas as backfill material as indicated on the Plans. Gravel base shall be in conformance with Section 9-03.10. The material shall contain particles of less than 4 inches maximum dimension, with less than 7 percent passing the U.S. No. 200 size sieve.

During period of wet weather the allowable fines content of the gravel base materials shall be no more than 5 percent passing the U.S. No. 200 size sieve.

### **2.6 GRAVEL BACKFILL FOR WALLS**

Gravel backfill for walls shall conform to Section 9-03.12(2) of the WSDOT Standard Specifications.

### **2.7 CRUSHED SURFACING**

Crushed surfacing base course and top course shall conform to Section 9-03.9(3) of the WSDOT Standard Specifications.

### **2.8 MISCELLANEOUS GRAVEL**

If the Plans call for a gravel that is not herein specified than the gravel shall conform to the type of gravel called for as per the WSDOT Specifications.

## **PART 3 EXECUTION**

### **3.1 FOUNDATION GRAVEL**

Foundation gravel shall be placed and compacted underneath all structures to a minimum depth of 12 inches unless indicated otherwise on the Plans, and to a greater depth where foundations are unstable and excess suitable excavated material is unavailable to stabilize such foundations.

In the event the Contractor unnecessarily overexcavates the pipe trench or structure foundation, or if the width of the pipe trench becomes wider than the pay limit shown on the Plans, all material so placed shall be at the Contractor's sole expense.

### **3.2 GRAVEL BACKFILL FOR PIPE BEDDING**

Bedding material shall be placed simultaneously on both sides of the pipe for the full width of the trench in lifts not exceeding 6 inches. To assure uniform support, the material shall be carefully worked underneath the pipe haunches with a tool capable of preventing the formation of void spaces around the pipe. In the event the Contractor overexcavates the pipe trench, or if the width of the pipe trench becomes wider than the pay limit shown on the Plans, all material so placed shall be at the Contractor's sole expense.

### **3.3 STRUCTURAL FILL**

Provide structural fill as shown on the Plans or where excavated material is unsuitable as directed by the Engineer. Structural fill shall be installed in lifts not to exceed 8 to 10 inches maximum thickness. Structural fill placed under structures shall be compacted to at least 95 percent of the maximum dry density as determined by the modified Proctor, per ASTM D1557.

### **3.4 BANK RUN GRAVEL FOR TRENCH BACKFILL**

Bank run gravel for trench backfill shall be used where excavated material is unsuitable or unavailable for the backfill of trenches as approved by the Owner.

In the event the Contractor overexcavates the pipe trench, or if the width of the pipe trench becomes wider than the pay limit shown on the Plans, all material so placed shall be at the Contractor's sole expense.

### **3.5 GRAVEL BORROW**

Gravel borrow shall be used where excavated material is unsuitable or unavailable for the bedding of trenches for rigid pipe as approved by the Owner.

### **3.6 GRAVEL BASE**

Gravel base shall be used where excavated material is unsuitable or unavailable for the backfill of trenches, around manholes, vaults and structures, as approved by the Engineer, as shown on the Plans and as specified herein.

### **3.7 GRAVEL BACKFILL FOR WALLS**

Gravel backfill for walls shall be used where excavated materials are unsuitable for backfilling around the walls of structures, as approved by the Owner, as shown on the Plans and specified in these specifications.

### **3.8 CRUSHED SURFACING**

Crushed surfacing base course and/or top course shall be placed underneath asphalt paving, to the lines and grades shown on the Plans or as required by the Plans and shall be compacted to a dense, unyielding state of at least 95 percent of the maximum dry density, using the modified Proctor, per ASTM D1557.

### **3.9 MISCELLANEOUS GRAVEL**

Miscellaneous gravel shall be installed per the Plans.

**\*\*\* END OF SECTION \*\*\***



## SECTION 02740

### HOT MIX ASPHALT

#### PART 1 GENERAL

##### 1.1 SCOPE

The work in this section shall be accomplished in accordance with the Standard Specifications for Road, Bridge and Municipal Construction, 2018 edition, as issued by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA), Washington State Chapter (hereafter "Standard Specifications"). Delete section 5-04 of the Standard Specifications, with the exception of 5-04.2(1), and replace it with the following:

The work specified in this Section includes providing and placing one or more layers of plant-mixed hot mix asphalt (HMA) on a prepared foundation or base in accordance with these Specifications and the lines, grades, thicknesses, and typical cross-sections shown in the Plans. The manufacture of HMA may include warm mix asphalt (WMA) processes in accordance with these Specifications. WMA processes include organic additives, chemical additives, and foaming.

This work also consists of adjusting castings to grade, furnishing and installing temporary HMA per the details in the Contract Plans.

The Work shall also consist of one or more courses of asphalt treated base (ATB) placed on the Subgrade in accordance with these Specifications and in conformity with the lines, grades, thicknesses, and typical cross-sections shown in the Plans or as staked.

HMA shall be composed of asphalt binder and mineral materials as may be required, mixed in the proportions specified to provide a homogeneous, stable, and workable mixture.

ATB shall be composed of a compacted course of base material which has been weatherproofed and stabilized by treatment with an asphalt binder.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
01400	Quality Control
02300	Earthwork

Northshore Utility District

451 Zone Control Valve Facility and Control Valve Vault

G&O #18591

02740-1 – Hot Mix Asphalt and  
Asphalt Treated Base Paving

<u>Section</u>	<u>Item</u>
02530	Utility Structures
02700	Gravel Materials

### 1.3 SUBMITTALS

#### A. MIX DESIGN – OBTAINING PROJECT APPROVAL

##### 1. ESALs

The number of ESALs for the design and acceptance of the HMA shall be <0.3 million.

Commercial HMA shall be an HMA Cl. 1/2" PG 58H-22 design mix or HMA Cl. 3/8" PG 58H-22.

No paving shall begin prior to the approval of the mix design by the Engineer.

**Nonstatistical evaluation** will be used for all HMA not designated as Commercial HMA in the contract documents.

**Commercial evaluation** will be used for Commercial HMA and for other classes of HMA in the following applications: sidewalks, road approaches, ditches, slopes, paths, trails, gores, prelevel, and pavement repair. Other nonstructural applications of HMA accepted by commercial evaluation shall be as approved by the Project Engineer. Sampling and testing of HMA mixture accepted by commercial evaluation will be at the option of the Project Engineer.

The Proposal quantity of HMA that is accepted by commercial evaluation will be excluded from the quantities used in the determination of nonstatistical evaluation.

**Nonstatistical Evaluation Mix Design.** Fifteen days prior to the first day of paving the contractor shall provide one of the following mix design verification certifications for Contracting Agency review:

- The WSDOT Mix Design Evaluation Report from the current WSDOT QPL, or one of the mix design verification certifications listed below.

- The proposed HMA mix design on WSDOT Form 350-042 with the seal and certification (stamp and signature) of a valid licensed Washington State Professional Engineer.
- The Mix Design Report for the proposed HMA mix design developed by a qualified City or County laboratory that is within 1 year of the approval date.

The mix design testing shall be performed by a lab accredited by a national authority such as Laboratory Accreditation Bureau, L-A-B for Construction Materials Testing, The Construction Materials Engineering Council (CMECs) ISO 17025 or AASHTO Accreditation Program (AAP) and shall supply evidence of participation in the AASHTO: resource proficiency sample program.

Mix designs for HMA accepted by Nonstatistical evaluation shall:

- Have the aggregate structure and asphalt binder content determined in accordance with WSDOT Standard Operating Procedure 732 and meet the requirements of Sections 9-03.8(2) of the Standard Specifications, except that Hamburg testing for ruts and stripping are at the discretion of the Engineer, and 9-03.8(6) of the Standard Specifications.
- Have anti-strip requirements, if any, for the proposed mix design determined in accordance with AASHTO T 283 or T 324, or based on historic anti-strip and aggregate source compatibility from previous WSDOT lab testing.

At the discretion of the Engineer, agencies may accept verified mix designs older than 12 months from the original verification date with a certification from the Contractor that the materials and sources are the same as those shown on the original mix design.

**Commercial Evaluation Mix Design** Approval of a mix design for “Commercial Evaluation” will be based on a review of a Mix Design from the current WSDOT QPL. At the discretion of the Engineer, agencies may accept verified mix designs older than 12 months from the original verification date with a certification from the Contractor that the materials and sources are the same as those shown on the original mix design. Testing of the HMA by the Contracting Agency for mix design approval is not required.

**Using Warm Mix Asphalt Processes.** The Contractor may elect to use additives that reduce the optimum mixing temperature or serve as a compaction aid for producing HMA. Additives include organic additives, chemical additives and foaming processes. The use of Additives is subject to the following:

- Do not use additives that reduce the mixing temperature more than allowed in subsection 3.3 F. in the production of mixtures.
- Before using additives, obtain the Engineer's approval using WSDOT Form 350-076 to describe the proposed additive and process.

## **PART 2 PRODUCTS**

### **2.1 VACANT**

### **2.2 HMA PAVEMENT**

HMA pavement, Commercial HMA, HMA Cl. 1/2" PG 58H-22 or HMA Cl. 3/8" PG 58H-22.

#### **A. MATERIALS**

Materials shall meet the requirements of the following sections of the Standard Specifications:

Asphalt Binder	9-02.1(4)
Cationic Emulsified Asphalt	9-02.1(6)
Anti-Stripping Additive	9-02.4
HMA Additive	9-02.5
Aggregates	9-03.8
Recycled Asphalt Pavement	9-03.8(3)B
Mineral Filler	9-03.8(5)
Recycled Material	9-03.21
Portland Cement	9-01
Sand	9-03.1(2).
(As noted in subsection 3.3D.1. for crack sealing)	
Joint Sealant	9-04.2
Foam Backer Rod	9-04.2(3)A

The Contract documents may establish that the various mineral materials required for the manufacture of HMA will be furnished in whole or in part by the Contracting Agency. If the documents do not establish the

furnishing of any of these mineral materials by the Contracting Agency, the Contractor shall be required to furnish such materials in the amounts required for the designated mix. Mineral materials include coarse and fine aggregates, and mineral filler.

The Contractor may choose to utilize recycled asphalt pavement (RAP) in the production of HMA. The RAP may be from pavements removed under the Contract, if any, or pavement material from an existing stockpile.

The Contractor may use up to 20 percent RAP by total weight of HMA. The asphalt content and gradation test data shall be reported to the Contracting Agency when submitting the mix design for approval on the QPL. The Contractor shall include the RAP as part of the mix design as defined in these Specifications.

The grade of asphalt binder shall be as required by the Contract. Blending of asphalt binder from different sources is not permitted.

The Contractor may only use warm mix asphalt (WMA) processes in the production of HMA with 20 percent or less RAP by total weight of HMA. The Contractor shall submit to the Engineer for approval the process that is proposed and how it will be used in the manufacture of HMA.

Production of aggregates shall comply with the requirements of Section 3-01 of the Standard Specifications.

Preparation of stockpile site, the stockpiling of aggregates, and the removal of aggregates from stockpiles shall comply with the requirements of Section 3-02 of the Standard Specifications.

## B. HMA TOLERANCES AND ADJUSTMENTS

### 1. Job Mix Formula (JFM) Tolerances

After the JMF is determined as required in subsection 3.6A. The constituents of the mixture at the time of acceptance shall conform to the following tolerances:

<b>Aggregate, percent passing</b>	<b>Nonstatistical Evaluation</b>	<b>Commercial Evaluation</b>
1", 3/4", 1/2", and 3/8" sieves	±6%	±8%
U.S. No. 4 sieve	±6%	±8%
U.S. No. 8 sieve	±6%	±8%
U.S. No. 200 sieve	±2.0%	±3.0%
Asphalt Binder	±0.5%	±0.7%

These tolerance limits constitute the allowable limits as described in Standard Specification Section 1-06.2. The tolerance limit for aggregate shall not exceed the limits of the control points section, except the tolerance limits for sieves designated as 100 percent passing will be 99-100. The tolerance limits on sieves shall only apply to sieves with control points.

### **2.3 TEMPORARY HMA**

Temporary HMA material shall meet the requirements for Commercial HMA.

## **PART 3 EXECUTION**

### **3.1 GENERAL**

Where paving occurs on a facility, the Contractor shall maintain access to the facility at all times. The Contractor shall provide 1-week notification to the Contracting Agency prior to paving and shall coordinate all work with the Contracting Agency to ensure their paving plan does not interfere with the Contracting Agency's on-going operations.

When paving occurs on a roadway open to traffic, the requirements of subsection 3.3B. apply.

The Contractor shall provide, place and maintain all temporary markings and signage as required to warn and direct facility traffic as necessary during their paving operations.

### **3.2 VACANT**

### 3.3 HMA PLACEMENT

#### A. WEATHER LIMITATIONS

Do not place HMA for wearing course on any Traveled Way beginning October 1<sup>st</sup> through March 31<sup>st</sup> of the following year without written concurrence from the Engineer.

Do not place HMA on any wet surface, or when the average surface temperatures are less than those specified below, or when weather conditions otherwise prevent the proper handling or finishing of the HMA.

#### Minimum Surface Temperature for Paving

Compacted Thickness (Feet)	Wearing Course	Other Courses
Less than 0.10	55 degrees F	45 degrees F
0.10 to .20	45 degrees F	35 degrees F
More than 0.20	35 degrees F	35 degrees F

#### B. PAVING UNDER TRAFFIC

When the Roadway being paved is open to traffic, the requirements of this Section shall apply.

The Contractor shall keep intersections open to traffic at all times except when paving the intersection or paving across the intersection. During such time, and provided that there has been an advance warning to the public, the intersection may be closed for the minimum time required to place and compact the mixture. In hot weather, the Engineer may require the application of water to the pavement to accelerate the finish rolling of the pavement and to shorten the time required before reopening to traffic.

Before closing an intersection, advance warning signs shall be placed and signs placed marking the detour or alternate route.

During paving operations, temporary pavement markings shall be maintained throughout the project. Temporary pavement markings shall be installed on the Roadway prior to opening to traffic. Temporary pavement markings shall be in accordance with Standard Specifications Section 8-23.

All costs in connection with performing the Work in accordance with these requirements shall be included in the unit Contract prices for the various Bid items involved in the Contract.

## C. EQUIPMENT

### 1. Mixing Plant

Plants used for the preparation of HMA shall conform to the following requirements:

#### a. Equipment for Preparation of Asphalt Binder

Tanks for the storage of asphalt binder shall be equipped to heat and hold the material at the required temperatures. The heating shall be accomplished by steam coils, electricity, or other approved means so that no flame shall be in contact with the storage tank. The circulating system for the asphalt binder shall be designed to ensure proper and continuous circulation during the operating period. A valve for the purpose of sampling the asphalt binder shall be placed in either the storage tank or in the supply line to the mixer.

#### b. Thermometric Equipment

An armored thermometer, capable of detecting temperature ranges expected in the HMA mix, shall be fixed in the asphalt binder feed line at a location near the charging valve at the mixer unit. The thermometer location shall be convenient and safe for access by Inspectors. The plant shall also be equipped with an approved dial-scale thermometer, a mercury actuated thermometer, an electric pyrometer, or another approved thermometric instrument placed at the discharge chute of the drier to automatically register or indicate the temperature of the heated aggregates. This device shall be in full view of the plant operator.

#### c. Heating of Asphalt Binder

The temperature of the asphalt binder shall not exceed the maximum recommended by the asphalt binder manufacturer nor shall it be below the minimum



temperature required to maintain the asphalt binder in a homogeneous state. The asphalt binder shall be heated in a manner that will avoid local variations in heating. The heating method shall provide a continuous supply of asphalt binder to the mixer at a uniform average temperature with no individual variations exceeding 25 degrees F. Also, when a WMA additive is included in the asphalt binder, the temperature of the asphalt binder shall not exceed the maximum recommended by the manufacturer of the WMA additive.

d. Sampling and Testing of Mineral Materials

The HMA plant shall be equipped with a mechanical sampler for the sampling of the mineral materials. The mechanical sampler shall meet the requirements of Standard Specification Section 1-05.6 for the crushing and screening operation. The Contractor shall provide for the setup and operation of the field testing facilities of the Contracting Agency as provided for in Standard Specifications Section 3-01.2(2).

e. Sampling HMA

The HMA plant shall provide for sampling HMA by one of the following methods:

- i. A mechanical sampling device attached to the HMA plant.
- ii. Platforms or devices to enable sampling from the hauling vehicle without entering the hauling vehicle.

2. Hauling Equipment

Trucks used for hauling HMA shall have tight, clean, smooth metal beds and shall have a cover of canvas or other suitable material of sufficient size to protect the mixture from adverse weather.

Whenever the weather conditions during the work shift include, or are forecast to include, precipitation or an air temperature less than 45 degrees F or when time from loading to unloading exceeds 30 minutes, the cover shall be securely attached to protect the HMA.

The Contractor shall provide an environmentally benign means to prevent the HMA mixture from adhering to the hauling equipment. Excess release agent shall be drained prior to filling hauling equipment with HMA. Petroleum derivatives or other coating material that contaminate or alter the characteristics of the HMA shall not be used. For live bed trucks, the conveyer shall be in operation during the process of applying the release agent.

### 3. Pavers

HMA pavers shall be self-contained, power-propelled units, provided with an internally heated vibratory screed and shall be capable of spreading and finishing courses of HMA plant mix material in lane widths required by the paving section shown in the Plans.

The HMA paver shall be in good condition and shall have the most current equipment available from the manufacturer for the prevention of segregation of the HMA mixture installed, in good condition, and in working order. The equipment certification shall list the make, model, and year of the paver and any equipment that has been retrofitted.

The screed shall be operated in accordance with the manufacturer's recommendations and shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, segregating, or gouging the mixture. A copy of the manufacturer's recommendations shall be provided upon request by the Contracting Agency. Extensions will be allowed provided they produce the same results, including ride, density, and surface texture as obtained by the primary screed. Extensions without augers and an internally heated vibratory screed shall not be used in the Traveled Way.

When specified in the Contract, reference lines for vertical control will be required. Lines shall be placed on both outer edges of the Traveled Way of each Roadway. Horizontal control utilizing the reference line will be permitted. The grade and slope for intermediate lanes shall be controlled automatically from reference lines or by means of a mat referencing device and a slope control device. When the finish of the grade prepared for paving is superior to the established tolerances and when, in the opinion of the Engineer, further improvement to the line, grade, cross-section,

and smoothness can best be achieved without the use of the reference line, a mat referencing device may be substituted for the reference line. Substitution of the device will be subject to the continued approval of the Engineer. A joint matcher may be used subject to the approval of the Engineer. The reference line may be removed after the completion of the first course of HMA when approved by the Engineer. Whenever the Engineer determines that any of these methods are failing to provide the necessary vertical control, the reference lines will be reinstalled by the Contractor.

The Contractor shall furnish and install all pins, brackets, tensioning devices, wire, and accessories necessary for satisfactory operation of the automatic control equipment.

If the paving machine in use is not providing the required finish, the Engineer may suspend Work as allowed by Standard Specification Section 1-08.6. Any cleaning or solvent type liquids spilled on the pavement shall be thoroughly removed before paving proceeds.

4. Material Transfer Device or Material Transfer Vehicle

A Material Transfer Device/Vehicle (MTD/V) shall only be used with the Engineer's approval, unless otherwise required by the contract.

Where an MTD/V is required by the contract, the Engineer may approve paving without an MTD/V, at the request of the Contractor. The Engineer will determine if an equitable adjustment in cost or time is due.

When used, the MTD/V shall mix the HMA after delivery by the hauling equipment and prior to laydown by the paving machine. Mixing of the HMA shall be sufficient to obtain a uniform temperature throughout the mixture. If a windrow elevator is used, the length of the windrow may be limited in urban areas or through intersections, at the discretion of the Engineer.

- a. To be approved for use, an MTV:
  - i. Shall be self-propelled vehicle, separate from the hauling vehicle or paver.

- ii. Shall not be connected to the hauling vehicle or paver.
  - iii. May accept HMA directly from the haul vehicle or pick up HMA from a windrow.
  - iv. Shall mix the HMA after delivery by the hauling equipment and prior to placement into the paving machine.
  - v. Shall mix the HMA sufficiently to obtain a uniform temperature throughout the mixture.
- b. To be approved for use, an MTD:
- i. Shall be positively connected to the paver.
  - ii. May accept HMA directly from the haul vehicle or pick up HMA from a windrow.
  - iii. Shall mix the HMA after delivery by the hauling equipment and prior to placement into the paving machine.
  - iv. Shall mix the HMA sufficiently to obtain a uniform temperature throughout the mixture.

## 5. Rollers

Rollers shall be of the steel wheel, vibratory, oscillatory, or pneumatic tire type, in good condition and capable of reversing without backlash. Operation of the roller shall be in accordance with the manufacturer's recommendations. When ordered by the Engineer for any roller planned for use on the project, the Contractor shall provide a copy of the manufacturer's recommendation for the use of that roller for compaction of HMA. The number and weight of rollers shall be sufficient to compact the mixture in compliance with the requirements of subsection 3.3J. The use of equipment that results in crushing of the aggregate will not be permitted. Rollers producing pickup, washboard, uneven compaction of the surface, displacement of the mixture or other undesirable results shall not be used.

#### D. PREPARATION OF TREATED SURFACES FOR HMA

A treated surface includes cement concrete, asphalt concrete, brick, seal coat, bituminous surface treatment and cement treated base. When the treated surface or old base is irregular, the Contractor shall bring it to a uniform grade and cross-section as shown on the Plans or approved by the Engineer.

Preleveling of uneven or broken treated surfaces over which HMA is to be placed may be accomplished by using an asphalt paver, a motor patrol grader, or by hand raking, as approved by the Engineer.

Compaction of preleveling HMA shall be to the satisfaction of the Engineer and may require the use of small steel wheel rollers, plate compactors, or pneumatic rollers to avoid bridging across preleveled areas by the compaction equipment. Equipment used for the compaction of preleveling HMA shall be approved by the Engineer.

Before construction of HMA on an existing paved surface, the entire surface of the pavement shall be clean. All fatty asphalt patches, grease drippings, and other objectionable matter shall be entirely removed from the existing pavement.

All treated surfaces over which HMA is to be placed shall be thoroughly cleaned of dust, soil, pavement grindings, and other foreign matter. All holes and small depressions shall be filled with an appropriate class of HMA. The surface of the patched area shall be leveled and compacted thoroughly. Prior to the application of tack coat, or paving, the condition of the surface shall be approved by the Engineer.

A tack coat of asphalt shall be applied to all treated surfaces on which any course of HMA is to be placed or abutted. Tack coat shall be uniformly applied to cover the treated surface with a thin film of residual asphalt free of streaks and bare spots at a rate between 0.02 and 0.10 gallons per square yard of retained asphalt. The rate of application shall be approved by the Engineer. A heavy application of tack coat shall be applied to all joints. For Roadways open to traffic, the application of tack coat shall be limited to surfaces that will be paved during the same working shift. The spreading equipment shall be equipped with a thermometer to indicate the temperature of the tack coat material.

Equipment shall not operate on tacked surfaces until the tack has broken and cured. If the Contractor's operation damages the tack coat it shall be repaired prior to placement of the HMA.

The tack coat shall be CSS-1, or CSS-1h emulsified asphalt. The CSS-1 and CSS-1h emulsified asphalt may be diluted once with water at a rate not to exceed one part water to one part emulsified asphalt. The tack coat shall have sufficient temperature such that it may be applied uniformly at the specified rate of application and shall not exceed the maximum temperature recommended by the emulsified asphalt manufacturer.

1. Crack Sealing

When the Proposal includes a pay item for crack sealing, seal all cracks 1/4 inch in width and greater.

a. Cleaning

Ensure that cracks are thoroughly clean, dry and free of all loose and foreign material when filling with crack sealant material. Use a hot compressed air lance to dry and warm the pavement surfaces within the crack immediately prior to filling a crack with the sealant material. Do not overheat pavement. Do not use direct flame dryers. Routing cracks is not required.

b. Sand Slurry

For cracks that are to be filled with sand slurry, thoroughly mix the components and pour the mixture into the cracks until full. Add additional CSS-1 cationic emulsified asphalt to the sand slurry as needed for workability to ensure the mixture will completely fill the cracks. Strike off the sand slurry flush with the existing pavement surface and allow the mixture to cure. Top off cracks that were not completely filled with additional sand slurry. Do not place the HMA overlay until the slurry has fully cured.

The sand slurry shall consist of approximately 20 percent CSS-1 emulsified asphalt, approximately 2 percent portland cement, water (if required), and the remainder clean Class 1 or 2 fine aggregate per Standard Specification Section 9-03.1(2). The components shall be thoroughly mixed and then poured into the cracks and joints until full. The following day, any cracks or joints that are not completely filled shall be topped off with additional sand slurry. After the sand slurry is placed, the filler shall be

struck off flush with the existing pavement surface and allowed to cure. The HMA overlay shall not be placed until the slurry has fully cured. The requirements of Standard Specification Section 1-06 will not apply to the portland cement and sand used in the sand slurry.

In areas where HMA will be placed, use sand slurry to fill the cracks.

In areas where HMA will not be placed, fill the cracks as follows:

- Cracks 1/4 inch to 1 inch in width – fill with hot pressure fed sealant.
- Cracks greater than 1 inch in width – fill with sand slurry.

c. Hot Pressure Fed Sealant

For cracks that are to be filled with hot poured sealant, apply the material in accordance with these requirements and the manufacturer's recommendations. Furnish a Type 1 Working Drawing of the manufacturer's product information and recommendations to the Engineer prior to the start of work, including the manufacturer's recommended heating time and temperatures, allowable storage time and temperatures after initial heating, allowable reheating criteria, and application temperature range. Confine hot poured sealant material within the crack. Clean any overflow of sealant from the pavement surface. If, in the opinion of the Engineer, the Contractor's method of sealing the cracks with hot pressure fed sealant results in an excessive amount of material on the pavement surface, stop and correct the operation to eliminate the excess material. Pouring sealant is not an acceptable method.

2. Crack Sealing Areas Prior to Paving

In areas where HMA will be placed, use sand slurry to fill the cracks.

3. Crack Sealing Areas Not to be Paved

In areas where HMA will not be placed, fill the cracks as follows:

- a. Cracks 1/4 inch to 1 inch in width - fill with hot pressure fed sealant.
- b. Cracks greater than 1 inch in width – fill with sand slurry.

4. Pavement Repair

The Contractor shall excavate pavement repair areas and shall backfill these with HMA in accordance with the details shown in the Plans and as marked in the field. The Contractor shall conduct the excavation operations in a manner that will protect the pavement that is to remain. Pavement not designated to be removed that is damaged as a result of the Contractor's operations shall be repaired by the Contractor to the satisfaction of the Engineer at no cost to the Contracting Agency. The Contractor shall excavate only within one lane at a time unless approved otherwise by the Engineer. The Contractor shall not excavate more area than can be completely finished during the same shift, unless approved by the Engineer.

Unless otherwise shown in the Plans or determined by the Engineer, excavate to a depth of 1.0 feet. The Engineer will make the final determination of the excavation depth required. The minimum width of any pavement repair area shall be 40 inches unless shown otherwise in the Plans. Before any excavation, the existing pavement shall be sawcut or shall be removed by a pavement grinder. Excavated materials will become the property of the Contractor and shall be disposed of in a Contractor-provided site off the Right of Way or used in accordance with Standard Specifications Sections 2-02.3(3) or 9-03.21.

Asphalt for tack coat shall be required as specified in subsection D. A heavy application of tack coat shall be applied to all surfaces of existing pavement in the pavement repair area.

Placement of the HMA backfill shall be accomplished in lifts not to exceed 0.35-foot compacted depth. Lifts that exceed 0.35 foot of compacted depth may be accomplished with the approval of the Engineer. Each lift shall be thoroughly compacted by a mechanical tamper or a roller.



E. PRODUCING/STOCKPILING AGGREGATES AND RAP

Aggregates and RAP shall be stockpiled according to the requirements of Standard Specifications Section 3-02. Sufficient storage space shall be provided for each size of aggregate and RAP. Materials shall be removed from stockpile(s) in a manner to ensure minimal segregation when being moved to the HMA plant for processing into the final mixture. Different aggregate sizes shall be kept separated until they have been delivered to the HMA plant.

F. MIXING

After the required amount of mineral materials, asphalt binder, recycling agent and anti-stripping additives have been introduced into the mixer the HMA shall be mixed until complete and uniform coating of the particles and thorough distribution of the asphalt binder throughout the mineral materials is ensured.

When discharged, the temperature of the HMA shall not exceed the optimum mixing temperature by more than 25 degrees F as shown on the reference mix design report or as approved by the Engineer. Also, when a WMA additive is included in the manufacture of HMA, the discharge temperature of the HMA shall not exceed the maximum recommended by the manufacturer of the WMA additive. A maximum water content of 2 percent in the mix, at discharge, will be allowed providing the water causes no problems with handling, stripping, or flushing. If the water in the HMA causes any of these problems, the moisture content shall be reduced as directed by the Engineer.

Storing or holding of the HMA in approved storage facilities will be permitted with approval of the Engineer, but in no event shall the HMA be held for more than 24 hours. HMA held for more than 24 hours after mixing shall be rejected. Rejected HMA shall be disposed of by the Contractor at no expense to the Contracting Agency. The storage facility shall have an accessible device located at the top of the cone or about the third point. The device shall indicate the amount of material in storage. No HMA shall be accepted from the storage facility when the HMA in storage is below the top of the cone of the storage facility, except as the storage facility is being emptied at the end of the working shift.

Recycled asphalt pavement (RAP) utilized in the production of HMA shall be sized prior to entering the mixer so that a uniform and thoroughly mixed HMA is produced. If there is evidence of the RAP not breaking

down during the heating and mixing of the HMA, the Contractor shall immediately suspend the use of the RAP until changes have been approved by the Engineer. After the required amount of mineral materials, RAP, new asphalt binder and asphalt rejuvenator have been introduced into the mixer the HMA shall be mixed until complete and uniform coating of the particles and thorough distribution of the asphalt binder throughout the mineral materials, and RAP is ensured.

**G. SPREADING AND FINISHING**

The mixture shall be laid upon an approved surface, spread, and struck off to the grade and elevation established. HMA pavers complying with subsection 3.3C. shall be used to distribute the mixture. Unless otherwise directed by the Engineer, the nominal compacted depth of any layer of any course shall not exceed the following:

HMA Class 1"	0.35 feet
HMA Class 3/4" and HMA Class 1/2" wearing course	0.30 feet
HMA Class 3/4" and HMA Class 1/2" other courses	0.35 feet
HMA Class 3/8" wearing course	0.25 feet
HMA Class 3/8" other courses	0.30 feet

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the paving may be done with other equipment or by hand.

When more than one job mix formula (JMF) is being utilized to produce HMA, the material produced for each JMF shall be placed by separate spreading and compacting equipment. The intermingling of HMA produced from more than one JMF is prohibited. Each strip of HMA placed during a work shift shall conform to a single JMF established for the class of HMA specified unless there is a need to make an adjustment in the JMF.

**H. AGGREGATE ACCEPTANCE PRIOR TO INCORPORATION IN HMA**

For HMA accepted by nonstatistical evaluation the aggregate properties of sand equivalent, uncompacted void content and fracture will be evaluated in accordance with Standard Specification Section 3-04.

Sampling and testing of aggregates for HMA accepted by commercial evaluation will be at the option of the Engineer.

## I. SURFACE SMOOTHNESS

The completed surface of all courses shall be of uniform texture, smooth, uniform as to crown and grade, and free from defects of all kinds. The completed surface of the wearing course of the following sections of Roadway shall not vary more than 1/4 inch from the lower edge of a 10-foot straightedge placed on the surface parallel to centerline on all Sections of roadway within the project limits that are posted less than 45 mph.

The completed surface of the wearing course of all other sections of Roadway shall not vary more than 1/8 inch from the lower edge of a 10-foot straightedge placed on the surface parallel to centerline.

The transverse slope of the completed surface of the wearing course shall vary not more than 1/4 inch in 10 feet from the rate of transverse slope shown in the Plans.

When deviations in excess of the above tolerances are found that result from a high place in the HMA, the pavement surface shall be corrected by one of the following methods:

1. Removal of material from high places by grinding with an approved grinding machine; or
2. Removal and replacement of the wearing course of HMA; or
3. By other method approved by the Engineer.

Correction of defects shall be carried out until there are no deviations anywhere greater than the allowable tolerances.

Deviations in excess of the above tolerances that result from a low place in the HMA and deviations resulting from a high place where corrective action, in the opinion of the Engineer, will not produce satisfactory results will be accepted with a price adjustment. The Engineer shall deduct from monies due or that may become due to the Contractor the sum of \$500.00 for each and every section of single traffic lane 100 feet in length in which any excessive deviations described above are found.

**J. SEALING PAVEMENT SURFACES**

Apply a fog seal where shown in the plans. Construct the fog seal in accordance with Standard Specifications Section 5-02.3. Unless otherwise approved by the Engineer, apply the fog seal prior to opening to traffic.

**K. HMA ROAD APPROACHES**

HMA approaches shall be constructed at the locations shown in the Plans or where staked by the Engineer. The Work shall be performed in accordance with Section 3.3.

**3.4 TEMPORARY PAVEMENT REPAIR**

During the course of construction, it may be necessary to provide improved temporary vehicle and/or pedestrian access within the project limits. Such temporary access shall be provided by temporarily patching trench crossings or other areas with temporary HMA until such time as the permanent surface restoration is installed. Locations shall include those areas specifically indicated on the Plans, directed by the Engineer or as further specified herein. This material will be furnished, placed, compacted, and removed and wastehauled at various locations throughout the project. The trenches and/or subgrade shall be thoroughly compacted and brought to a smooth grade prior to placing the material. It shall be placed, maintained (daily), and removed and wastehauled by the Contractor. Typical compacted depth will be 4 inches. Temporary HMA shall also be used around castings, after grinding, to provide a transition until final lift of HMA paving is installed.

**3.5 HMA JOINTS**

**A. TRANSVERSE JOINTS**

The Contractor shall conduct operations such that the placing of the top or wearing course is a continuous operation or as close to continuous as possible. Unscheduled transverse joints will be allowed and the roller may pass over the unprotected end of the freshly laid mixture only when the placement of the course must be discontinued for such a length of time that the mixture will cool below compaction temperature. When the Work is resumed, the previously compacted mixture shall be cut back to produce a slightly beveled edge for the full thickness of the course.

A temporary wedge of HMA constructed on a 20H:1V shall be constructed where a transverse joint as a result of paving or planing is open to traffic. The HMA in the temporary wedge shall be separated from

the permanent HMA by strips of heavy wrapping paper or other methods approved by the Engineer. The wrapping paper shall be removed and the joint trimmed to a slightly beveled edge for the full thickness of the course prior to resumption of paving.

The material that is cut away shall be wasted and new mix shall be laid against the cut. Rollers or tamping irons shall be used to seal the joint.

#### B. LONGITUDINAL JOINTS

The longitudinal joint in any one course shall be offset from the course immediately below by not more than 6 inches nor less than 2 inches. All longitudinal joints constructed in the wearing course shall be located at a lane line or an edge line of the Traveled Way. A notched wedge joint shall be constructed along all longitudinal joints in the wearing surface of new HMA unless otherwise approved by the Engineer. The notched wedge joint shall have a vertical edge of not less than the maximum aggregate size or more than 1/2 of the compacted lift thickness and then taper down on a slope not steeper than 4H:1V. The sloped portion of the HMA notched wedge joint shall be uniformly compacted.

### 3.6 QUALITY CONTROL

#### A. HMA MIXTURE ACCEPTANCE

Acceptance of HMA shall be as provided under nonstatistical, or commercial evaluation.

Nonstatistical evaluation will be used for the acceptance of HMA unless Commercial Evaluation is specified.

Commercial evaluation will be used for Commercial HMA and for other classes of HMA in the following applications: sidewalks, road approaches, ditches, slopes, paths, trails, gores, prelevel, temporary pavement, and pavement repair. Other nonstructural applications of HMA accepted by commercial evaluation shall be as approved by the Engineer. Sampling and testing of HMA mix accepted by commercial evaluation will be at the option of the Engineer.

The mix design will be the initial JMF for the class of HMA. The Contractor may request a change in the JMF. Any adjustments to the JMF will require the approval of the Engineer and may be made in accordance with this section.

## 1. HMA Tolerances and Adjustments

See Section 2.2 for Job Mix Formula Tolerances.

- a. Job Mix Formula Adjustments – An adjustment to the aggregate gradation or asphalt binder content of the JMF requires approval of the Engineer. Adjustments to the JMF will only be considered if the change produces material of equal or better quality and may require the development of a new mix design if the adjustment exceeds the amounts listed below.
  - i. Aggregates – 2 percent for the aggregate passing the 1-1/2", 1", 3/4", 1/2", 3/8", and the No. 4 sieves, 1 percent for aggregate passing the No. 8 sieve, and 0.5 percent for the aggregate passing the No. 200 sieve. The adjusted JMF shall be within the range of the control points in Standard Specifications Section 9-03.8(6).
  - ii. Asphalt Binder Content – The Engineer may order or approve changes to asphalt binder content. The maximum adjustment from the approved mix design for the asphalt binder content shall be 0.3 percent.

## 2. Mixture Acceptance – Nonstatistical Evaluation

HMA mixture which is accepted by Nonstatistical Evaluation will be evaluated by the Contracting Agency by dividing the HMA tonnage into lots.

The Contractor will furnish the Engineer with a copy of the results of all acceptance testing performed in the field. The Engineer will provide the Composite Pay Factor (CPF) of the completed sublots after three sublots have been tested. Sublot sample test results (gradation and asphalt binder content) may be challenged by the Contractor.

3. Mixture Nonstatistical Evaluation – Lots and Sublots

A lot is represented by randomly selected samples of the same mix design that will be tested for acceptance. A lot is defined as the total quantity of material or work produced for each JMF placed. Only one lot per JMF is expected. A subplot shall be equal to one day's production or 800 tons, whichever is less except that the final subplot will be a minimum of 400 tons and may be increased to 1,200 tons.

All of the test results obtained from the acceptance samples from a given lot shall be evaluated collectively. If the Contractor requests a change to the JMF that is approved, the material produced after the change will be evaluated on the basis of the new JMF for the remaining sublots in the current lot and for acceptance of subsequent lots. For a lot in progress with a CPF less than 0.75, a new lot will begin at the Contractor's request after the Engineer is satisfied that material conforming to the Specifications can be produced.

Sampling and testing for evaluation shall be performed on the frequency of one sample per subplot.

4. Mixture Nonstatistical Evaluation Sampling

Samples for acceptance testing shall be obtained by the Contractor when ordered by the Engineer. The Contractor shall sample the HMA mixture in the presence of the Engineer and in accordance with AASHTO T 168. A minimum of three samples should be taken for each class of HMA placed on a project. If used in a structural application, at least one of the three samples shall to be tested.

Sampling and testing HMA in a Structural application where quantities are less than 400 tons is at the discretion of the Engineer.

For HMA used in a structural application and with a total project quantity less than 800 tons but more than 400 tons, a minimum of one acceptance test shall be performed. In all cases, a minimum of three samples will be obtained at the point of acceptance, a minimum of one of the three samples will be tested for conformance to the JMF:

- If the test results are found to be within specification requirements, additional testing will be at the Engineer’s discretion.
- If test results are found not to be within specification requirements, additional testing of the remaining samples to determine a Composite Pay Factor (CPF) shall be performed.

5. Mixture Nonstatistical Evaluation – Acceptance Testing

Testing of HMA for compliance of Va will at the option of the Contracting Agency. If tested, compliance of Va will use WSDOT SOP 731.

Testing for compliance of asphalt binder content will be by WSDOT FOP for AASHTO T 308.

Testing for compliance of gradation will be by FOP for WAQTC T 27/T 11.

The Contractor will furnish the Engineer with a copy of the results of all acceptance testing performed in the field.

6. Mixture Nonstatistical Evaluation – Pay Factors

For each lot of material falling outside the tolerance limits in 3.6(1), the Contracting Agency will determine a Composite Pay Factor (CPF) using the following price adjustment factors:

<b>Table of Price Adjustment Factors</b>	
<b>Constituent</b>	<b>Factor “f”</b>
All aggregate passing: 1-1/2", 1", 3/4", 1/2", 3/8" and No. 4 sieves	2
All aggregate passing No. 8 sieve	15
All aggregate passing No. 200 sieve	20
Asphalt binder	40
Air Voids (Va) (where applicable)	20

Each lot of HMA produced under Nonstatistical Evaluation and having all constituents falling within the tolerance limits of the job mix formula shall be accepted at the unit Contract price with no further evaluation. When one or more constituents fall outside the nonstatistical tolerance limits in the Job Mix Formula shown in



Table of Price Adjustment Factors, the lot shall be evaluated in accordance with Standard Specification Section 1-06.2 to determine the appropriate CPF. The nonstatistical tolerance limits will be used in the calculation of the CPF and the maximum CPF shall be 1.00. When less than three sublots exist, backup samples of the existing sublots or samples from the Roadway shall be tested to provide a minimum of three sets of results for evaluation.

7. Mixture Nonstatistical Evaluation – Price Adjustments

For each lot of HMA mix produced under Nonstatistical Evaluation when the calculated CPF is less than 1.00, a Nonconforming Mix Factor (NCMF) will be determined. The NCMF equals the algebraic difference of CPF minus 1.00 multiplied by 60 percent. The total job mix compliance price adjustment will be calculated as the product of the NCMF, the quantity of HMA in the lot in tons, and the unit Contract price per ton of mix.

If a constituent is not measured in accordance with these Specifications, its individual pay factor will be considered 1.00 in calculating the Composite Pay Factor (CPF).

8. Mixture Nonstatistical Evaluation – Retests

The Contractor may request a subplot be retested. To request a retest, the Contractor shall submit a written request within 7 calendar days after the specific test results have been received. A split of the original acceptance sample will be retested. The split of the sample will not be tested with the same tester that ran the original acceptance test. The sample will be tested for a complete gradation analysis, asphalt binder content, and, at the option of the agency, Va. The results of the retest will be used for the acceptance of the HMA in place of the original subplot sample test results. The cost of testing will be deducted from any monies due or that may come due the Contractor under the Contract at the rate of \$500 per sample.

9. Mixture Acceptance – Commercial Evaluation

If sampled and tested, HMA mix produced under Commercial Evaluation and having all constituents falling within the tolerance limits of the job mix formula shall be accepted at the unit Contract price with no further evaluation. When one or more constituents

fall outside the commercial tolerance limits in the Job Mix Formula shown in Section 2.2, the lot may be subject to rejection. When less than three sublots exist, backup samples of the existing sublots or samples from the street shall be tested to provide a minimum of three sets of results for evaluation.

## B. HMA COMPACTION ACCEPTANCE

HMA mixture accepted by nonstatistical evaluation that is used in traffic lanes, including lanes for intersections, ramps, truck climbing, weaving, and speed change, and having a specified compacted course thickness greater than 0.10-foot, shall be compacted to a specified level of relative density. The specified level of relative density shall be a Composite Pay Factor (CPF) of not less than 0.75 when evaluated in accordance with Standard Specification Section 1-06.2, using a minimum of 92 percent of the maximum density. The maximum density shall be determined by WSDOT FOP for AASHTO T 729. The specified level of density attained will be determined by the evaluation of the density of the pavement. The density of the pavement shall be determined in accordance with WSDOT FOP for WAQTC TM 8, except that gauge correlation will be at the discretion of the Engineer, when using the nuclear density gauge and WSDOT SOP 736 when using cores to determine density.

HMA mixture accepted by commercial evaluation and HMA constructed under conditions other than those listed above shall be compacted on the basis of a test point evaluation of the compaction train or by testing of roadway cores. Compaction of the HMA mixture to a minimum of 92 percent of the reference maximum density is required for acceptance.

### 1. HMA Compaction – General Compaction Requirements

Compaction shall take place when the mixture is in the proper condition so that no undue displacement, cracking, or shoving occurs. Areas inaccessible to large compaction equipment shall be compacted by other mechanical means. Any HMA that becomes loose, broken, contaminated, shows an excess or deficiency of asphalt, or is in any way defective, shall be removed and replaced with new hot mix that shall be immediately compacted to conform to the surrounding area.

The type of rollers to be used and their relative position in the compaction sequence shall generally be the Contractor's option, provided the specified densities are attained. Unless the Engineer has approved otherwise, rollers shall only be operated in the static

mode when the internal temperature of the mix is less than 175 degrees F. Regardless of mix temperature, a roller shall not be operated in a mode that results in checking or cracking of the mat. Rollers shall only be operated in static mode on bridge decks.

2. HMA Compaction – Cyclic Density

Low cyclic density areas are defined as spots or streaks in the pavement that are less than 90 percent of the theoretical maximum density. At the Engineer’s discretion, the Engineer may evaluate the HMA pavement for low cyclic density, and when doing so will follow WSDOT SOP 733. A \$500 Cyclic Density Price Adjustment will be assessed for any 500-foot section with two or more density readings below 90 percent of the theoretical maximum density.

3. HMA Nonstatistical Compaction

a. HMA Nonstatistical Compaction – Lots and Sublots

HMA compaction which is accepted by nonstatistical evaluation will be based on acceptance testing performed by the Contracting Agency dividing the project into compaction lots.

A lot is represented by randomly selected samples of the same mix design that will be tested for acceptance, with a maximum of 15 sublots per lot; the final lot for a mix design may be increased to 25 sublots. Sublots will be uniform in size with a subplot size of 100 tons. The subplot locations within each density lot will be determined by the Engineer. For a lot in progress with a CPF less than 0.75, a new lot will begin at the Contractor’s request after the Engineer is satisfied that material conforming to the Specifications can be produced.

b. HMA Compaction Nonstatistical Evaluation – Acceptance Testing

The location of the HMA compaction acceptance tests will be randomly selected by the Engineer from within each subplot, with one test per subplot.

Tests for the determination of the pavement density will be taken in accordance with the required procedures for measurement by a nuclear density gauge or roadway cores after completion of the finish rolling.

If the Contracting Agency uses a nuclear density gauge to determine density the test procedures FOP for WAQTC TM 8 and WSDOT SOP T 729 will be used on the day the mix is placed and prior to opening to traffic.

Roadway cores for density may be obtained by either the Contracting Agency or the Contractor in accordance with WSDOT SOP 734. The core diameter shall be 4-inches minimum, unless otherwise approved by the Engineer. Roadway cores will be tested by the Contracting Agency in accordance with WSDOT FOP for AASHTO T 166.

If the Contract includes the Bid item "Roadway Core" the cores shall be obtained by the Contractor in the presence of the Engineer on the same day the mix is placed and at locations designated by the Engineer. If the Contract does not include the Bid item "Roadway Core" the Contracting Agency will obtain the cores.

For a lot in progress with a CPF less than 0.75, a new lot will begin at the Contractor's request after the Engineer is satisfied that material conforming to the Specifications can be produced.

A lot is represented by randomly selected samples of the same mix design that will be tested for acceptance. A lot is defined as the total quantity of material or work produced for each Job Mix Formula placed. Only one lot per JMF is expected. A subplot shall be equal to one day's production or 400 tons, whichever is less except that the final subplot will be a minimum of 200 tons and may be increased to 800 tons. Testing for compaction will be at the rate of five tests per subplot per WSDOT T 738.

HMA for preleveling shall be thoroughly compacted. HMA that is used for preleveling wheel rutting shall be compacted with a pneumatic tire roller unless otherwise approved by the Engineer.

c. Test Results

For a subplot that has been tested with a nuclear density gauge that did not meet the minimum of 92 percent of the reference maximum density in a compaction lot with a CPF below 1.00 and thus subject to a price reduction or rejection, the Contractor may request that a core be used for determination of the relative density of the subplot. The relative density of the core will replace the relative density determined by the nuclear density gauge for the subplot and will be used for calculation of the CPF and determination of acceptance of the HMA compaction lot.

When cores are taken by the Contracting Agency at the request of the Contractor, they shall be requested by noon of the next workday after the test results for the subplot have been provided or made available to the Contractor. Core locations shall be outside of wheel paths and as determined by the Engineer. Traffic control shall be provided by the Contractor as requested by the Engineer. Failure by the Contractor to provide the requested traffic control will result in forfeiture of the request for cores. When the CPF for the lot based on the results of the HMA cores is less than 1.00, the cost for the coring will be deducted from any monies due or that may become due the Contractor under the Contract at the rate of \$200 per core and the Contractor shall pay for the cost of the traffic control.

d. HMA Nonstatistical Compaction – Price Adjustments

For each compaction lot with one or two sublots, having all sublots attain a relative density that is 92 percent of the reference maximum density the HMA shall be accepted at the unit Contract price with no further evaluation. When a subplot does not attain a relative density that is 92 percent of the reference maximum density, the lot shall be evaluated in accordance with Standard Specification Section 1-06.2 to determine the appropriate CPF. The maximum CPF shall be 1.00, however, lots with a calculated CPF in excess of 1.00 will be used to offset lots with CPF values below 1.00 but greater than 0.90. Lots with CPF lower than 0.90 will be evaluated for compliance per subsection 3.6 C. Additional testing by either a nuclear moisture-density

gauge or cores will be completed as required to provide a minimum of three tests for evaluation.

For compaction below the required 92 percent a Non-Conforming Compaction Factor (NCCF) will be determined. The NCCF equals the algebraic difference of CPF minus 1.00 multiplied by 40 percent. The Compaction Price Adjustment will be calculated as the product of CPF, the quantity of HMA in the compaction control lot in tons, and the unit Contract price per ton of mix.

#### 4. HMA Commercial Evaluation Compaction

The location of the HMA compaction tests will be randomly selected by the Engineer.

Tests for the determination of the pavement density will be taken by the Contractor, in accordance with the required procedures for measurement by a nuclear density gauge or roadway cores, after completion of the finish rolling.

HMA mixture accepted by commercial evaluation shall be compacted on the basis of a test point evaluation of the compaction train. The Contractor shall provide the RICE density test results for the HMA mixture, identifying the reference maximum density of the mix, prior to the first day of paving. The test point evaluation shall be performed by the Contractor, in accordance with instructions from the Engineer. The number of passes with an approved compaction train, required to attain a minimum of 92 percent of the reference maximum density, shall be used on all subsequent paving.

If the Contracting Agency uses a nuclear density gauge to determine density the test procedures FOP for WAQTC TM 8 and WSDOT SOP T 729 will be used on the day the mix is placed and prior to opening to traffic.

Alternatively, the HMA mixture accepted by commercial evaluation may be evaluated by testing of roadway cores taken after completion of the finish rolling, resulting in a minimum of 92 percent of the reference maximum density. Roadway cores for density shall be obtained by the Contractor in accordance with WSDOT SOP 734. The core diameter shall be 4-inches minimum, unless otherwise approved by the Engineer. Roadway cores will be

tested by the Contractor in accordance with WSDOT FOP for AASHTO T 166. Core locations shall be outside of wheel paths and as determined by the Engineer

If the Contract includes the Bid item “Roadway Core” the cores shall be obtained by the Contractor in the presence of the Engineer on the same day the mix is placed and at locations designated by the Engineer.

## C. REJECT WORK

### 1. Reject Work General

Work that is defective or does not conform to Contract requirements shall be rejected. The Contractor may propose, in writing, alternatives to removal and replacement of rejected material. Acceptability of such alternative proposals will be determined at the sole discretion of the Engineer.

HMA that has been rejected is subject to the requirements in Standard Specification Section 1-06.2(2) and this specification, and the Contractor shall submit a corrective action proposal to the Engineer for approval.

### 2. Rejection by Contractor

The Contractor may, prior to sampling, elect to remove any defective material and replace it with new material. Any such new material will be sampled, tested, and evaluated for acceptance.

### 3. Rejection Without Testing (Mixture or Compaction)

The Engineer may, without sampling, reject any batch, load, or section of Roadway that appears defective. Material rejected before placement shall not be incorporated into the pavement. Any rejected section of Roadway shall be removed.

No payment will be made for the rejected materials or the removal of the materials unless the Contractor requests that the rejected material be tested.

Nonstatistical Evaluation: If the Contractor elects to have the rejected material tested, a minimum of three representative samples will be obtained and tested. Acceptance of rejected

material will be based on conformance with the nonstatistical acceptance Specification. If the CPF for the rejected material is less than 0.75, no payment will be made for the rejected material; in addition, the cost of sampling and testing shall be borne by the Contractor. If the CPF is greater than or equal to 0.75, the cost of sampling and testing will be borne by the Contracting Agency. If the material is rejected before placement and the CPF is greater than or equal to 0.75, compensation for the rejected material will be at a CPF of 0.75. If rejection occurs after placement and the CPF is greater than or equal to 0.75, compensation for the rejected material will be at the calculated CPF with an addition of 25 percent of the unit Contract price added for the cost of removal and disposal.

Commercial Evaluation: If the Contractor elects to have the rejected material tested, a minimum of three representative samples shall be obtained and tested by the Contractor. Acceptance of rejected material will be based on conformance with the commercial evaluation tolerances in Section 2.2. If one or more of the mixture components are out of tolerance then, no payment will be made for the rejected material; in addition, the cost of sampling and testing shall be borne by the Contractor. If the material is rejected before placement and all of the mixture components are within the commercial evaluation tolerances, then compensation for the rejected material will be at the unit Contract price, with an addition of 25 percent of the unit Contract price added for the cost of testing, removal and disposal.

4. Rejection – A Partial Sublot

In addition to the random acceptance sampling and testing, the Engineer may also isolate from a normal sublot any material that is suspected of being defective in relative density, gradation or asphalt binder content. Such isolated material will not include an original sample location. A minimum of three random samples of the suspect material will be obtained and tested. The material will then be non-statistically evaluated as an independent lot in accordance with subsection 3.6B.3.

5. Rejection – An Entire Sublot

An entire sublot that is suspected of being defective may be rejected. When a sublot is rejected a minimum of two additional random samples from this sublot will be obtained. These additional



samples and the original subplot will be evaluated as an independent lot in accordance with subsection 3.6B.3.

6. Rejection – A Lot in Progress

The Contractor shall shut down operations and shall not resume HMA placement until such time as the Engineer is satisfied that material conforming to the Specifications can be produced:

- a. When the Composite Pay Factor (CPF) of a lot in progress drops below 1.00 and the Contractor is taking no corrective action; or
- b. When the Pay Factor (PF) for any constituent of a lot in progress drops below 0.95 and the Contractor is taking no corrective action; or
- c. When either the PF for any constituent or the CPF of a lot in progress is less than 0.75.

7. Rejection – An Entire Lot (Mixture or Compaction)

An entire lot with a CPF of less than 0.75 will be rejected.

### 3.7 SAWCUTTING

Where shown on the Plans or where directed in the field by the Contracting Agency, the Contractor shall make a neat vertical sawcut at the boundaries of the area to be removed. Care shall be taken during sawcutting so as to prevent damage to the existing HMA or cement concrete pavement, to remain in place. Any pavement or cement concrete surface that is damaged by the Contractor outside the area scheduled for removal due to the Contractor's operations or negligence shall be repaired or replaced to the Contracting Agency's satisfaction by the Contractor at no additional cost to the Contracting Agency.

All cuts shall be continuous, full depth, and shall be made with saws specifically equipped for this purpose. No skip cutting, wheel cutting or jack hammering will be allowed unless specifically approved otherwise in writing by the Contracting Agency. However, even if preapproved as a method of cutting, no payment will be made for this type of work, and it shall be considered incidental and included in the various unit contract and lump sum prices listed in the Proposal.

The location of all pavement cuts shall be preapproved by the Contracting Agency in the field before cutting commences.

All water and slurry material resulting from sawcutting operations shall not be allowed to enter the storm drainage or sanitary sewer system and shall be removed from the site and disposed of in accordance with the Washington State Department of Ecology regulations.

All existing pavement edges shall be saw cut back to sound material, in uniform lines immediately prior to paving operations. Any edges broken between the time of cutting and placement of new paving shall be recut to the satisfaction of the Contracting Agency at no additional cost to the Contracting Agency. All excess excavated materials shall be hauled to waste.

### **3.8 HMA TRENCH PATCH**

This work shall consist of the preparation, placing and compaction of HMA above trench sections, in accordance with the details included on the plans and the requirements outlined herein. The work shall be in conformance with Section 3.3 herein unless specifically directed otherwise by the Contracting Agency.

The Contractor shall restore all paved surfaces excavated or disturbed to a condition acceptable to the Contracting Agency or the municipality having control of the road. The trench section shall be patched as indicated on the plans and in accordance with the following steps:

- A. Temporary HMA shall be installed to the top of the existing pavement. For areas that will be open to traffic, the Contractor shall inspect the condition of the temporary trench patch daily and maintain as directed by the Contracting Agency. Use of steel sheets to provide temporary trench protection for traffic is subject to Contracting Agency approval.
- B. Crushed rock/temporary HMA shall be removed to the depth of existing pavement or to the depth of the pavement section specified on the plans, whichever is thicker. The trench shall be paved to match the existing pavement surface. All trench areas shall be patched and cleaned by close of work that day.

Before any HMA material is placed, all pavement cuts shall be trued so that marginal lines of the patch will form a rectangle with straight edges and vertical faces a minimum of 1 foot back from the maximum trench width.

The HMA shall be placed per subsection 3.3G., Spreading and Finishing. The HMA trench patch thickness shall match existing pavement thickness or the minimum pavement repair section indicated on the plans whichever is thicker.

Seal all joints per Section 3.5, HMA Joints.

### **3.9 HMA OVERLAY**

#### **A. PLANING (MILLING) BITUMINOUS PAVEMENT**

The planning plan must be approved by the Engineer and a pre-planning meeting must be held prior to the start of any planing. See subsection 3.9C.2. for information on planning submittals.

Locations of existing surfacing to be planed are as shown in the Drawings.

Where planing an existing pavement is specified in the Contract, the Contractor must remove existing surfacing material and to reshape the surface to remove irregularities. The finished product must be a prepared surface acceptable for receiving an HMA overlay.

Use the cold milling method for planing unless otherwise specified in the Contract. Do not use the planer on the final wearing course of new HMA. Conduct planing operations in a manner that does not tear, break, burn, or otherwise damage the surface which is to remain. The finished planed surface must be slightly grooved or roughened and must be free from gouges, deep grooves, ridges, or other imperfections. The Contractor must repair any damage to the surface by the Contractor's planing equipment, using an Engineer approved method.

Repair or replace any metal castings and other surface improvements damaged by planing, as determined by the Engineer.

A tapered wedge cut must be planed longitudinally along curb lines sufficient to provide a minimum of 4 inches of curb reveal after placement and compaction of the final wearing course. The dimensions of the wedge must be as shown on the Drawings or as specified by the Engineer.

A tapered wedge cut must also be made at transitions to adjoining pavement surfaces (meet lines) where butt joints are shown on the Drawings. Cut butt joints in a straight line with vertical faces 2 inches or more in height, producing a smooth transition to the existing adjoining pavement.

After planing is complete, planed surfaces must be swept, cleaned, and if required by the Contract, patched and preleveled.

The Engineer may direct additional depth planing. Before performing this additional depth planing, the Contractor must conduct a hidden metal in pavement detection survey as specified in subsection 3.9B.

Gutter panels, curbs, or utility structures damaged as a result of planing operations shall be replaced by the Contractor at their own expense. No additional monies will be due the Contractor for damage to curbs, gutters, or utility structures, all costs of which shall be borne by the Contractor.

**B. PRE-PLANING METAL DETECTION CHECK**

Before starting planing of pavements, and before any additional depth planing required by the Engineer, the Contractor must conduct a physical survey of existing pavement to be planed with equipment that can identify hidden metal objects.

Should such metal be identified, promptly notify the Engineer.

See Standard Specification Section 1-07.16(1) regarding the protection of survey monumentation that may be hidden in pavement.

The Contractor is solely responsible for any damage to equipment resulting from the Contractor's failure to conduct a pre-planing metal detection survey, or from the Contractor's failure to notify the Engineer of any hidden metal that is detected.

**C. PAVING AND PLANING UNDER TRAFFIC**

**1. General**

In addition, the requirements of Standard Specification Section 1-07.23 and the traffic controls required in Standard Specification Section 1-10, and unless the Contract specifies otherwise or the Engineer approves, the Contractor must comply with the following:

**a. Intersections**

- i. Keep intersections open to traffic at all times, except when paving or planing operations through an intersection requires closure. Such closure must be kept to the minimum time required to place and compact the HMA mixture, or plane as appropriate. For paving, schedule such closure to**

individual lanes or portions thereof that allows the traffic volumes and schedule of traffic volumes required in the approved traffic control plan. Schedule work so that adjacent intersections are not impacted at the same time and comply with the traffic control restrictions required by the Traffic Engineer. Each individual intersection closure or partial closure, must be addressed in the traffic control plan, which must be submitted to and accepted by the Engineer, see Standard Specification Section 1-10.2(2).

- ii. When planing or paving and related construction must occur in an intersection, consider scheduling and sequencing such work into quarters of the intersection, or half or more of an intersection with side street detours. Be prepared to sequence the work to individual lanes or portions thereof.
  - iii. Should closure of the intersection in its entirety be necessary, and no trolley service is impacted, keep such closure to the minimum time required to place and compact the HMA mixture, plane, remove asphalt, tack coat, and as needed.
  - iv. Any work in an intersection requires advance warning in both signage and a number of Working Days advance notice as determined by the Engineer, to alert traffic and emergency services of the intersection closure or partial closure.
  - v. Allow new compacted HMA to cool to ambient temperature before any traffic is allowed on it. Traffic is not allowed on newly placed HMA until approval has been obtained from the Engineer.
- b. Temporary centerline marking, post-paving temporary marking, temporary stop bars, and maintaining temporary pavement marking must comply with Standard Specification Section 8-23.
  - c. Permanent pavement marking must comply with Standard Specification Section 8-22.

d. Roadways Open to Traffic

When the roadway being paved is open to traffic, the following requirements shall apply:

The Contractor shall keep roadways open to traffic at all times except where paving is in progress. During such time, and provided that there has been an advance warning to the public, only that specified section of road being paved may be closed for the minimum time required to place and compact the HMA. Adjacent travel lanes and shoulder shall be left open for traffic during these times. In hot weather, the Engineer may require the application of water to the pavement to accelerate the finish rolling of the pavement and to shorten the time required before reopening to traffic.

Before temporarily closing a portion of the road, advance-warning signs shall be placed and signs shall also be placed clearly alerting the driver of temporary lane closures.

During paving operations, temporary pavement markings shall be maintained throughout the project. Temporary pavement markings shall be installed on the roadway prior to opening to traffic and shall be in accordance with Standard Specification Section 8-23.

All costs in connection with performing the Work in accordance with these requirements shall be included in the unit contract prices for the various bid items involved in the Contract.

2. Submittals – Planing Plan and HMA Paving Plan

The Contractor must submit a separate planing plan and a separate paving plan to the Engineer at least 5 working days in advance of each operation's activity start date. These plans must show how the moving operation and traffic control are coordinated, as they will be discussed at the pre-planing briefing and pre-paving briefing. When requested by the Engineer, the Contractor must provide each operation's traffic control plan on 24 x 36 inch or larger size Shop Drawings with a scale showing both the area of operation and sufficient detail of traffic beyond the area of operation where detour traffic may be required. The scale on the Shop Drawings is

1 inch = 20 feet, which may be changed if the Engineer agrees sufficient detail is shown.

The planing operation and the paving operation include, but are not limited to, metal detection, removal of asphalt and temporary asphalt of any kind, tack coat and drying, staging of supply trucks, paving trains, rolling, scheduling, and as may be discussed at the briefing.

When intersections will be partially blocked or when allowed to be totally blocked, provide adequately sized and noticeable signage alerting traffic of closures to come, a minimum 2 Working Days in advance. The traffic control plan must show where police officers will be stationed when signalization is or may be, countermanded, and show areas where flaggers are proposed.

At a minimum, the planing and the paving plan must include:

- a. A copy of the accepted traffic control plan, see Standard Specification Section 1-10.2(2), detailing each day's traffic control as it relates to the specific requirements of that day's planing and paving. Briefly describe the sequencing of traffic control consistent with the proposed planing and paving sequence, and scheduling of placement of temporary pavement markings and channelizing devices after each day's planing, and paving.
- b. A copy of each intersection's traffic control plan.
- c. Haul routes from Supplier facilities, and locations of temporary parking and staging areas, including return routes. Describe the complete round trip as it relates to the sequencing of paving operations.
- d. Names and locations of HMA Supplier facilities to be used.
- e. List of all equipment to be used for paving.
- f. List of personnel and associated job classification assigned to each piece of paving equipment.
- g. Description (geometric or narrative) of the scheduled sequence of planing and of paving, and intended area of planing and of paving for each day's work, must include

the directions of proposed planing and of proposed paving, sequence of adjacent lane paving, sequence of skipped lane paving, intersection planing and paving scheduling and sequencing, and proposed notifications and coordinations to be timely made. The plan must show HMA joints relative to the final pavement marking lane lines.

- h. Names, job titles, and contact information for field, office, and plant supervisory personnel.
  - i. A copy of the approved Mix Designs.
  - j. Tonnage of HMA to be placed each day.
  - k. Approximate times and days for starting and ending daily operations.
3. Pre-Paving and Pre-Planing Briefing

At least 2 Working Days before the first paving operation and the first planing operation, or as scheduled by the Engineer for future paving and planing operations to ensure the Contractor has adequately prepared for notifying and coordinating as required in the Contract, the Contractor must be prepared to discuss that day's operations as they relate to other entities and to public safety and convenience, including driveway and business access, garbage truck operations, transit operations and working around energized overhead wires, school and nursing home and hospital and other accesses, other contractors who may be operating in the area, pedestrian and bicycle traffic, and emergency services. The Contractor, and Subcontractors that may be part of that day's operations, must meet with the Engineer and discuss the proposed operation as it relates to the submitted planing plan and paving plan, approved traffic control plan, and public convenience and safety. Such discussion includes, but is not limited to:

- a. General for both Paving Plan and for Planing Plan:
  - i. The actual times of starting and ending daily operations.
  - ii. In intersections, how to break up the intersection, and address traffic control and signalization for that operation, including use of peace officers.



- iii. The sequencing and scheduling of paving operations and of planing operations, as applicable, as it relates to traffic control, to public convenience and safety, and to other contractors who may operate in the Project Site.
  - iv. Notifications required of Contractor activities, and coordinating with other entities and the public as necessary.
  - v. Description of the sequencing of installation and types of temporary pavement markings as it relates to planning and to paving.
  - vi. Description of the sequencing of installation of, and the removal of, temporary pavement patch material around exposed castings and as may be needed.
  - vii. Description of procedures and equipment to identify hidden metal in the pavement, such as survey monumentation, monitoring wells, street car rail, and castings, before planning, see subsection 3.9C.1.
  - viii. Description of how flaggers will be coordinated with the planing, paving, and related operations.
  - ix. Description of sequencing of traffic controls for the process of rigid pavement base repairs.
  - x. Other items the Engineer deems necessary to address.
- b. Paving – additional topics:
- i. When to start applying tack and coordinating with paving.
  - ii. Types of equipment and numbers of each type equipment to be used. If more pieces of equipment than personnel are proposed, describe the sequencing of the personnel operating the types of equipment. Discuss the continuance of operator

personnel for each type equipment as it relates to meeting Specification requirements.

- iii. Number of JMFs to be placed, and if more than one JMF how the Contractor will ensure different JMFs are distinguished, how pavers and MTVs are distinguished if more than one JMF is being placed at the time, and how pavers and MTVs are cleaned so that one JMF does not adversely influence the other JMF.
- iv. Description of contingency plans for that day's operations such as equipment breakdown, rain out, and Supplier shutdown of operations.
- v. Number of sublots to be placed, sequencing of density testing, and other sampling and testing.

### **3.10 PAVEMENT MARKINGS**

In those areas where the proposed work causes existing pavement with striping and/or pavement markings to be removed, the Contractor shall not only replace the pavement, as noted herein, and as shown on the Plans, but shall also remark and restripe the new pavement so as to restore the new pavement to its former condition.

Pavement markings shall conform to Standard Specification Section 8-22.2 and 8-22.3, and the latest edition and amendments thereto of the Manual on Uniform Traffic Control Devices (MUTCD) as adopted by the State of Washington, and shall be constructed as shown in the Plans except as modified herein.

Raised pavement markers shall conform to Standard Specifications Section 8-09.2 and 8-09.3.

### **3.11 ADJUSTING STRUCTURES TO GRADE**

All utility castings and monuments within the existing and/or new pavement area shall be referenced by the Contractor prior to any pavement removal or planing. The Contractor shall keep a record of such references and submit a copy to the Contracting Agency.

Existing structures and new structures shall be adjusted to the finished grade as shown on the Plans and as further specified herein. Existing boxes, rings, grates,

covers, and lids shall be reset in a careful and workmanlike manner to conform to the required grades.

The new and existing utility castings and monuments shall be adjusted to grade in the following manner:

As soon as the street has been paved past each structure or casting, the HMA mat shall be scored around the location of the structure or casting. After rolling has been completed and the mat has cooled, it shall be cut along the scored lines. The structure or casting shall then be raised to finished pavement grade and the annular spaces filled as indicated on the Plans. The Contractor shall install the pavement to give a smooth finished appearance. All covers, lids, frames, and grates shall be thoroughly cleaned.

After pavement is in place, all new pavement joints shall be sealed with a 6-inch-wide strip of hot asphalt sealer. A sand blanket shall be applied to the surface of the hot asphalt sealer immediately after the placement of the sealer to help alleviate the tracking of the asphalt. The sealer shall meet the requirements of the Standard Specifications Section 9-04.2(1).

**\*\*\* END OF SECTION \*\*\***

## SECTION 02820

### CHAIN LINK FENCE AND GATES

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the furnishing and installing of new chain link fence materials, and the modifications to the existing fence system conforming to the lines, grades, and details and at the locations as shown on the Plans.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
Section 4	Measurement and Payment
01300	Submittals

#### PART 2 PRODUCTS

##### 2.1 FENCING

The fence shall have continuous chain link wire, tension wire and three strands of barbed wire supported on angled extension arms. The chain link shall have a 2-inch diamond mesh and 9-gauge wire, meeting ASTM 668, Class 2b. The total height of the fence shall be as shown on the Plans. The fence shall be heavy steel guard fence with top and bottom rails and bottom tension wire. Top and bottom selvages of chain link fabric are to have a twisted and barbed finish.

Fabric shall be galvanized with 1.8 ounces per square foot.

The posts shall be equipped with extension arms, designed to carry three strands of barbed wire at an angle of 45 degrees. The topmost barbed wire shall be located approximately 12 inches above the fabric, and approximately 12 inches out from the fence line. Extension arms for line posts shall be of 14-gauge (minimum) pressed steel, provided with slots for securely fastening the barbed wires. Corner and fence post arms are to be of similar construction, and shall be constructed from a minimum of 12-gauge strip steel or heavy malleable iron, and shall be designed to provide sufficient strength to support the barbed wire.

Fence shall be provided with privacy slats as shown on the Plans. Slats shall be vertically oriented within the wire mesh fabric and shall be comprised of plastic materials. Slats shall provide visual barrier to the interior of the fenceline, and shall be resistant to degradation from UV light, water, and exposure to the

elements. Slats shall be provided with bottom channel that will allow the vertical slats to “lock” into place.

The barbed wire shall be of the 4-point pattern, each wire to be composed of two strands of No. 12-1/2-gauge wire, galvanized after weaving.

## **2.2 GATES**

Gates shall be installed for the full opening shown on the Drawings as per the manufacturer’s recommendations.

Gateposts shall be provided in accordance with ASTM F900 and have a ball top.

## **PART 3 EXECUTION**

### **3.1 TEMPORARY FENCING**

The Contractor shall furnish and install temporary fencing around the site so as to protect the site and prevent unauthorized entry into the site. The Contractor shall also maintain the temporary fencing throughout the course of the construction and provide any and all security necessary for site safety and protection during periods when sections of the fence may be down or open. Temporary fencing shall be removed by the Contractor only after receiving written authorization from the Owner for its removal.

### **3.2 FENCING INSTALLATION**

The chain link fencing shall be erected in straight lines between angle points by skilled workmen experienced in this type of construction, in accordance with the manufacturer’s recommendations and these Specifications. The new fence installation shall not commence until final grading is complete and finish grade elevations are established. The new fence shall be constructed to provide security for the site. There shall not be any gaps between finish elevations and the bottom links of the fence which would allow entrance into the site.

The site fence shall be constructed in conformance with Section 8-12 of the WSDOT Standard Specifications. The maximum spacing for line posts shall be 10-feet on center. Posts shall be set plumb in true line as shown on the Plans and the remainder of the hole filled with concrete that must extend around the posts to a point 2 inches above finished grade. The top surface shall have a crowned watershed finish.

Concrete shall be proportioned to provide at least 2,500 psi strength at 28 days. Materials, methods of proportioning, mixing, transporting and placing shall conform to Section 03300. After the concrete has set, accessories shall be



## SECTION 02832

### SEGMENTAL CONCRETE RETAINING WALLS

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the segmental concrete retaining walls as shown on the Plans and as specified herein.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
02300	Earthwork
02700	Gravel Materials
15050	Piping Systems

##### 1.3 SUBMITTALS

Submit segmental concrete retaining wall manufacturer's data in accordance with Section 01300.

#### PART 2 PRODUCTS

Manufacturers of segmental concrete retaining walls include, but are not limited to, the following:

Ultrablock, Inc.

Provide size and configuration as indicated on the Plans. Blocks shall be concrete with dimensions of 29.5" x 29.5" x 59" and weigh approximately 4,320 lbs. Chamfered edges provide 8 square inches of drainage area per block. Top blocks shall have flush tops. Blocks shall be standard grade with one full side and one side face free from large imperfections. Surface face shall be plain face.

Base material shall conform to Section 02700.

Drain pipe shall be PVC or CPEP and conform to Section 15050.

## **PART 3 EXECUTION**

### **3.1 EXCAVATION**

Confirm location and elevation of walls. Width of excavation should allow for width of wall base and drain pipe. Where the wall steps up one block in height, the base block shall be installed at the lowest level to establish grade and face location of the second level.

All excavation shall follow state, local and OSHA guidelines.

### **3.2 BASE PREPARATION**

Base material shall be compacted to at least 95 percent of the maximum dry density, using the modified Proctor, per ASTM D1557.

### **3.3 SETTING BLOCKS**

Clean top and bottom of blocks before placement.

Place first block at lowest elevation of wall.

Mark a line perpendicular to the wall. Place the first block 1 inch from the string line. Align the face of the next block with first and set in place.

If the base width of the wall requires two or more blocks, place the blocks at the back of the wall first.

Always place the best face of the blocks on the outside of the wall.

Do not set more than 25 to 30 feet of block along the length of base before starting the second and third row.

**\*\*\* END OF SECTION \*\*\***



## SECTION 02834

### SOLDIER PILE WALL

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this section shall consist of the installation of permanent soldier pile walls as shown on the Plans. Piles for soldier pile walls shall not be driven. This Work also includes cutting off piles when and where required.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
01310	Project Meetings
01400	Quality Control
05120	Structural Steel
09900	Painting

##### 1.3 REFERENCES

This Section references the latest revisions of the following documents:

<u>Reference</u>	<u>Title</u>
ACI 212.3R	Chemical Admixtures for Concrete
ACI 212.4R	Guide for Use of High-Range Water-Reducing Admixtures (Superplasticizers) in Concrete
ACI 301	Structural Concrete for Buildings
ACI 304	Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 318	Building Code Requirements for Reinforced Concrete
ASTM C33	Concrete Aggregates
ASTM C94	Ready-Mixed Concrete
ASTM C109	Test Method for Comprehensive Strength of Hydraulic Cement Mortars
ASTM C131	Abrasion and Impact Test - Small Aggregate
ASTM C150	Portland Cement
ASTM C260	Air Entraining Admixtures for Concrete
ASTM C494	Chemicals Admixtures for Concrete

ASTM C618	Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C939	Test Method for Flow of Grout for Preplaced-Aggregate Concrete
Geotechnical Report	PanGEO, Inc., December 20, 2023

#### **1.4 SUBMITTALS**

Submittals shall be in accordance with Section 01300.

##### **A. GROUT MIX DESIGN**

Submit mix design for proposed mix indicating components and proportions by weight, including any admixtures. Mix design shall state chloride content.

##### **B. CERTIFIED TEST REPORTS**

Submit test results indicating compressive strength of grout in compliance with requirements herein and ACI 301.

##### **C. SIEVE ANALYSIS**

Submit sieve analysis for proposed coarse and fine aggregates indicating components, source, and gradation.

##### **D. PRODUCT AND MANUFACTURER'S DATA**

Provide data on proposed admixtures. For admixtures other than those proposed for air entrainment, submit a letter from the manufacturer describing the benefits of its use for the project and effect of its use on the properties of the grout mix. Product data shall expressly state admixtures are chloride free; or the manufacturer shall submit a letter certifying same.

Manufacturer's data for auger drilling, equipment, and grout pumping equipment shall be submitted for acceptance. A detailed sequence and procedures outline for construction of auger-placed piles shall be submitted for acceptance.

##### **E. MATERIAL DELIVERY TICKETS**

Provide copies of all concrete and grout material delivery tickets to the Engineer.

**F. SHOP DRAWINGS**

Indicate profiles, sizes, spacing, locations, and complete details of structural members, to include openings, cuts, camber, fasteners, connections, and other pertinent data. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.

**G. MANUFACTURER'S MILL CERTIFICATE**

Submit under provisions of Section 01400 certifying that products meet or exceed specified requirements.

**H. MILL TEST REPORTS**

Submit under provisions of Section 01400 Manufacturer's Certificates, indicating structural strength, destructive and non-destructive test analysis.

**I. WELDERS' CERTIFICATES**

Submit under provisions of Section 01400 Manufacturer's Certificates, certifying welders employed on the Work, verifying AWS qualifications within the previous 12 months.

**J. DESIGN CALCULATIONS**

For proposed use of precast concrete lagging, or other alternative substitutions, the Contractor shall submit design Calculations to the owner for review and approval. Design calculations shall be stamped, signed, and dated by a civil or structural engineer licensed in the State of Washington

**1.5 QUALITY ASSURANCE**

Perform work in accordance with ACI 301. Acquire cement and aggregates from same source for all work performed on project. Conform to ACI 305R when concreting during hot weather. Conform to ACI 306R when concreting during cold weather. Provide or coordinate field and laboratory testing as described in this Section and under provisions of Section 01400.

Keep complete and accurate as-built records of augering. Indicate the pile location, depth, and date drilled. Record and report immediately to the Engineer any unusual conditions encountered during pile installation.

Pile installer shall be regularly engaged in the installation of soldier piles similar to the requirements of this project for at least 5 years. Provide documentation demonstrating same.

Design deviations shall provide an installation equivalent to the basic intent without incurring additional cost to the Owner.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

Deliver material to site at such intervals to ensure uninterrupted progress of work. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

## **1.7 COORDINATION**

Coordinate work in accordance with provisions of Section 01310. Coordinate the installation of piles with erection of concrete formwork and placement of form accessories.

## **1.8 PAYMENT**

No separate or additional payment will be made for the work and material specified herein. All costs of the work specified herein shall be included in the lump sum bid price in accordance with Section 01200 of the Specifications.

## **PART 2 PRODUCTS**

### **2.1 STRUCTURAL STEEL**

Structural steel, including piles, shall be as shown on the Plans and meet the requirements of Section 05120.

### **2.2 LAGGING**

#### **A. WOOD LAGGING**

Provide size and species as indicated on the Plans. Wood lagging shall be pressure-treated with waterborne preservative in accordance with Use Category UC4 per AWPA Standard U1. Field cuts shall be painted with preservative. Use 1/4" 316 stainless steel shims for gaps between courses of lagging.

## **2.3 GROUT CASING MATERIALS**

### **A. CEMENT**

ASTM C150, Type II - Moderate. Use one brand of cement throughout the Project, unless otherwise acceptable to the Engineer.

### **B. FINE AND COARSE AGGREGATES**

ASTM C33. Maximum aggregate size, 3/8 of an inch max. Provide aggregates from a single source.

### **C. WATER**

Clean, potable and not detrimental to concrete grout.

## **2.4 ADMIXTURES**

### **A. HIGH RANGE WATER REDUCER AND RETARDER**

ASTM C494, Type G.

Master Builders DCI  
Sika Sikament 320  
W.R. Grace Daracem-100

### **B. POZZOLAN**

ASTM C618, Class F with CaO maximum content at 10 percent.

## **2.5 GROUT MIX FOR CASING**

Grout shall consist of a mixture of Portland cement, pozzolanic material, sand, aggregate, and water, proportioned and mixed so as to produce a grout capable of being pumped without difficulty and having a minimum compressive strength of 4,000 psi at 28 days.

## **2.6 AUGER DRILLING EQUIPMENT**

The auger hoisting equipment shall be capable of withdrawing the auger smoothly and at a constant rate. The minimum inside diameter of the hollow shaft of the augerflight shall be 1-1/4 inches. Auger drilling equipment shall be capable of installing piles up to 35 feet below the existing ground surface.

## **2.7 GROUT INJECTION EQUIPMENT**

Grout injection equipment shall have a grout pressure gauge in clear view of the equipment operator and a positive pressure shall be maintained at all times during grouting. The grout pump shall be a positive displacement pump. The pump discharge capacity shall be calibrated in strokes per cubic foot or revolutions per cubic foot. A counter shall be attached to the grout pump to determine the volume of grout pumped, measured by the number of strokes of a displacement-type pump. A certified pump calibration chart indicating volume per counter stroke shall be provided prior to drilling any piles. Remove oil or other rust inhibitors from mixing drums and pressure-grout pumps and clean equipment prior to mixing and placing grout.

## **2.8 PROTECTIVE COATINGS**

Steel soldier piles and other steel components integral to the soldier pile via welded or bolted connection as shown on the Plans shall be coated in accordance with Section 09900.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION REQUIREMENTS**

Drill and install piles from the existing ground surfaces as shown on the Plans. Locate piles where indicated on the Plans. The maximum permissible variation of the center of front face of each pile from the required location is 1 inch. No pile shall be out of required axial alignment by more than 2 percent. Periodically check the required axial alignment of each pile casing during the drilling operation and after reaching required tip elevation. Installed piles which are damaged, mislocated, or out of alignment beyond the maximum tolerance specified or which are unsuitable for other reasons shall be abandoned and replaced with additional piles placed at no additional cost to the Owner.

### **3.2 SHAFT EXCAVATION**

When unexpected obstructions, which require specialized equipment or labor, are encountered the Contractor shall notify the Engineer promptly and the obstruction shall be removed and the excavation continued as directed by the Engineer. Removal of unexpected obstructions will be paid for by force account in accordance with Section 1-09.6 of the Standard Specifications.

The Contractor shall use a specially built cleanout bucket, to clean the bottom of the excavation such that not more than 2 inches of loose or disturbed material is present. The Contractor is responsible for the disposal of augured material per

Section 6-16.5. The excavated shaft shall be inspected and approved by the Engineer prior to proceeding with construction.

During drilled pile excavation or upon completed of the drilled pile excavation, the Contractor shall dewater the hole. The Contractor shall maintain the shaft in this dewatered condition until placement of concrete is complete, except by approval of the Engineer.

Excavation of shaft shall not commence until a minimum of 12 hours after the concrete for the adjacent shafts has been poured.

Inspection: Immediately upon completion of the drilled pile excavation and dewatering, notify the Engineer that the pile excavation is ready for inspection. Following inspection by the Engineer, construct the drilled pile without undue delay. Maintain pile in dewatered condition until placement of concrete is complete.

The Contractor shall have available at all times a suitable light for inspection of the drilled pile excavation throughout its entire length. The Contractor shall also have available at all times a plumb weight and tape to check the vertical alignment and depth of each drilled shaft excavation. All excavation that is not within the tolerance specified shall be corrected or replaced at the Contractor's expense. The pile excavation must be inspected and approved by the Engineer before soldier piles and concrete are placed in the excavation.

#### A. TEMPORARY CASING

The pile excavation shall be cased if required to prevent caving and sloughing of materials. The bottom of the casing shall be advanced closely with the excavation as the excavation proceeds. The temporary casing shall be steel and shall be of ample strength to withstand handling stresses, the pressure of concrete, hydrostatic pressure, the stresses caused by surrounding earth or backfill material, and shall be watertight. The casing shall be smooth, clean, and well oiled. The outside diameter of the casing shall be not less than the specified diameter of the drilled shaft. The top of the casing shall extend sufficiently above the top elevation of the finished drilled shaft to permit excess concrete to be placed for the anticipated slump caused by casing removal.

### 3.3 BACKFILLING SHAFT

Placing Concrete: Promptly following the Engineer's inspection of the drilled pile excavation and placement of the soldier piles, place concrete in the finished drilled pile. Concrete shall be placed in the drilled pile up to the elevation shown in the Plans.

Place concrete in the drilled pile excavation by dropping concrete through a funnel or drop chute placed in the top of the drilled pile excavation. Center the funnel or chute in the excavation and provide a discharge pipe of not more than 8 inches in diameter with a length of not less than 2 feet.

Force the concrete to drop straight down into the excavation without hitting the side of the casing before the concrete strikes the bottom. Cast the entire drilled pile in a single pour. Place concrete continuously exercising care to fill every part of the pile excavation and to work the concrete around the soldier pile without displacing the pile.

If tremie methods are approved by the Engineer, keep tremie pipe as near as possible to the bottom of the excavation and always below the top of the column of concrete.

### **3.4 CUTOFF**

Terminate grout placement as shown on Plans. The Contractor shall carefully trim off all grout beyond the cutoff elevation shown on the Plans with hand-operated chipping guns prior to placement of the pile caps and/or beams.

### **3.5 STRUCTURAL STEEL SOLDIERS**

Steel soldiers shall be provided and placed plumb and as shown on the Plans.

Provide necessary stabilizers for centering steel placed in fluid grout. Steel soldier shall have minimum clearance as shown on the Plans.

### **3.6 DISPOSAL OF EXCAVATED MATERIAL**

Do not leave any piles partially completed overnight. Completely install soldier and protect at the end of each workday. Excavated material resulting from augering shall be disposed of by the Contractor at an approved site selected by the Contractor.

### **3.7 LAGGING**

The Contractor shall install lagging as indicated on the Plans and fasten to soldier pile flanges as required for support during lagging installation.

The excavation and removal of lean concrete for the lagging installation shall proceed in advance of the lagging. The lagging shall be installed from the top of the pile proceeding downward.



Voids behind the timber lagging shall be backfilled as required to restore existing slope with Structural Fill. The level of the backfill behind the lagging shall be to the finished grade shown in the Plans.

Excavation below the installed lagging shall not be greater than 3 feet during the lagging installation. Contractor shall install lagging immediately as excavation progresses. Excavation faces shall not be left unsupported overnight. All timber lagging shall be as specified on the Plans.

Apply heavy brush coat of same wood preservative material to surfaces exposed to sawcutting or drilling.

### **3.8 DRAIN MAT**

Install drain mat and free-draining material as indicated on the Plans.

**\*\*\* END OF SECTION \*\*\***

## SECTION 02900

### LANDSCAPING

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the installation of all landscaping work as shown on the Plans and as specified herein. Landscaping activities shall include work both at the project location as well as any residential properties that are affected by construction activities.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
02230	Clearing and Grubbing
02300	Earthwork

##### 1.3 SUBMITTALS

###### A. WATERING SCHEDULE

Prior to Final Acceptance of the Landscaping, the Contractor shall submit a written "watering schedule" to the Owner to ensure adequate watering (summer, fall, winter, and spring) of all plant materials during the Guarantee Period of this Contract. Watering shall be by hand and watering truck, unless otherwise directed by the Owner.

###### B. PLANT PROCUREMENT

The Contractor shall provide all plants of the size, species, variety and quality noted and specified. Submit written documentation to the Owner that all specified plant materials have been ordered. If unavailable, the Contractor shall notify the Owner in writing immediately and provide the names, addresses, and telephone numbers of five nursery suppliers that have been contacted. If substitution should be permitted, it can be made only with the prior written acceptance of the Owner.

###### C. SOIL ANALYSIS REPORTS

See Section 2.1 and 2.2 of this Specification.

**D. SUBGRADE PERCOLATION TEST RESULTS**

See Section 3.1 of this Specification.

**E. SEED MIX**

See Section 2.4 of this Specification.

**F. WEED AND PEST CONTROL PLAN**

See Section 1.5 of this Specification.

**1.4 QUALITY ASSURANCE**

**A. CONTRACTOR QUALIFICATIONS**

All landscaping work shall be performed by a licensed Landscape Contractor registered in the State of Washington and shall be qualified for landscaping work through certification by the Washington Association of Landscape Professionals (WALP).

**B. PLANT MATERIAL**

Quality, size, and conditions as determined by standards set forth in the American Association of Nurserymen Standard ANSI Z60.1.

**C. FERTILIZER**

Conform to Washington State Department of Agriculture Laws and Federal Specification O-F-241D pertaining to commercial fertilizers.

**D. SEED**

Conform to the minimum standards for “certified” grade seed.

Furnished in standard container on which the following information is shown: seed name, lot number, net weight, percentage of purity, germination, weed seed and inert material.

Furnish to the Owner duplicate copies of a statement signed by the vendor, certifying that each lot of seed has been tested by a recognized seed testing laboratory within 6 months before the date of delivery on the Project.

Seed that is wet, moldy, or otherwise damaged in transit or storage will not be accepted.

## **1.5 WEED AND PEST CONTROL PLAN**

The Weed and Pest Control Plan (WPCP) shall be submitted and approved by the Owner prior to starting any landscape work.

The WPCP shall include scheduling and methods of all control measures described in this Section, including soil preparation methods to meet the required soil surface conditions in the planting areas. The weed control plan shall show general weed control including:

- Hand, mechanical, and chemical methods;
- Timing and frequency;
- Application of herbicides including type, rate, use, and timing; and
- Noxious weed control.

Target weeds and unwanted vegetation to be removed shall be identified and listed in the weed control plan.

The plan shall be prepared and signed by a licensed commercial operator with a Washington State Department of Agriculture (WSDA) Commercial Applicator pesticide license. The plan shall include methods of weed control, dates of weed control operations, and the name, application rate, and Material Safety Data Sheets (MSDS) of all proposed herbicides. In addition, the Contractor shall furnish the Owner with a copy of the current product label for each herbicide/pesticide and spray adjuvant to be used. These product labels shall be submitted with the weed control plan for approval.

All herbicides and/or pesticides must be carefully selected and applied in accordance with U.S. Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology), WSDA, and local sensitive area ordinances and regulations.

## **1.6 GUARANTEE**

### **A. GUARANTEE PERIOD**

Guarantee work within this Specification for 2 years against all defects of materials and workmanship. The guarantee period begins after the date of Final Acceptance. Replace plants and seed areas not in normal healthy growing condition at the end of guarantee period. Replace with plants with identical species, size, and seed mix. Final Acceptance will be certified in writing by the Owner.

B. DEAD AND DISFIGURED PLANT MATERIAL

Any plant material that is 25 percent or more dead or disfigured shall be considered dead and must be replaced at no charge. A tree shall be considered dead when the main leader has died back or there is 25 percent of the crown dead. Plants shall be considered disfigured when excessive dead wood has been removed or when the symmetry, typical habit of growth, or sculptured form has been impaired by the removal of dead wood.

During the 2-year guarantee period, should any seed areas showing signs of failure such as dead or dying areas of grass or bare spots larger than 6-inch square, the Contractor shall repair or replace all deficient areas to the satisfaction of the Owner.

C. SEED PLANT REPLACEMENT

All plants are subject to one replacement only per item, and the Contractor shall submit, after each replacement period, a marked planting plan showing the exact location of each item replaced at that time. The owner may require the contractor to replace dead plants prior to the end of the guarantee period at no additional cost. This applies only after Final Acceptance.

Replacements made by the Contractor shall be made in the same manner as specified for the original planting, and shall be done at no extra cost to the Owner.

Replace all trees, shrubs, and groundcovers and seed areas when plants are no longer in a satisfactory growing condition as determined by the Owner for the duration of the guarantee period. Make replacements within 10 working days of notification from the Owner.

D. ACCESS TO PROJECT SITE

Contractor has the right to enter upon the property for inspection and curative treatment of any materials needing such which are still under warranty during the entire guarantee period. The Owner must be notified at least 48 hours in advance of any corrective or curative treatment measures so as to arrange for convenient access to the area.

E. APPLICABLE CONDITIONS

The guarantee shall be 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 condition of the plant shall be deemed replaceable cause; however, this would not apply to plant losses due to abnormal weather conditions such as floods, excessive wind damage, drought, severe freezing or abnormal rains, as determined by the National Weather Service.

F. MAINTENANCE DURING GUARANTEE

It is expressly understood that the Contractor will be responsible, during the Guarantee Period, for normal landscape maintenance of the project. Maintenance of the landscape shall include, but not be limited to hand watering, mowing, weeding, monitoring and treating any disease and/or pest-problems, cultivating and any other maintenance requirements, per standard trade practices, to keep the plant materials in a normal healthy growing condition.

**PART 2 MATERIALS**

**2.1 TOPSOIL**

The topsoil shall consist of 67 percent sandy loam and 33 percent composted organic material by volume.

The soil shall meet the following requirements:

Soil shall be sandy loam or loamy sand consisting largely of sand, but with enough silt and clay present to give it a small amount of stability. Individual sand grains can be seen and felt readily. On squeezing in the hand when dry, it shall fall apart when the pressure is released; on squeezing when moist, it shall form a cast that does not only hold its shape when the pressure is released, but shall withstand careful handling without breaking.

The mixed soil shall meet the following gradation:

<u>Screen Size</u>	<u>Percent Passing</u>
1/2 inch	100
1/4 inch	95 – 100
#10	85 – 95
#30	60 – 75
#60	50 – 60

<u>Screen Size</u>	<u>Percent Passing</u>
#100	20 – 30
#200	5 – 15

Shall have a pH range of 5.5 to 7.5. Soils indicated having a pH below 5.5 shall be treated with dolomitic limestone as necessary to attain this pH range. Soils having a pH greater than 7.5 shall be treated with sulfur as necessary to attain this pH range. The pH shall be determined by soil test.

Organic material shall consist of composted yard debris or organic waste material composted for a minimum of 3 months. Compost shall consist of 100 percent recycled content. In addition, the organic material shall have the following physical characteristics:

1. Shall pass a standard cress test for seed germination (90 percent germination compared to standard).
2. Shall have a pH from 5.5 to 7.5.
3. Shall have a maximum electrical conductivity of 3.0 ohms/cm.
4. Shall have a maximum carbon to nitrogen ratio of 40:1.
5. Shall be certified by the “Process to Further Reduce Pathogens” (PFRP) guideline for hot composting as established by the United States Environmental Protection Agency.

Submit a certified laboratory analysis from an accredited soils testing laboratory indicating the Material source and compliance with all planting soil Specifications to the Engineer for approval before delivery to the Project Site. The analysis shall be with a sample size of no less than 1 pound.

## **2.2 COMPOST**

Composted material shall be derived from a Type 1 feedstock and produced by a facility in compliance with WAC 173-350-220. The compost shall meet Grade AA Compost as defined by Ecology’s Interim Guidelines for Compost Quality (Publication #94-38, Revised November 1994). Compost material shall have 100 percent passing a 1/2-inch screen. The carbon to nitrogen ratio (C:N) of the compost shall be in the range of 20:1 to 35:1. Organic matter of the composted material shall be between 4 percent and 10 percent, and the moisture content shall be between 35 percent to 50 percent as determined by ASTM D 2974. The pH of the compost shall be within the range of 5.5 to 7.0 as determined by ASTM D 2976. The maximum electrical conductivity of composted material shall be 6 ohms/cm. Decomposed Organic Compost shall be mature as determined by US

Composting Council stability test ratings referred to in the Ch 173-350 WAC. The product shall be tested within 6 months of proposed use.

**2.3 ARBORIST WOOD CHIP MULCH**

Clean recycled wood chip from tree-trimming, composting operations or wood reclamation operations and shall not contain elements in quantities that would be detrimental to plant life. The product shall be certified free of all plant parasitic organisms, viable weed seeds, heavy metals or parasitic residues.

**2.4 SEEDING, FERTILIZING, AND MULCHING**

All areas that have been cleared and grubbed, graded, and where restoration is required, shall receive seeding, fertilizing and mulching. These areas shall be leveled, acceptable to the Owner, existing topsoil broken up to a depth of 6 inches and hydroseeded. Graded areas shall receive 6 inches of Class A topsoil prior to hydroseeding. Native materials selected by the Engineer from material excavated for foundations and stockpiled on site shall be used for topsoil.

For those areas in which hydroseeding would be difficult, the Contractor may request approval from the Owner to hand-apply the hydroseeding mix. Approval shall be granted for hand-application only after reviewing and approving the procedure that the Contractor recommends.

Seeding, fertilizing and mulching shall be installed using an approved-type hydroseeder.

The seed mixture shall have the following composition, proportion and quality:

<b>Kind and Variety of Seed in Mixture</b>	<b>Percent By Weight</b>	<b>Minimum Percent of Pure Seed</b>	<b>Minimum Percent of Germination</b>
Colonial Bent Grass (Highland or Astoria)	10%	9.8%	85%
Creeping Red Fescus (Illahee Rainier or Pennlawn)	40%	39.2%	90%
Perennial Rye Grass	30%	29.4%	90%
White Clover (Pre-inoculated)	20%	19.6%	90%
Maximum Percentage of Weed Seed	1.0%		
Maximum Inert and Other Crops	1.0%		

The seed shall be applied at a minimum rate of 120 pounds per acre.



A commercial fertilizer of the following formulation shall be furnished as specified, and all fertilizer shall be premixed prior to use on the job. The fertilizer shall be applied at the rate of 500 lbs. per acre.

<b>Nitrogen (Inorganic) as N<sub>2</sub></b>	<b>Nitrogen (Organic) Ureaformaldehyde</b>	<b>Phosphorous as P<sub>2</sub>O<sub>5</sub></b>	<b>as K<sub>2</sub>O</b>	<b>Potassium lbs/Acre</b>
10%	38%	20%	20%	500

Wood cellulose fiber mulch shall be applied at the rate of 2,000 pounds per acre.

## **2.5 PLANT MATERIALS**

### **A. QUALITY**

Genera, species, and variety; quantity, size, and conditions as shown on the Plans.

## **PART 3 EXECUTION**

### **3.1 PRODUCT DELIVERY, STORAGE, AND HANDLING**

#### **A. DELIVERY**

Deliver fertilizer and soil additives to the site in original unopened containers bearing manufacturer's guaranteed chemical analysis, weight, manufacturer's name, trademark, and conformance with state law.

Protect plant material during delivery to prevent damage to root ball, trunks, stems, or desiccation of leaves.

Transport plants in enclosed trucks. Large trees shall be totally wrapped to prevent damage and windburn. Provide adequate protection so that trunks are not scarred in transport and branches are not broken. Tree trunks shall be wrapped with protective covering prior to handling and loading. Covering shall be removed at the time of plant materials inspection at the job site.

#### **B. HANDLING**

Exercise care in handling, loading, unloading, and storing of plant materials. Plant materials damaged in any way shall be discarded and replaced with undamaged materials.

## C. STORAGE

Protect plant materials from mechanical damage, wind, excessive sun, and drying out. If planting is delayed more than 4 hours after delivery, set plants in shade and keep roots moist by covering with mulch, soil or other acceptable means of retaining moisture.

Protect packaged materials from deterioration during storage.

### 3.2 PERCOLATION TEST

Prior to soil preparation, a percolation test shall be performed. This shall be accomplished by excavating a pit 2 feet in depth within the landscape area. Fill the pit with water and allow to drain for 24 hours. After 24 hours, refill the pit with water. If the time required for the pit to drain completely after being filled the second time is greater than 24 hours, the Contractor shall notify the Owner. The Contractor shall be paid for work required to solve the drainage problem, such as installation drainage sumps at a unit price basis and agreed upon by a Change Order prior to commencement of work.

### 3.3 SEED INSTALLATION

Seeding, fertilizing and mulching shall be installed in conformance with Sections 8-01 and 9-14 of the WSDOT Standard Specifications.

The seed materials will be applied in two applications. The first application shall consist of seed and a non-toxic tracer. The second application shall consist of a homogenous mixture of fertilizer and wood cellulose fiber mulch, and shall be uniformly applied over the seed within 48 hours of the seed application unless otherwise directed by the Owner.

When weather conditions are not conducive to satisfactory results from seeding operations, the Owner may order the work suspended and it shall be resumed only when the desired results are likely to be obtained.

Inspection is required for each area when seeding and fertilizing is complete, and again after mulching is complete.

Areas not receiving a uniform application of seeding at the specified rate as determined by the Engineer shall be reseeded at the Contractor's expense prior to mulching or payment.

### **3.4 SEEDED AREA SOIL PREPARATION**

Verify that planting bed grades are in accordance with those indicated on the Plans before proceeding with work. Verify that soil conditions are satisfactory for soil preparation work.

Prepare soil no closer than 3 feet from existing tree trunks up to 6 inches in diameter; no closer than 4 feet from existing tree trunks up to 12 inches in diameter; no closer than 6 feet from existing tree trunks larger than 12 inches in diameter.

Loosen compacted soils to a depth of 12 inches. Rake and remove all material larger than 1-1/2 inches in diameter.

Place 2 inches of compost over existing soil, mix and till to a depth of 6 inches. This material shall be suitable topsoil from the site or imported material.

### **3.5 LANDSCAPE AREA SOIL PREPARATION**

Verify that planting bed grades are in accordance with those indicated on the Plans before proceeding with work. Verify that soil conditions are satisfactory for soil preparation work.

Prepare soil no closer than 3 feet from existing tree trunks up to 6 inches in diameter; no closer than 4 feet from existing tree trunks up to 12 inches in diameter; no closer than 6 feet from existing tree trunks larger than 12 inches in diameter.

Loosen compacted soils to a depth of 12 inches. Rake and remove all material larger than 1-1/2 inches in diameter.

Place 2 inches of compost over existing soil, mix and till to a depth of 6 inches. Place additional 6 inches of topsoil on top of this throughout all buffer planting areas.

### **3.6 PROTECTION**

All planting materials shall be properly protected against harm from normal weather conditions and the public by the Contractor until Final Acceptance. Maintenance of all the planted areas until Final Acceptance, shall include, but not be limited to, watering, mowing, weeding, and pruning as well as replacement of any plants that appear to be in distress. Tree stakes shall be kept secure at all times. Although planting should occur in spring or fall and when weather conditions are favorable, special planting techniques, defoliating, wilt proofing or spray misting may be required should unseasonable planting conditions occur.

No work shall be performed in, over or adjacent to planting areas without approved protection and safeguards.

Plant losses due to abnormal weather conditions such as, floods, excessive wind, drought, severe freezing or abnormal rains; as determined by the National Weather Service shall not be the responsibility of the Contractor.

### **3.7 WEED CONTROL**

The Contractor shall use extreme care to ensure chemicals remain within the designated areas. The use of chemical herbicides shall require the use of anti-drift and activating agents and a spray pattern indicator, unless otherwise allowed by the Owner.

All applications of post-emergent herbicides shall be made while green and growing tissue is present. Should unwanted vegetation reach the seed stage in violation of these Specifications, the Contractor shall physically remove and bag the seed heads. All physically removed vegetation and seed heads shall be disposed of offsite at no cost to the Owner.

The Contractor shall assume all responsibility for rendering any area unsatisfactory for planting by reason of chemical application. The Contractor shall replace, repair and pay for all damages caused by their negligence to the satisfaction of the Owner prior to final payment.

### **3.8 PEST CONTROL**

The Contractor shall use extreme care to ensure chemicals remain within the designated areas. The use of spray chemical pesticides shall require the use of anti-drift and activating agents and a spray pattern indicator, unless otherwise allowed by the Owner.

The Contractor shall assume all responsibility for rendering any area unsatisfactory for planting by reason of chemical application. The Contractor shall replace, repair and pay for all damages caused by their negligence to the satisfaction of the Owner prior to final payment.

### **3.9 CONSTRUCTION ACCEPTANCE**

Construction acceptance shall be subject to well-established trees, shrubs, groundcover, and seeded areas that fulfill the requirement of the approved Plans. The Contractor shall protect and care for all plantings until fully established and healthy. Care shall include equipment and labor necessary to provide sufficient and continuous watering of all seeded areas until final acceptance.

Final Acceptance of all landscaping work described in this Specification, with the exclusion of possible replacements of plant materials under the Guarantee, shall be made by the Owner to determine 100 percent completion of the Contract work. This review shall be made upon written request to the Owner no less than 48 hours prior to the anticipated date of inspection.

**\*\*\* END OF SECTION \*\*\***

## SECTION 02950

### SITE RESTORATION AND REHABILITATION

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes areas requiring restoration or rehabilitation as shown on the Plans or specified herein, including those areas that shall be graded, restored with hydroseeding or sod, areas restored with concrete sidewalk and driveway, and areas containing certain improvements and landscaping on and along the right-of-way including the adjacent private properties. The work also includes repair and replacement of fencing and other property features impacted construction.

Particular care shall be taken to minimize damage to landscaped areas within and adjacent to construction areas. In the event that construction is to be carried out in landscaped areas, appropriate measures shall be taken to restore such areas to conditions existing prior to construction.

Surface restoration type and location are shown on the Plans.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
02230	Clearing and Grubbing
02300	Earthwork
02740	Hot Mix Asphalt Paving
03300	Cast-In-Place Concrete

#### PART 2 PRODUCTS

##### 2.1 CONCRETE

Concrete for concrete curb and gutter shall meet the requirements of Section 8-04 of the WSDOT Standard Specifications. Concrete for driveway entrances shall meet the requirement of Section 8-06 of the WSDOT Standard Specification. Concrete for sidewalks shall be the requirements of Section 8-14 of the WSDOT Standard Specification.

## **PART 3 EXECUTION**

### **3.1 CONCRETE**

Concrete Curbs and Gutters shall be constructed per WSDOT Standard Specifications Section 8-04. Sidewalks shall be constructed per WSDOT Standard Specifications Section 8-14. Driveway entrances shall be constructed per WSDOT Standard Specification Section 8-06.

Any curb, gutter, sidewalk or driveway entrance damaged, defaced, cracked, chipped, or determined to be of poor workmanship, in the opinion of the Owner, shall be removed, wastehailed and replaced by the Contractor, at the Contractor's expense. Sacking and grinding shall not be considered an acceptable means for repairing unacceptable sections. The Contractor shall further provide verbal and written notice (door hanger) to property owners identifying restricted use of their driveways, sidewalks, etc. This notice must be provided twice: at 1 week prior and again 1 day prior to the work being performed.

At locations where the new sidewalk is to abut existing concrete, saw concrete for a depth of 2 inches and chip the old concrete back to sound material on a straight line, clean the surface, and apply a neat cement paste just prior to pouring the new sidewalk.

Place preformed asphalt expansion joints in the adjacent curb, where the sidewalk ends at a curb, and around posts, poles, or other objects protruding through the sidewalk.

Provide contraction joints transversely to the walks at locations opposite the contraction joints in the curb. These joints shall be 3/16-inch by 1-inch weakened plane joints. They shall be straight and at right angles to the surface of the walk. Walk areas wider than 20 feet shall have longitudinal contraction joints at spacings not to exceed 15 feet.

Place, process, finish, and cure concrete in conformance with the applicable requirements of ACI 614 and this Specification. Where the requirements differ, the higher requirement shall govern.

Broom the surface with a fine-hair broom at right angles to the length of the walk and tool at all edges, joints, and markings. Mark the walks transversely at 5-foot intervals with a joining tool. Upon completion of the finishing, apply an approved curing compound to exposed surfaces. Protect the sidewalk from damage for a period of 7 days.

Driveway access shall be maintained at all times. The Contractor shall use steel plates to bridge entrances or construct entrances in sections in order to protect new driveway entrances and allow access during the curing period.

The driveway entrance, curb and gutter and sidewalk shall be protected against damage or defacement of any kind until acceptance by the Owner. Any driveway entrance not acceptable, in the opinion of the Engineer, because of damage or defacement shall be removed, wastehauled, and replaced by the Contractor at the Contractor's expense. Sacking, grinding, or spot repair shall not be considered an acceptable means for repairing unacceptable sections.

### **3.2 FINISHING AND CLEANUP**

Before acceptance of the Project, all pipes, manholes, catch basins, and other appurtenances shall be cleaned of all debris and foreign material. After all other work on the Project is completed and before final acceptance, the entire roadway, including the roadbed, planting, sidewalk areas, shoulders, driveways, alley and side street approaches, slopes, ditches, utility trenches, and construction areas shall be neatly finished to the lines, grades and cross-sections shown on the Drawings and as hereinafter specified.

In undeveloped areas, the entire area which has been disturbed by the construction shall be shaped so that, upon completion, the area will present a uniform appearance, blending into the contour of the adjacent properties. All other requirements outlined previously shall be met. Slopes, sidewalk areas, planting areas and roadway shall be smoothed and finished to the required cross-section and grade.

Upon completion of the cleaning and dressing, the Project shall appear uniform in all respects. All graded areas shall be true to line and grade as shown on the typical sections and as required by the Owner.

All rocks in excess of 1-inch diameter shall be removed from the entire construction area and shall be disposed of the same as required for other waste material. In no instance, shall the rock be thrown onto private property. Overhang on slopes shall be removed and slopes dressed neatly so as to present a uniform, well sloped surface.

All excess excavated material within the limits of the Project shall be removed entirely. All debris resulting from clearing and grubbing or grading operations shall be removed and disposed.

Drainage facilities, such as inlets, catch basins, culverts, and open ditches, shall be cleaned of all debris resulting from the Contractor's operations.



All pavements and oil mat surfaces, whether new or old, shall be thoroughly cleaned. Existing improvements, such as Portland cement concrete curbs, curb and gutters, walls, sidewalks, and other facilities which have been sprayed by the asphalt cement shall be cleaned to the satisfaction of the Owner.

Castings for manholes, monuments, water valves, lamp poles, vaults, and other similar installations which have been covered with the asphalt material shall be cleaned to the satisfaction of the Owner.

### **3.3 CONSTRUCTION ACCEPTANCE**

The Contractor shall protect and care for all seeded and sodded areas until fully established and healthy. Care shall include equipment and labor necessary to provide sufficient and continuous watering of all seeded areas until final acceptance.

The Contractor shall guarantee landscaping materials and workmanship for a period of 2 years following the date of project acceptance. During the 2-year guarantee period, should any seed areas show signs of failure such as dead or dying areas of grass or bare spots, the Contractor shall repair or replace all deficient areas to the satisfaction of the Owner.

### **3.4 PERMANENT SIGNING AND APPURTENANCES**

During the life of the Contract all existing signs, mailboxes and other appurtenances that are damaged or removed shall be replaced by the Contractor at no additional expense to the Owner.

Existing signs may be temporarily relocated to portable sign stands for convenience of construction, subject to the approval of the Owner. When temporarily installed on posts, the signs shall be located as near as practical to their permanent locations and shall have a minimum vertical clearance above the pavement in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). Private signs and appurtenances shall be removed and provided to the Owner.

All portable sign stands shall be designed to rigidly support the sign in position without creating a hazard to the motorist. Portable sign stands shall be furnished by the Contractor and upon completion of the work shall remain the property of the Contractor and shall be removed from the Project.

All signs, unless specified herein, shall be mounted at a height of 7 feet as measured vertically from the ground (finished grade) to the bottom of the sign.

### **3.5 ADJUSTMENT OF NEW AND EXISTING STRUCTURES TO GRADE**

This work consists of constructing and/or adjusting all new and existing utility structures encountered on the Project to finished grade.

Prior to commencing manhole adjustments, a plywood and visqueen cover, as approved by the Owner, shall be placed over the manhole base and channel to protect them from debris.

The castings shall not be adjusted until the contractor has completed his paving operations. The asphalt concrete pavement around the casting shall be cut and removed to a neat circle, the diameter of which shall not exceed 6 inches from the outside diameter of the casting frame. The casting frame shall be brought up to the desired grade. Adjustment of manholes, catch basins and precast concrete vaults shall be made with the use of concrete adjustment rings or bricks. No iron adjustment rings will be allowed. An approved class of mortar (one part cement to two parts of plaster sand) shall be placed between adjustment rings or bricks and casting frame to completely fill all voids and to provide a watertight seal. No rough or uneven surfaces will be permitted inside or out. Adjustment rings or brick shall be placed and aligned so as to provide vertical sides and vertical alignment of ladder steps (if steps are necessary).

**\*\*\* END OF SECTION \*\*\***

**DIVISION 3**  
**CONCRETE**

## SECTION 03200

### CONCRETE REINFORCEMENT

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes reinforcement and associated items for all concrete, including, but not necessarily limited to: reinforcing steel bars, wire fabric, and accessories for cast-in-place concrete.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
03300	Cast-In-Place Concrete
04200	Masonry

##### 1.3 REFERENCES

This Section references the latest revisions of the following documents:

<u>Reference</u>	<u>Title</u>
ACI 301	Structural Concrete for Buildings
ACI 318	Building Code Requirements for Structural Concrete
ACI SP-66	American Concrete Institute - Detailing Manual
ANSI/ASTM A82	Cold Drawn Steel Wire for Concrete Reinforcement
ANSI/ASTM A185	Welded Steel Wire Fabric for Concrete Reinforcement
ANSI/AWS D1.4	Structural Welding Code for Reinforcing Steel
ASTM A615	Deformed and Plain Billet Steel Bars for Concrete Reinforcement

##### 1.4 SUBMITTALS

Submit in accordance with provisions of Section 01300.

###### A. SHOP DRAWINGS

Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, and supporting and spacing devices.

**B. MANUFACTURER'S CERTIFICATE**

Certify that reinforcing bar and welded wire fabric meet or exceed specified requirements.

Submit certified copies of mill test reports of reinforcement materials analysis.

**1.5 QUALITY ASSURANCE**

Perform Work in accordance with ACI 301.

**1.6 COORDINATION**

Coordinate with placement of formwork, formed openings, and other Work.

**PART 2 PRODUCTS**

**2.1 REINFORCEMENT**

**A. REINFORCING STEEL**

ASTM A615, deformed bars: Grade 40 for #3 bars and smaller, Grade 60 for #4 bars and larger, unless noted otherwise on the Plans.

**B. WELDED STEEL WIRE FABRIC**

ASTM A185 Plain Type; in flat sheets; plain.

**2.2 ACCESSORY MATERIALS**

**A. TIE WIRE**

Minimum 16-gauge annealed type.

**B. CHAIRS, BOLSTERS, BAR SUPPORTS, SPACERS**

Sized and shaped for strength and support of reinforcement during concrete placement conditions including load-bearing pad on bottom where required to prevent vapor barrier puncture.

**C. SPECIAL CHAIRS, BOLSTERS, BAR SUPPORTS, SPACERS  
ADJACENT TO WEATHER EXPOSED CONCRETE SURFACES**

Plastic-coated steel type; size and shape as required.

**D. MECHANICAL BAR SPLICES**

Comply with ACI 318 requirement of minimum tensile strength of 125 percent of specified yield for reinforcement.

Subject to compliance with the requirements and approval of the Engineer, products, which may be incorporated into the work include, but are not limited to, the following:

BAR-LOCK (MBT) Coupler Systems  
“ERICO” REBAR SPLICING

**E. ADHESIVE ANCHORS**

Injection adhesive system shall consist of a dual-cylinder adhesive refill pack, a mixing nozzle, and dispenser. The adhesive shall be formulated to include resin and hardeners.

1. Subject to compliance with the requirements, products which may be incorporated in the work include, but are not limited to, the following:
  - a. HIT RE 500 Injection Adhesive Anchor, Hilti, Inc.
  - b. SET-XP, Simpson Strong Tie, Inc.
  - c. PE1000+, Powers Fasteners, Inc.

**2.3 FABRICATION**

Fabricate concrete reinforcing in accordance with ACI SP-66. Obtain written approval from the Engineer prior to welding reinforcing steel. Weld reinforcement in accordance with ANSI/AWS D1.4.

**PART 3 EXECUTION**

**3.1 PLACEMENT**

Comply with Concrete Reinforcing Steel Institute’s recommended practice for “Placing Reinforcing Bars” for details and methods of reinforcement placement and supports, and as herein specified. Avoiding cutting or puncturing vapor barrier during reinforcement placement and concreting operations.

Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete. Accurately position, support, and

secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal/plastic chairs, runners, bolsters, spacers, and hangers, as required.

Install reinforcing bars with clearance indicated on the Plans. Provide laps as shown and stagger locations to minimize the concentration of multiple reinforcing at joints. Bar lap splicing shall have full contact. Where full contact cannot be achieved, the maximum space between the spliced bars shall not exceed 2 inches. Unless noted otherwise on the Plans, provide two #5 minimum trim bars around all openings and penetrations. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with tie wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

**\*\*\* END OF SECTION \*\*\***

## SECTION 03300

### CAST-IN-PLACE CONCRETE

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes schedules, notes, and details for the construction of cast-in-place concrete structures, landings, equipment piers, housekeeping pads and slabs on grade.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
01310	Project Meetings
01400	Quality Control
03200	Concrete Reinforcement
Division 7	Thermal and Moisture Protection

##### 1.3 REFERENCES

This Section references the latest revisions of the following documents:

<u>Reference</u>	<u>Title</u>
ACI 117	Specifications for Tolerances for Concrete Construction and Materials and Commentary
ACI 212.3	Chemical Admixtures for Concrete
ACI 301	Specifications for Structural Concrete
ACI 304	Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305	Hot Weather Concreting
ACI 306	Cold Weather Concreting
ACI 309	Guide for Consolidation of Concrete
ACI 318	Building Code Requirements for Structural Concrete and Commentary
ACI 350	Code Requirements for Environmental Engineering Concrete Structures and Commentary
ACI 347	Guide to Formwork for Concrete
ACI 350.1	Tightness Testing of Reinforced Engineering Concrete Structures and Commentary
ASTM C31	Making and Curing Concrete Test Specimens in the Field
ASTM C33	Concrete Aggregates
ASTM C39	Compressive Strength of Cylindrical Concrete Specimens



ASTM C42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C94	Ready-Mixed Concrete
ASTM C131	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C143	Slump of Hydraulic Cement Concrete
ASTM C150	Portland Cement
ASTM C172	Sampling Freshly Mixed Concrete
ASTM C173	Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Air-Entraining Admixtures for Concrete
ASTM C309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Chemical Admixtures for Concrete
ASTM C535	Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C618	Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C881	Epoxy-Resin-Base Bonding Systems for Concrete

#### **1.4 SUBMITTALS**

Submittals shall be in accordance with Section 01300.

##### **A. GENERAL**

The submittal for each included concrete mix shall include, as a complete package, the following as defined below:

1. Concrete Mix Design
2. Certified Test Results
3. Sieve Analysis
4. Product Data

An incomplete concrete mix submittal package may render a rejection of the mix or could delay the review process.

B. CONCRETE MIX DESIGN

Submit mix design for the proposed mix to be used on the Project, indicating components, and proportions by weight, including any admixtures. Mix design shall state chloride content. Mix designs to be provided are:

1. Unspecified Concrete
2. Lean Concrete
3. Cement Grout

C. CERTIFIED TEST RESULTS

Submit laboratory test results indicating compressive strength of concrete in compliance with requirements specified herein and in accordance with ACI 301.

D. SIEVE ANALYSIS

Submit sieve analysis for proposed coarse and fine aggregates indicating components, source, gradation, and WSDOT aggregate source approval report, including WSDOT Aggregate Source ID.

E. PRODUCT DATA

Provide product data on all proposed admixtures, accessories, and embedded items to be used on the Project, including, but not limited to:

1. Cement; source and type
2. Air Entraining Agent
3. Water Reducing Admixtures
4. Pozzolans
5. Bonding Agents
6. Curing Compounds/Floor Hardeners
7. Non-Shrink Grout; Non-metallic and Metallic
8. Waterstops

9. Plastic Joint Formers
10. Vapor Barriers
11. Stair Nosings

For admixtures other than those proposed for air entrainment, submit a letter from the manufacturer describing the benefits of its use for the project and effect of its use on the properties of the concrete. Product data shall expressly state admixtures are chloride free, or the manufacturer shall submit a letter certification stating the same.

**F. MATERIAL DELIVERY TICKETS**

Provide copies of all concrete and grout material delivery tickets for the Project to the Engineer.

**1.5 QUALITY ASSURANCE**

Perform work in accordance with ACI 301. Acquire cement and aggregates from same source for all work performed on the Project. Conform to ACI 305 when concreting during hot weather. Conform to ACI 306 when concreting during cold weather. Provide or coordinate field and laboratory testing as described later in this Section and under provisions of Section 01400.

**1.6 COORDINATION**

Coordinate work in accordance with provisions of Section 01310. Coordinate the placement of embedded items with erection of concrete formwork and placement of form accessories.

**PART 2 PRODUCTS**

**2.1 FORM MATERIALS**

**A. FORMS FOR EXPOSED FINISH CONCRETE**

Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on the Plans.

**B. FORMS FOR UNEXPOSED FINISH CONCRETE**

Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

**C. FORMS FOR CYLINDRICAL COLUMNS AND SUPPORTS**

Metal, fiberglass reinforced plastic, or paper or fiber tubes. Construct paper or fiber tubes of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist loads imposed by wet concrete without deformation.

**D. FORM COATINGS**

Provide commercial formulation form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

**E. FORM TIES**

Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units, which will leave no metal closer than 1-1/2 inches to surface. Unless noted otherwise on Plans, provide ties with plastic cone devices which, when removed, will leave holes not larger than 1-inch diameter in concrete surface.

**2.2 CONCRETE MATERIALS**

**A. CEMENT**

ASTM C150, Type II – Moderate or Type I - II. Use one brand of cement throughout the project, unless otherwise approved by the Engineer. Provide low alkali cement where Alkali-Silica Reaction (ASR) mitigation measures are required by WSDOT Aggregate Source Approval.

**B. FINE AND COARSE AGGREGATES**

Comply with ASTM C33. Provide aggregates from a single source. Coarse aggregate shall be size designation 67 (Nominal size 3/4-inch to No. 4 sieve) for all concrete. Aggregates shall show a loss of weight not exceeding 35 percent after 500 revolutions in a Los Angeles wear machine, when tested in accordance with ASTM C131 or ASTM C535. Aggregates shall be from a WSDOT approved source.

C. WATER

Clean, potable, and not detrimental to concrete, in compliance with ASTM C94.

**2.3 ADMIXTURES**

Except for air entrainment, use of all other admixtures used shall be subject to approval of the Engineer and at no additional cost to the Owner. Only admixtures expressly stated by the manufacturer as being chloride-free shall be used. Subject to compliance with requirements, products, which may be incorporated into the work include, but are not limited to, the following:

A. AIR ENTRAINMENT

ASTM C260 certified by manufacturer to be compatible with other proposed admixtures.

Master Builders MB AE 90 or MICRO-AIR  
Sika AER  
W.R. Grace Daravair or Darex Series

B. WATER REDUCING ADMIXTURE

ASTM C494 Type A.

Master Builders PolyHeed  
Sika Plastocrete 161  
W.R. Grace WRDA Series

C. ACCELERATING ADMIXTURE

ASTM C494 Type C.

Master Builders Pozzoloth NC534  
Sika Plastocrete 161 FL  
W.R. Grace Polarset or DCI

D. WATER REDUCING, RETARDING ADMIXTURE

ASTM C494, Type D.

Master Builders Pozzoloth 100XR  
Sika Plastiment

W.R. Grace Daratard Series

E. WATER REDUCING, ACCELERATING ADMIXTURE

ASTM C494, Type E.

Euclid Chemical Co. Accelguard 80  
Master Builders Pozzutec 20  
W.R. Grace Daracel

F. HIGH RANGE WATER REDUCER (HRWR)

ASTM C494, Type F.

Master Builders Rheobuild 1000/3000 FC  
Sika Sikament 10 ESL  
W.R. Grace ADVA 100

G. HIGH RANGE WATER REDUCER AND RETARDER

ASTM C494, Type G.

Master Builders Pozzolith 440N  
W.R. Grace Daracem-100

H. POZZOLAN

ASTM C618 - CLASS F, with a CaO maximum content of 10 percent.

**2.4 ACCESSORIES**

A. BONDING AGENT

ASTM C881, Type I and II, Grade 2, Class C, Epoxy Resin. Subject to Contract requirements, provide one of the following or equal:

Sika Armatec 110  
Conspec SpecBond 100  
W.R. Meadows Sealtight Rezi Weld 1000

B. CURING COMPOUND/CHEMICAL FLOOR HARDENER

ASTM C309, Type I, Class A and B. Subject to Contract requirements, provide one of the following or equal:

W.R. Meadows Sealtight 1100-Clear  
Conspec RX cure  
Chemrex, Inc. Masterkure  
Burke Spartan-Cote WB

C. GENERAL PURPOSE NON-SHRINK NON-METALLIC GROUT

Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi (17 Mpa) in 48 hours and 7,000 psi (48 Mpa) in 28 days. Subject to Contract requirements, provide one of the following or equal:

Sika SikaGrout 212  
Conspec 100 Non Metallic  
Chemrex, Inc. Masterflow 928 Grout  
W.R. Meadows Sealtight 588

D. WATERSTOPS

Provide waterstop of type and size at construction joints and other joints as indicated on the Plans.

1. PVC (Polyvinyl Chloride)

Serrated (ribbed), 3/8 of an inch minimum thickness for 6 inches and larger and 3/16 of an inch minimum thickness for 4 inches. Comply with Corps of Engineers CRD-C-572. No reclaimed PVC will be allowed in waterstop.

Subject to compliance with requirements, manufacturers offering products, which may be incorporated in the work, include, but are not limited to, the following:

Greenstreak  
Vinylex Corporation  
W.R. Meadows

2. Cold Joint Waterstop

Install where shown on the Plans or at locations approved by the Engineer. Cold joint waterstop shall be certified by the manufacturer to be compatible for use in wastewater (sewage) containment structures. Unless otherwise shown in the Plans, size shall be 1-inch thick and 1-inch wide.

Subject to compliance with requirements, manufacturers offering products, which may be incorporated in the work, include, but are not limited to, the following:

Hydrotite, Greenstreak

E. PLASTIC JOINT FORMER

Provide and install, per manufacturer's recommendations, where shown on the Plans or at locations approved by the Engineer. Subject to compliance with requirements, manufacturers offering products, which may be incorporated in the work, include, but are not limited to, the following:

Greenstreak  
Vinylex Corporation  
W.R. Meadows

F. STAIR NOSINGS

American Safety Tread Co., Inc., Style 816 with steel wing anchors with nuts and anchor bolts or equal.

G. VAPOR BARRIER

Six-mil fabric reinforced plastic film.

**2.5 CONCRETE MIX**

A. GENERAL

Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method is used, use an independent testing facility acceptable to the Engineer for preparing and reporting proposed mix designs. The testing facility shall not be the same as that used for field quality control testing.



The maximum water soluble chloride ion content, expressed as a percent of the cement, contributed from all ingredients of the concrete mix, including water, aggregates, cementitious materials, and admixtures, shall not exceed 0.10 percent. Pozzolans may be counted as part of the total cementitious material in the concrete mix design. The cementitious material is the “minimum cement content” specified in the mix design for each type of concrete. When pozzolans are used as part of this “cement content,” the minimum content shall be 15 percent by weight of the total cementitious materials (Portland cement and pozzolans) and not more than 20 percent.

Where ASR mitigation measures are required by WSDOT, provide a minimum of 15 percent pozzolan included in the cementitious material in the design mix.

## B. MIX DESIGNS

Provide normal weight concrete with the following properties, unless noted otherwise on the Plans.

1. Unspecified Concrete of general use in structures, sidewalks, and where no specific class of concrete is designated.

Structural concrete of general use in liquid containment structures.

Minimum compressive strength @ 28 days:	4,000 psi
Minimum cement content:	6 sacks per cubic yard
Maximum water cement ratio by weight:	0.45
Nominal coarse aggregate size:	1-1/2" to No. 4 (size designation 467)

2. Lean Concrete

Concrete for pipe thrust blocks or for use as noted as “Concrete Fill” on the Plans.

Minimum compressive strength @ 28 days:	2,500 psi
Minimum cement content:	5 sacks per cubic yard

3. Cement Grout

Material for filling guard posts, grouting of clarifier bottoms or for other uses as shown on the Plans. Cement grout shall be sand and cement only and shall not contain coarse aggregate.

Minimum compressive strength @ 28 days:	2,500 psi
Minimum cement content:	6.5 sacks per cubic yard
Maximum water cement ratio by weight:	0.54

## C. ADMIXTURES

### 1. Air Entrainment

Use air-entraining admixture complying with ASTM C260 in all exterior exposed concrete. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement in accordance with ASTM C173 or C231 having total air content with a tolerance of plus or minus 1 percent within the following limits:

- 5.5 percent for 1.5 inch max. coarse aggregate size
- 6.0 percent for 1.0 inch max. coarse aggregate size
- 7.0 percent 0.50 inch or less max. coarse aggregate size

### 2. Other Admixtures

Use of all other admixtures shall be subject to the approval of the Engineer, and shall be in accordance with ACI 212.3 and Manufacturer's recommendations. Only admixtures stated by the manufacturer to be chloride free shall be used.

## D. SLUMP LIMITS

Proportion and design mixes to result in concrete slump (1 inch  $\pm$  of the maximum) at the point of placement in accordance with ASTM C143 as follows:

Ramps, slabs, and sloping surfaces: 3 inches.

Reinforced foundation systems: 3 inches.

Other concrete: 4 inches.

Concrete containing HRWR admixture (super-plasticizer): Not more than 8 inches after addition of HRWR to site-verified 2- to 3-inch slump concrete.

## E. CONCRETE MIXING

Comply with requirements of ASTM C94, and as herein specified.

During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than that specified in ASTM C94 may be required.

## **PART 3 EXECUTION**

### **3.1 GENERAL**

Coordinate the installation of joint materials and vapor barriers with placement of forms and reinforcing steel.

### **3.2 FORMS**

Design, erect, support, brace, and maintain formwork to support vertical and lateral, static, and dynamic loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.

Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.

Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the work. Use selected materials to obtain required finishes. Solidly butt joints and provide back up at all joints to prevent leakage of cement paste.

Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast-in-place concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Provide Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

Chamfer all exposed corners and edges and other areas shown on the Plans, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

### **3.3 JOINTS AND WATERSTOPS**

#### **A. CONSTRUCTION JOINTS**

Locate and install construction joints where indicated, or locate so as not to impair strength and appearance of the structure, as acceptable to the Engineer. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints, except as otherwise shown on the Plans.

#### **B. WATERSTOPS**

Provide waterstops in construction joints of all water containment structures and where shown on the Plans. Install waterstops to form continuous diaphragm in each joint in accordance with manufacturer's recommendations. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions and recommendations. All waterstops shall be tied into place using hog rings and/or tie wire to keep the waterstop from moving during placement of concrete. Provide manufacturer's written warranty for all waterstop installations.

#### **C. ISOLATION JOINTS IN SLABS-ON-GRADE**

Unless otherwise noted, construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as shown on the Plans.

Joint filler and sealant materials are specified in Division 7.

D. SLAB (CONTROL) JOINTS

Construct joints in slabs-on-grade as shown on the Plans. Use saw cuts 1/8 of an inch wide x 1/4 of the slab depth or inserts 1/4-inch wide x 1/4 of the slab depth.

E. PREMOLDED (CONTROL) JOINTS

Insert premolded plastic, hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.

F. EDGE FORMS AND SCREED STRIPS FOR SLABS

Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

**3.4 INSTALLATION OF EMBEDDED ITEMS:**

A. GENERAL

Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use installation drawings, diagrams, instructions, and directions provided by suppliers of items to be embedded.

B. CLEANING AND TIGHTENING

Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

C. REGLETS

Install reglets to receive top edge of foundation sheet waterproofing, and to receive thru-wall flashing as shown at lintels, relieving angles, and other conditions.

### **3.5 VAPOR BARRIER INSTALLATION**

Following leveling and tamping of granular base material for slabs on grade, place vapor barrier sheeting with longest dimension parallel with direction of concrete placement.

Lap joints a minimum of 6 inches and seal with appropriate approved tape. After placement of vapor barrier, cover with sand material and compact to depth as shown on the Plans.

### **3.6 PLACING REINFORCEMENT**

See Section 03200.

### **3.7 PREPARATION OF FORM SURFACES**

Clean reused forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

Thin form coating compounds only with thinning agent of type, amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

### **3.8 PREPARATION OF EXISTING CONCRETE SURFACES**

The Contractor shall bush hammer all existing concrete surfaces that are to have new concrete cast against them. Apply epoxy bonding agent prior to placing concrete.

### **3.9 CONCRETE PLACEMENT**

#### **A. GENERAL**

Comply with ACI 304 and as herein specified.

Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Apply temporary protective covering to lower 2 feet of

finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during concrete placement.

#### B. PLACING CONCRETE IN FORMS

Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

#### C. PLACING CONCRETE SLABS

Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations. Maintain reinforcing in proper position during concrete placement operations.

#### D. COLD WEATHER PLACING

Protect concrete work from physical damage or reduced strength, which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

When air temperature has fallen to or is expected to fall below 40 degrees F (4 degrees C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than

50 degrees F (10 degrees C), and not more than 80 degrees F (27 degrees C) at point of placement.

Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

#### E. HOT WEATHER PLACING

When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F (32 degrees C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is at Contractor's option.

Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed. Upon approval, water-reducing retarding admixture (Type D) may be used when required by high temperatures, low humidity, or other adverse placing conditions.

### **3.10 FINISH OF FORMED SURFACES**

Provide smooth form finish for all formed concrete surfaces exposed-to-view including all surfaces exposed to water or wastewater, or that are to be covered with a coating material applied directly to the concrete, or a covering material applied directly to concrete, such as veneer plaster, painting, or other similar type of system.

Provide smooth form finish for surfaces to be waterproofed or dampproofed. Surfaces must comply with recommendations of the manufacturer of the product being utilized.

Provide rough form finish for formed concrete surfaces not exposed-to-view in the finished work or by other construction, unless otherwise indicated.



A. SMOOTH FORM FINISH

This is to be the as-cast concrete surface obtained utilizing selected form facing material, arranged orderly and symmetrically with a minimum of seams, and as specified herein.

Repair and patch tie holes and defective areas, with all fins or other projections completely removed and smoothed, by one of the following methods:

1. Provide smooth rubbed finish to concrete surfaces after form removal. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.
2. Provide grout "sacked" cleaned finish. The sacking grout shall be one part Portland cement to 1-1/2 parts fine sand by volume, and mixed with water to consistency of thick paint. Proprietary additives such as epoxy bonding agents or adhesives may be used at Contractor's option. Blend standard Portland cement and white Portland cement, amounts to be determined by trial patches, so that final color of dry grout matches adjacent surfaces. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep sacked surfaces damp by fog spray or other acceptable method so surfaces do not dry out.

B. ROUGH FORM FINISH

This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/8 of an inch in height rubbed down or chipped off. All "bug holes" exceeding 1/2 inch in diameter and exceeding 1/4-inch depth shall be repaired or filled in.

C. RELATED UNFORMED SURFACES

At tops of walls, horizontal offsets, and similar unformed surfaces occurring at adjacent formed surfaces, continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

## D. TOLERANCES FOR FORMED SURFACES

1. Variations from the plumb:
  - a. In the lines and surfaces of columns, pier, walls and in arises In any 10 feet of length – 1/4 inch. Maximum for entire length – 1 inch
  - b. For exposed corner columns, control-joint grooves, and other conspicuous lines In any 20 feet of length – 1/4 inch. Maximum for entire length – 1/2 inch
2. Variations from level or from the grades indicated on the Plans:
  - a. In slab soffits, ceilings, beam soffits, and in arises, measured before removal of supporting shores In any 10 feet of length – 1/4 inch. In any bay or opening, or in any 20 feet of length – 3/8 of an inch. Maximum for entire length – 3/4 inch
  - b. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines In any bay or opening, or in any 20 feet of length – 1/4 inch. Maximum for entire length – 1/2 inch
3. Variations in the linear building lines from the established position in plan view In 20 feet of length – 1/2 inch. Maximum for entire length – 1 inch
4. Variations in distance between walls, columns and partitions In any 10 feet of distance – 1/4 inch. In any bay or opening – 1/2 inch. Maximum total variation – 1-inch.
5. Variations in the sizes and locations of sleeves, floor openings and wall openings Minus – 1/4 inch  
Plus – 1/2 inch

- |    |  |   |
|----|--|---|
| 6. | Variations in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls    | Minus – 1/4 inch<br>Plus – 1/2 inch   |
| 7. | Variations in footings:  |   |
| a. | Variation from dimensions on Plans when formed or plus 3-inches when placed against unformed excavations | Minus – 1/2 inch<br>Plus – 2 inches   |
| b. | Misplacement of eccentricity   | 2 percent of the footing width in the direction of the misplacement, but not more than 2 inches |
| c. | Reduction in thickness of specified thickness  | Minus – 5 percent   |
| 8. | Variations in steps:   |   |
| a. | In a flight of stairs  | Riser – 1/8 of an inch<br>Tread – 1/4 inch  |
| b. | In consecutive steps   | Riser – 1/16 of an inch<br>Tread – 1/8 of an inch   |

### 3.11 MONOLITHIC SLAB FINISHES:

#### A. SCRATCH FINISH

Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping, including grout finishes where indicated on plans, or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated. Slope surfaces uniformly to floor drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms, or rakes.

B. FLOAT FINISH

Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

C. TROWEL FINISH

Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks and uniform in texture and appearance. Grind smooth surface defects that would telegraph up through applied floor covering system.

D. TROWEL AND FINE BROOM FINISH

Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

E. NON-SLIP BROOM FINISH

Apply non-slip broom finish to exterior concrete platforms, landings, steps, and ramps, sidewalks and elsewhere as indicated. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Owner before application.

F. CHEMICAL-HARDENER FINISH

Apply chemical-hardener finish to interior exposed concrete floors and steps, unless noted otherwise. Apply liquid chemical-hardener after complete curing and drying of the concrete surface. Evenly apply each coat, and allow 24 hours for drying between coats. Apply proprietary chemical hardeners, in accordance with manufacturer's printed instructions. After final coat of chemical-hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

G. TOLERANCES FOR MONOLITHIC SLAB FINISHES

The flatness of the concrete shall be carefully controlled and the tolerances shall be measured by the straight edge system as specified in paragraph 4.5.7 of ACI 117, using a 10-foot straight edge, within 72 hours after floor slab installation and before shores and/or forms are removed. The tolerances listed below shall be met at any and every location at which the straight edge can be placed.

Bullfloated	1/2 inch
Float Finish	3/16 inch
Trowel Finish	1/8 inch
Straightedges	5/16 inch

**3.12 CONCRETE CURING AND PROTECTION**

A. GENERAL

Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep concrete continuously wet for not less than 7 days. Begin final curing procedures immediately following initial curing and before concrete has dried out. Continue final curing for at least 7 days in accordance with ACI 301 curing methods. Avoid rapid drying of concrete at the end of final curing period.

B. CURING METHODS

Perform curing of concrete by use of curing and sealing compound, by moist curing, by moisture-retaining cover curing, or by combinations thereof, as herein specified.

Provide moisture curing by the following methods. Keep concrete surface continuously wet by covering with water, or provide continuous water-fog spray.

Covering concrete surface with absorptive cover, thoroughly saturating cover with water and keeping continuously thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.

Provide moisture-cover curing as follows: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in wide as practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

Provide curing and sealing compound to exposed interior slabs and to exterior slabs, walls, sidewalks, and curbs, as follows:

Apply curing and sealing compound to concrete slabs and walls as soon as initial curing operations are complete or immediately after the forms have been stripped (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Completely cover the concrete surfaces with curing and sealing compound. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair any damage during curing period.

Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to the Engineer.

#### C. CURING FORMED SURFACES

Cure formed concrete surfaces, including undersides of beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period and until forms are removed. When forms are removed, continue curing by methods specified above, as applicable.

#### D. CURING UNFORMED SURFACES

Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of an appropriate curing method.

Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture retaining cover.

### **3.13 SHORES AND SUPPORTS**

#### **A. GENERAL**

Comply with ACI 347 for shoring, and as herein specified. Extend shoring from ground to roof for structures four stories or less, unless otherwise permitted. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to safely support work without excessive stress or deflection.

Keep reshores in place a minimum of 15 days after placing upper tier, and longer if required, until all concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

#### **B. REMOVAL OF FORMS**

Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F (10 degrees C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

Formwork supporting weight of concrete, such as beam soffits, joints, suspended slabs, and other structural elements, may not be removed in less than 14 days and until concrete has attained 70 percent of the design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens, representative of concrete location or members.

Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

### **3.14 REUSE OF FORMS**

Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Provide new form facing material. Apply new form coating compound as specified for new formwork prior to reuse of forms.

When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use “patched” forms for exposed concrete surfaces, unless approved by the Engineer and acceptable to the Owner.

### **3.15 MISCELLANEOUS CONCRETE ITEMS**

#### **A. FILLING-IN**

Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work. Fill-in all form tie holes and other forming system holes with non-shrink grout.

#### **B. CURBS**

Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

#### **C. BASE PLATE, EQUIPMENT BASES AND FOUNDATIONS**

Provide machine and equipment bases (housekeeping pad/pier) and foundations, as shown on the Plans. Set anchor bolts for machines and equipment with template at correct elevations, complying with certified diagrams or templates of manufacturers furnishing machines and equipment.

Provide 4-inch-high, square or rectangular concrete pad around all conduits and small diameter pipes that penetrate through floor slabs.

Provide leveling grout under base plates and equipment frames using non-metallic, non-shrink grout. Minimum thickness for leveling grout shall be 1/2 inches unless noted otherwise on the Plans or specified by equipment manufacturer.

#### **D. STAIR NOSINGS**

Provide stair nosings at all exterior cast-in-place concrete stairs or steps. The stair nosings shall be installed in accordance with the manufacturer’s written instructions.



### **3.16 CONCRETE SURFACE REPAIRS**

#### **A. PATCHING DEFECTIVE AREAS**

Repair and patch defective areas immediately after removal of forms. Cut out honeycomb, rock pockets, voids or bugholes over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. For water and wastewater containment structures, utilize an epoxy resin bonding agent. Place patching mortar after bonding compound has dried.

For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

#### **B. REPAIR OF FORMED SURFACES**

Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of the Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, bug holes, honeycomb, rock pockets; fins and other discolorations that cannot be removed by cleaning. Flush out form tie holes and form bolt holes, fill with non-shrink grout, or precast concrete cone plugs or rubber plugs secured in place with bonding agent or epoxy adhesive.

Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. All repairs shall be approved by the Engineer. If defects cannot be repaired, the Contractor shall remove and replace the concrete.

#### **C. REPAIR OF UNFORMED SURFACES**

Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.

Repair finished unformed surfaces that contain defects, which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01 inches wide or which penetrate to reinforcement or

completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to the Engineer.

Repair defective areas, except random cracks and single holes not exceeding 1-inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3 inches of clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cutout holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding agent has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

Perform structural repairs with prior approval of the Engineer for method and procedure, using specified epoxy adhesive and mortar. Repair methods not specified above may be used, subject to approval of the Engineer. If acceptable repairs cannot be made, the Contractor shall remove and replace the concrete at no cost to the Owner.

### 3.17 QUALITY CONTROL TESTING DURING CONSTRUCTION

#### A. GENERAL

Sampling and testing for quality control during placement of concrete shall include the following:

1. Sampling Fresh Concrete

ASTM C172, except modified for slump to comply with ASTM C94.

2. Slump

ASTM C143: one test at point of discharge for each day's placement of each type of concrete; additional tests when concrete consistency seems to have changed.

3. Air Content

ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure method for normal weight concrete; one for each day's placement of each type of air-entrained concrete.

4. Concrete Temperature

Test hourly when air temperature is 40 degrees F (4 degrees C) and below, and when 80 degrees F (27 degrees C) and above; and each time a set of compression test specimens is made.

5. Compression Test Specimen

ASTM C31; one set of four standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

6. Compressive Strength Tests

ASTM C39; one set for each day's placement exceeding 5 cubic yards plus additional sets for each 50 cubic yards over and above the first 25 cubic yards of each concrete class placed in any 1 day;

one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

When total quantity of a given class of concrete is less than 50 cubic yards, Engineer may waive strength test if, in their judgment, adequate evidence of satisfactory strength is provided.

When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

Test results will be reported in writing to Engineer and Contractor within 24 hours after testing. FAX of test results is acceptable; however, mailing hard copies of test results is also required. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

7. Nondestructive Testing

Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection of concrete.

8. Additional Tests

The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in a structure, as directed by the Owner. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for cost of such tests when unacceptable concrete is verified.

**\*\*\* END OF SECTION \*\*\***



**B. DELIVERY TICKETS**

Provide copies of delivery tickets to the Owner.

**1.5 DELIVERY AND HANDLING**

Comply with requirements of ASTM C94.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

**A. PORTLAND CEMENT**

Type I, II, or III comply with ASTM C150 or State of Washington, Standard Specifications for Road, Bridge, and Municipal Construction Article 9-01, Current Edition.

**B. FLY ASH (POZZOLAN)**

ASTM C618, Class F or Class C.

**C. AGGREGATES**

ASTM C33 or State of Washington, Standard Specifications for Road, Bridge and Municipal Construction, Current Edition, Articles 9-03.1 or 9-03.14.

**D. WATER**

Clean, potable and free from oil or other contaminants.

**E. ADMIXTURES**

State of Washington, Standard Specifications for Road, Bridge and Municipal Construction, Current Edition, Article 9-23.6.







**DIVISION 4**

**MASONRY**

## SECTION 04200

### MASONRY

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes masonry construction as indicated on the Plans and schedules. The types of masonry work include but are not limited to the following: Concrete masonry units (CMU) and brick masonry, notes and details to show size and location of units and typical connections for installation and construction of units.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
01400	Quality Control
03200	Concrete Reinforcement
03300	Cast-in-Place Concrete

##### 1.3 REFERENCES

This Section references the latest revisions of the following documents:

<u>Reference</u>	<u>Title</u>
ACI SP-66	ACI Detailing Manual
ASTM A82	Steel Wire, Plain, for Concrete Reinforcement
ASTM C67	Sampling and Testing Brick and Structural Clay Tile
ASTM C90	Load-Bearing Concrete Masonry Units
ASTM C140	Sampling and Testing Concrete Masonry Units and Related Units
ASTM C144	Aggregate for Masonry Mortar
ASTM C150	Portland Cement
ASTM C207	Hydrated Lime for Masonry Purposes
ASTM C404	Aggregates for Masonry Grout
ASTM C476	Grout for Masonry
ASTM C578	Rigid, Cellular Polystyrene Thermal Insulation
ASTM C780	Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM C1363	Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus

IMIAC

International Masonry Industry All-Weather Council:  
Recommended Practices and Guide Specifications for Cold  
Weather Masonry Construction

#### **1.4 SUBMITTALS**

Submittals shall be in accordance with Section 01300.

##### **A. SHOP DRAWINGS**

Submit shop drawings for fabrication, bending, and placement of reinforcing bars. Comply with ACI SP-66.

##### **B. PRODUCT DATA**

Submit manufacturer's product data for each type of masonry unit, accessory, and other types of manufactured products. Unless noted otherwise on the plans, provide a color palette of at least six colors for color selection by Owner.

##### **C. CERTIFICATES**

Submit manufacturer's certificate certifying that each product meets or exceeds specified requirements.

#### **1.5 QUALITY ASSURANCE**

##### **A. QUALIFICATIONS**

###### **1. Installer**

Company specializing in performing the work specified in this Section shall have minimum 5 years of documented experience.

##### **B. SINGLE SOURCE RESPONSIBILITY**

Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

Obtain mortar ingredients of uniform quality, including color for exposed masonry, from manufacturer for each cementitious component and from one source and producer for each aggregate.

## C. TESTING

Test the following materials by the methods indicated:

### 1. Concrete Masonry Units (CMU)

Test each type, class, and grade of concrete masonry unit per ASTM C140.

### 2. Mortar

Test each mortar type per ASTM C780.

## 1.6 DELIVERY, STORAGE, AND HANDLING

Deliver masonry materials to project in undamaged condition. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, or other causes.

Store cementitious materials off ground, under cover and in dry location. Store aggregates where grading and other required characteristics can be maintained. Store masonry accessories including metal items to prevent deterioration and accumulation of dirt.

## 1.7 PROJECT CONDITIONS

### A. PROTECTION OF WORK

During erection, cover top of walls with waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.

### B. STAINING

Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Immediately remove grout or mortar in contact with such masonry.

Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.

Protect sills, ledges, and projections from droppings of mortar.

### C. COLD WEATHER PROTECTION

Do not lay masonry units that are wet or frozen. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch. Remove masonry damaged by freezing conditions.

Perform the following construction procedures while masonry work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout.

For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected within 10 degrees F (6 degrees C).

Range: 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C)

Mortar: Heat mixing water to produce mortar temperature between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C).

Grout: Follow normal masonry procedures.

Range 32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C)

Mortar: Heat mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C); maintain temperature of mortar on boards above freezing.

Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in-place grout temperature of 70 degrees F (21 degrees C) at end of workday.

Range: 25 degrees F (-4 degrees C) to 20 degrees F (-7 degrees C)

Mortar: Heat mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C); maintain temperature of mortar on boards above freezing.

Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in-place grout temperature of 70 degrees F (21 degrees C) at end of workday.

Heat both sides of walls under construction using salamanders or other heat sources.

Use windbreaks or enclosures when wind is in excess of 15 mph.

20 degrees F (-7 degrees C) and below:

Mortar: Heat mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C); maintain temperature of mortar on boards above freezing.

Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in-place grout temperature of 70 degrees F (21 degrees C) at end of workday.

Masonry Units: Heat masonry units so that they are above 20 degrees F (-7 degrees C) at time of laying.

Provide enclosure and auxiliary heat to maintain an air temperature of at least 40 degrees F (4 degrees C) for 24 hours after laying units.

Do not heat water for mortar and grout above 160 degrees F (71 degrees C).

Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air

temperatures except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.

Range: 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C)

Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.

Range: 32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C)

Completely cover masonry with weather-resistant membrane for at least 24 hours.

Range: 25 degrees F (0 degrees C) to 20 degrees F (-7 degrees C)

Completely cover masonry with weather-resistant insulating blankets or similar protection for at least 24 hours, 48 hours for grouted masonry.

20 degrees F (-7 degrees C) and below:

Except as otherwise indicated, maintain masonry temperature above 32 degrees F (0 degrees C) for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry, maintain heated enclosure to 40 degrees F (4 degrees C) for 48 hours.

## **PART 2 PRODUCTS**

### **2.1 CONCRETE MASONRY UNITS**

#### **A. GENERAL**

Comply with referenced standards and other requirements indicated, applicable to each form of concrete masonry unit required. Provide special shapes where required for lintels, corners, jambs, sash control joints, headers, bonding and other special conditions. Provide square-edged units for outside corner, except where indicated as bullnose.

All material for exterior block walls shall contain the manufacturer's recommended amount of the Dry Block System Admixture for water repellency.

All mortar for exterior block walls shall contain the recommended amount of the Dry Block Mortar Admixture for water repellency and to assure proper bond strength.

Provide units complying with characteristics indicated for grade, type, face size, exposed face, and weight classification.

**B. HOLLOW LOAD-BEARING BLOCK UNITS**

ASTM C90, Grade N, Type I, moisture controlled, medium weight (density shall exceed 110 pcf).

1. Size

Unless noted otherwise on the Plans, provide manufactured standard units with nominal face dimensions 16 inches long by 8 inches tall (15-5/8 inches x 7-5/8 inches actual) by thickness shown on the Plans.

2. Color and Pattern

Interior Wall Units: Smooth faced, natural color.

Exterior Wall Units: Split faced, color selection by owner.

Provide color palette of at least six colors for Owner selection.

**2.2 MORTAR AND GROUT MATERIALS**

**A. PORTLAND CEMENT**

ASTM C150, Type I, except Type III may be used for cold weather construction. Provide natural color or white cement as required to produce required mortar color. Mortar color shall coordinate with block color. Provide mortar color options to the Owner for selection.

**B. HYDRATED LIME**

ASTM C207, Type S.

**C. AGGREGATE FOR MORTAR**

ASTM C144.



D. AGGREGATE FOR GROUT

ASTM C404.

E. ADMIXTURES

Comply with Section 03300.

Dry Block Mortar Admixture.

F. WATER

Clean, potable and free of oils.

**2.3 REINFORCEMENT AND ANCHORAGE**

A. REINFORCING BARS

Comply with Section 03200.

B. SINGLE WYTHE JOINT REINFORCEMENT

Truss or Ladder type; hot dip galvanized after fabrication cold-drawn steel conforming to ASTM A82, 3/16 of an inch (4.8 mm) side rods with 3/16 of an inch (4.8 mm) cross ties; manufactured by National Wire, or equal.

**2.4 FLASHINGS**

A. COPPER/KRAFT PAPER FLASHINGS

3-oz/sq. ft. (915-g/sq. m) sheet copper bonded to fiber-reinforced asphalt treated Kraft paper; manufactured by York Manufacturing, or equal.

**2.5 ACCESSORIES**

A. PREFORMED CONTROL JOINTS

Synthetic Rubber material. Provide with corner and tee accessories, cement fused joints, manufactured by Williams Products, Inc., or equal.

B. CLEANING SOLUTION

Not harmful to masonry work or adjacent materials.

Do not use Muriatic Acid.

Subject to compliance with requirements, product(s), which may be incorporated into the work include, but are not limited to, the following:

Fabrikleen Masonry Cleaner, by Fabrikem Chemicals, International.

NMD 80 Masonry Detergen, EaCo Chem, Inc.

C. DAMPPROOFING

Apply a clear siloxane sealer with an active solids content of 6.5 percent on the exterior of all CMU (follow manufacturer's recommended coverage rate and application instructions).

Provide one coat of Chemprobe Corporation Prime-A-Pell Plus and then one finish coat of Chemprobe Corporation Conformel clear. Apply coating at a maximum rate of 150 square feet/gallon.

D. INSULATED CMU WALLS

Provide insulated CMU walls as shown on the Plans.

The expanded polystyrene insulation shall be individually molded to have a minimum density of 1.0 lb/ft<sup>3</sup>, and shall conform to ASTM C578 Standard Type 1.

Thermal capabilities of insulated CMU walls when tested in accordance with ASTM C1363:

<b>Nominal CMU Wall Thickness</b>	<b>U, Value for 2 Core Insulated CMU Wall System</b>
8-Inch	0.19
10-Inch	0.17
12-Inch	0.15

Subject to compliance with requirements, the products, which may be incorporated in the work, include, but are not limited to, the following:

ICON Universal Inserts by Concrete Block Insulating Systems, Inc. (CBIS, Inc.)

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

For Insulated CMU Walls install insulation in block cores at the block manufacturer's plant in conformance with Korfil installation requirements.

Thickness: Build single-wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.

Build chases and recesses as shown or required for the work of other trades. Provide not less than 8 inches of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.

Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible.

Use dry cutting saws to cut concrete masonry units.

Match masonry coursing, bonding, color, and texture of new masonry work with existing masonry work.

Provide smooth exterior face CMU where the masonry is to receive attachments such as light fixtures, water faucets, electrical boxes, etc.

### **3.2 CONSTRUCTION TOLERANCES**

#### **A. VARIATION FROM PLUMB**

For vertical lines and surfaces of columns, walls and arises do not exceed 1/4 inch in 10 feet, corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4 inch in any story. For vertical alignment of head joints, do not exceed plus or minus 1/8 inch in 10 feet.

#### **B. VARIATION FROM LEVEL**

For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4 inch in any bay or 20 foot maximum. For top surface of bearing walls, do not exceed 1/8 of

an inch between adjacent floor elements in 10 feet or 1/16 of an inch within width of a single unit.

C. VARIATION OF LINEAR BUILDING LINE

For position shown on the Plans and related portion of columns, walls and partitions, do not exceed 3/8 of an inch in any bay or 20 feet maximum.

D. VARIATION IN CROSS-SECTIONAL DIMENSIONS

For columns and thickness of walls, do not exceed minus 3/8 of an inch nor plus 3/8 of an inch from dimensions shown on the Plans.

E. VARIATION IN MORTAR JOINT THICKNESS

Do not exceed bed joint thickness indicated by more than plus or minus 1/8 of an inch or do not exceed head joint thickness by more than plus or minus 1/8 of an inch from dimensions shown on the Plans.

### 3.3 TEMPORARY FORMWORK

Provide temporary formwork and shoring as required for support of masonry construction. Construct formwork to conform to shape, line and dimensions shown on the Plans. Make sufficiently tight to prevent leakage of mortar, grout, or concrete (if any). Brace, tie and support as required to maintain position and shape during construction and curing of reinforced masonry.

Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and all other reasonable temporary loads that may be placed on them during construction.

Allow at least then the following minimum time to elapse after completion of members before removing shoring or forms, provided suitable curing conditions have been obtained during the curing period.

Girders and Beams	10 calendar days
Slabs	7 calendar days
Reinforced Masonry Soffits	7 calendar days

### 3.4 PLACING REINFORCEMENT

A. GENERAL

Clean reinforcement of loose rust, mill scale, earth, ice or other materials that will reduce bond to mortar or grout. Do not use reinforcement bars

with kinks or bends not shown on the Plans or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.

Position reinforcement accurately at the spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or one inch (whichever is greater).

For columns, piers and pilasters, provide a clear distance between vertical bars as shown on the Plans, but not less than 1-1/2 times the nominal bar diameter or 1-1/2 inches, whichever is greater. Provide lateral ties as shown on the Plans.

Splice reinforcement bars where shown. Provide lapped splices, unless otherwise indicated. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie. Provide not less than minimum lap shown on the Plans.

Embed prefabricated horizontal joint reinforcement as the work progresses, with a minimum cover of 5/8 of an inch on exterior face of walls and 1/2 inch at other locations. Lap units not less than six inches at ends. Use prefabricated "L" and "T" units to provide continuity at corners and intersections. Cut and bend units as recommended by manufacturer for continuity at returns, offsets, column fire-proofing, pipe enclosures and other special conditions.

#### B. ANCHORING

Anchor reinforced masonry work to supporting structure as shown on the Plans.

### 3.5 INSTALLATION OF CONCRETE MASONRY UNITS

#### A. GENERAL

Do not wet concrete masonry units (CMU).

Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately locate openings, movement-type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.

Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work. As the work

progresses, build-in items specified under this and other sections of these Specifications. Fill in solidly with masonry around build-in items.

Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise shown on the Plans.

Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and road mortar or grout into core to completely fill the masonry unit.

Fill cores in hollow concrete masonry units with grout three courses (24 inches) under bearing plates, beams, lintels, posts and similar items, unless otherwise shown on the Plans.

Lay CMU units with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed joint widths shown, or if not shown, provide 3/8-inch joints.

Cut joints flush for masonry walls, which are to be concealed or to be covered by other materials, unless otherwise shown on the Plans.

Tool exposed joints slightly concave using a jointer larger than joint thickness, unless otherwise shown on the Plans.

Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units, which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

Use special blocks as required to provide solid CMU face at all surfaces including, but not limited to, jambs, headers and sills. Exposed ends of CMU cores are not allowed.

## B. FLASHING OF MASONRY WORK

Provide concealed flashing in masonry work at, or above, shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetration in flashing with mastic before covering with mortar.

Extend flashings through exterior face of masonry and turn down to form drip.

Extend flashing the full length of lintels and shelf angles and minimum of 4 inches into masonry each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4 inches and through the inner wythe to within 1 inch of the interior face of the wall in exposed work. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2 inches. At heads and sills turn up ends not less than 2 inches to form a pan. Install flashing to comply with manufacturer's instructions. Provide weep holes in the head joints where shown on the Plans.

## C. WALLS

### 1. Pattern Bond

Lay CMU wall units in half-running bond with vertical joints in each course centered on units in courses above and below, unless otherwise shown on the Plans. Bond and interlock each course at corners and intersections. Use special shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.

Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimension indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.

Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.

### 2. Option

Where all vertical cores are not shown to be grouted, Contractor may elect to fill all vertical cores with grout, in which case requirements for mortar bedding of cross-webs and closing of core spaces below bond beams do not apply.

D. LINTELS

Install steel lintels where shown on the Plans. Provide masonry lintels where shown and wherever openings of more than 1 foot for brick size units and 2 feet for block size units are shown without structural steel or other supporting lintels. Provide minimum bearing of 8 inches at each jamb, unless otherwise shown on the Plans.

E. CONTROL AND EXPANSION JOINTS

Provide vertical and horizontal expansion, control and isolation joints in masonry where shown on the Plans. Build in related items as the masonry work progresses.

Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints, if any.

Build flanges of factory-fabricated expansion joint units into masonry.

Build in non-metallic joint fillers where shown on the Plans.

F. COLUMNS, PIERS, AND PILASTERS

Use CMU units of the size, shape and number of vertical core spaces shown. If not shown on the Plans, use units that provide minimum clearances and grout coverage for number and size of vertical reinforcement bars shown on the Plans. Provide pattern bond shown, or if not shown, alternate head joints in vertical alignment.

Where bonded pilaster construction is shown, lay wall and pilaster units together to maximum pour height specified.

G. GROUTING

Use "Fine Grout" per ASTM C476 for filling spaces less than 4 inches in one or both horizontal directions.

Use "Coarse Grout" per ASTM C476 for filling 4-inch spaces or larger in both horizontal directions.

Use "Concrete Mix" for filling spaces 10 inches or larger.



## H. GROUTING TECHNIQUE

### 1. General

At the Contractor's option, use either low-lift or high-lift grouting techniques subject to requirements that follow.

### 2. Low-Lift Grouting

Provide minimum clear dimension of 2 inches and clear area of 8 square inches in vertical cores to be grouted.

Place vertical reinforcement prior to laying of CMU. Extend above elevation of maximum pour height as required for splicing. Support in position at vertical intervals not exceeding 192 bar diameters nor 10 feet.

Lay CMU to maximum pour height. Do not exceed 5-foot height, or if bond beam occurs below 5-foot height, stop pour at course below bond beam.

Pour grout using chute or container with spout. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than 1 hour. Terminate grout pours 1-1/2 inches below top course of pour.

Bond Beams: Stop grout in vertical cells 1-1/2 inches below bond beam course. Place horizontal reinforcement in bond beams; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

### 3. High-Lift Grouting

Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension and area is 3 inches and 10 square inches, respectively.

Provide cleanout holes in first course at all vertical cells, which are to be filled with grout. Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.

Construct masonry to full height of maximum grout pour specified, prior to placing grout.

Limit grout lifts to a maximum height of 5 feet and grout pour to a maximum height of 24 feet for single wythe hollow concrete masonry walls, unless otherwise shown on the Plans.

Place vertical reinforcement before grouting. Place before or after laying masonry units, as required by job conditions. Tie vertical reinforcement to dowels at base of masonry where shown and thread CMU over or around reinforcement. Support vertical reinforcement at intervals not exceeding 192 bar diameters nor 10 feet.

Where individual bars are placed after laying masonry, place wire loops extending into cells as masonry is laid and loosen before mortar sets. After insertion of reinforcement bar, pull loops and bar to proper position and tie free ends.

Where reinforcement is prefabricated into cage units before placing, fabricate units with vertical reinforcement bars and lateral ties of the size and spacing shown on the Plans.

Place horizontal beam reinforcement as the masonry units are laid. Embed lateral tie reinforcement in mortar joints where indicated. Place as masonry units are laid, at vertical spacing shown.

Where lateral ties are shown in contact with vertical reinforcement bars, embed additional lateral tie reinforcement in mortar joints. Place as shown, or if not shown, provide as required to prevent grout blowout or rupture of CMU face shells, but provide not less than No. 2 bars or 8-gauge wire ties spaced 16 inches on center for members with 20 inches or less side dimensions, and 8 inches on center for members with side dimensions exceeding 20 inches.

## I. PREPARATION OF GROUT SPACES

Prior to grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.

Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before

starting grouting operations. Place grout by pumping into grout spaces unless alternate methods are acceptable to the Owner.

Limit grout pours to sections, which can be completed in 1 working day with not more than one hour interruption of pouring operation. Place grout in lifts that do not exceed 5 feet. Allow not less than 30 minutes, nor more than 1 hour between lifts of a given pour. Rod or vibrate each grout lift during pouring operation.

Place grout in lintels or beams over openings in one continuous pour.

Where bond beam occurs more than one course below top of pour, fill bond beam course to within 1 inch of vertically reinforced cavities, during construction of masonry.

When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 1-1/2 inches of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

## J. FIELD QUALITY CONTROL

### 1. General

Contractor shall employ, a testing laboratory experienced in performing types of masonry field quality control tests for masonry as specified in Section 01400.

### 2. Unit Test Method

#### a. Brick Tests

For each type and grade of brick indicated, test units by methods of sampling and testing of ASTM C67 except select five bricks at random for each 10,000 units or fraction thereof installed.

#### b. Concrete Masonry Unit Tests

For each type, class and grade of concrete masonry unit indicated, test units by method of sampling and testing of ASTM C140.

c. Mortar Tests

For each type indicated, test mortar by ASTM C780 methods for sampling and testing. Conduct tests no less frequently than that required to evaluate mortar used to install each increment of masonry units indicated above from which samples are taken for testing.

K. REPAIR, POINTING, AND CLEANING

1. General

Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

2. Pointing

During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.

3. Final Cleaning

After mortar is thoroughly set and cured, clean masonry as follows:

Remove large mortar particles by hand with wooden paddles and non-metallic scrape, hoes or chisels.

Test cleaning methods on sample wall panel; leave panel uncleaned for comparison purposes. Obtain Owner's approval of sample wall cleaning before proceeding with cleaning of masonry.

Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.

Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.

For masonry made of clay or shale, clean masonry with cleaning solution in accordance with manufacturer's recommendations. Muriatic acid shall not be used. Apply acidic cleaner in compliance with directions of cleaner manufacturer.

Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins.

Provide final protection of masonry work and maintain conditions in a manner acceptable to the Owner that ensures unit masonry work to be without damage and deterioration at time of substantial completion.

**\*\*\* END OF SECTION \*\*\***

**DIVISION 5**

**METALS**

## SECTION 05120

### STRUCTURAL STEEL

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes structural steel work as shown on the Plans, including schedules, notes, and details to show size and location of members, typical connections, and type of steel required. Miscellaneous metal fabrications are specified elsewhere in Division 5.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
03300	Cast-In-Place Concrete
07410	Metal Roof and Wall Panels

##### 1.3 REFERENCES

This Section references the latest revisions of the following documents:

<u>Reference</u>	<u>Title</u>
ASTM A36	Structural Steel
ASTM A53	Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe
ASTM A123	Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products
ASTM A153	Zinc Coating (Hot Dip) on Iron and Steel Hardware
ASTM A276	Stainless Steel Bars and Shapes
ASTM A307	Carbon Steel Externally Threaded Standard Fasteners
ASTM A325	High Strength Bolts for Structural Steel Joints
ASTM A490	Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints
ASTM A500	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes
ASTM A501	Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A572	High-Strength Structural Steel
ASTM A992	High-Strength Structural Steel
AWS A2.4	Standard Welding Symbols
AWS D1.1	Structural Welding Code
AISC	Specification for Structural Steel Buildings
SSPC	Steel Structures Painting Council

## 1.4 SUBMITTALS

Submit under provisions of Section 01300.

### A. SHOP DRAWINGS

Indicate profiles, sizes, spacing, locations, and complete details of structural members, to include openings, cuts, camber, fasteners, connections, and other pertinent data. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.

### B. MANUFACTURER'S MILL CERTIFICATE

Submit under provisions of Section 01300 certifying that products meet or exceed specified requirements.

### C. MILL TEST REPORTS

Submit under provisions of Section 01300 Manufacturer's Certificates, indicating structural strength, destructive and non-destructive test analysis.

### D. WELDERS' CERTIFICATES

Submit under provisions of Section 01300 Manufacturer's Certificates, certifying welders employed on the Work, verifying AWS qualifications within the previous 12 months.

## 1.5 QUALITY ASSURANCE

Codes and Standards: Comply with the provisions of the following, except otherwise indicated:

<b><u>Standard</u></b>	<b><u>Title</u></b>
AISC	"Code of Standard Practice for Steel Buildings and Bridges"
AISC	"Specifications for Structural Steel Buildings," including "Commentary" and Supplements thereto as issued
AISC	"Specifications for Structural Joints using ASTM A325 or A490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.



American Welding Society (AWS) D1.1 “Structural Welding Code – Steel”

ASTM A6 “General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use”

## **1.6 DELIVERY, STORAGE, AND HANDLING**

Deliver material to site at such intervals to ensure uninterrupted progress of work.

Deliver anchor bolts and anchorage devices that are to be embedded in cast-in-place concrete or masonry in ample time as to not delay work.

Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

#### **A. STRUCTURAL STEEL SHAPES**

ASTM A992, High-Strength Structural Steel.

#### **B. STRUCTURAL STEEL PLATES AND BARS**

ASTM A36, unless noted otherwise.

#### **C. STRUCTURAL TUBING**

Cold-Formed: ASTM A500, Grade B,  $F_y=46\text{KSI}$

Hot-Formed: ASTM A501,  $F_y=36\text{KSI}$

#### **D. STEEL PIPE**

ASTM A53, Type E or S Grade B.

#### **E. HEADED STUD-TYPE CONNECTORS**

ASTM A108, Grade 1015, forged steel, uncoated.

F. HIGH-STRENGTH THREADED FASTENERS

Heavy hexagon structural bolts, as follows:

Quenched and tempered medium carbon steel bolts, nuts and washers complying with ASTM A325.

Quenched and tempered alloy steel bolts, nuts and washers complying with ASTM A490 where indicated.

Heavy hexagon nuts complying with ASTM A563.

Hardened washers complying with ASTM F436.

Provide and install bolts with load indicator devices (load indicator washers or snap-off heads).

G. ANCHOR BOLTS AND THREADED RODS

ASTM F1554, Grade 36, unless noted otherwise. Heavy hexagon nuts complying with ASTM A563 and hardened washers complying with ASTM F436.

ASTM A193 Grade B8, where stainless steel is noted in the plans. Heavy hexagon nuts complying with ASTM A194 Grade 8 and type 304 stainless steel washers.

H. UNFINISHED THREADED FASTENERS

ASTM A307, Grade A, regular low-carbon steel bolts and nuts. Provide hexagonal heads and nuts for all connections.

I. EXPANSION ANCHORS

Provide size and type indicated. Expansion anchors shall be one piece stud type, wedge-style anchor.

Carbon steel expansion anchors shall meet the following:

- Stud: ASTM A108 and zinc plated in accordance with ASTM B633
- Wedge: AISI 1010 carbon steel
- Nut: ASTM A563 Grade A
- Washer: SAE 1005-1020

Stainless steel expansion anchors shall meet the following:

- Stud: ASTM F593, AISI 304 or 316
- Wedge: AISI 304 or 316
- Nut: ASTM F594
- Washer: AISI 304 or 316 conforming to ASTM A240

Subject to compliance with the requirements, products which may be incorporated in the work include, but are not limited to, the following:

KWIK Bolt 3, Hilti, Inc.  
Strong-Bolt 2, Simpson Strong Tie, Inc.  
Power-Stud+ SD1, Powers Fasteners, Inc.

#### J. FLUSH TYPE EXPANSION ANCHORS

Provide size to match fastener indicated, conforming to AISI 12L14, meeting ASTM A108, and zinc plated in accordance with ASTM B633, SC1, Type III.

Subject to compliance with the requirements products, which may be incorporated in the work include, but are not limited to, the following:

HDI Anchor, Hilti, Inc.  
Drop-In Anchor, Powers Fasteners, Inc.

#### K. ADHESIVE ANCHORS

1. Adhesive capsules shall be self-contained two-part component consisting of a vinyl urethane resin with a Dibenzoyl Peroxide Hardener.

Subject to compliance with the requirements products, which may be incorporated in the work include, but are not limited to the following:

HVU Adhesive capsule, Hilti, Inc.  
Chem-Stud Capsule, Powers Fasteners, Inc.

2. Injection adhesive system shall consist of a dual-cylinder adhesive refill pack, a mixing nozzle, and dispenser. The adhesive shall be formulated to include resin and hardeners.

Subject to compliance with the requirements products, which may be incorporated in the work include, but are not limited to, the following:

HIT RE 500 V3 Injection Adhesive Anchor, Hilti, Inc.  
SET-XP, Simpson Strong Tie, Inc.  
PE1000+, Powers Fasteners, Inc.

3. For hollow-base materials such as concrete masonry units (CMU), provide galvanized screen tubes as required by the manufacturer.

Subject to compliance with the requirements products, which may be incorporated in the work include, but are not limited to, the following:

HIT HY 70 Adhesive Anchor System for Unreinforced  
Masonry, Hilti, Inc.  
Pure 110+, Powers Fasteners, Inc.

#### L. WELDING MATERIALS

AWS A5.1 or A5.5, E70XX; AWS A5.17, E70S-X; AWS A5.20, E70XT-X. Comply with AWS code.

#### M. GROUTING MATERIALS

Shall comply with Section 03300 "Cast-in-Place Concrete."

#### N. STRUCTURAL STEEL PRIMER PAINT

Epoxy Primer per Section 09900, SSPC SP-10.

## 2.2 FABRICATION

### A. SHOP FABRICATION AND ASSEMBLY

Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.

Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence, which will expedite erection and minimize field handling of materials.

Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

**B. CONNECTIONS**

Weld or bolt shop connections, as indicated on the Plans or as specified.

Bolt field connections, except where welded connections or other connections are indicated.

Provide high-strength threaded fasteners for all bolted connections, except where unfinished bolts are indicated.

**C. HIGH-STRENGTH BOLTED CONSTRUCTION**

Install high-strength threaded fasteners in accordance with AISC “Specifications for Structural Joints using ASTM A325 or A490 Bolts.”

**D. WELDED CONSTRUCTION**

Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work. Assemble and weld built-up sections where indicated by methods which will produce true alignment of axes without warp.

**E. SHEAR CONNECTORS**

Prepare steel surfaces as recommended by manufacturer of shear connectors. Shop weld shear connectors, spaced as shown, to beams and girders in composite construction. Use automatic end welding of headed stud shear connectors in accordance with manufacturer’s printed instructions.

**F. STEEL WALL FRAMING**

Select members, which are true and straight for fabrication of steel wall framing. Straighten as required to provide uniform, square and true members in completed wall framing. Where indicated, build up welded doorframes attached to structural steel framing. Weld exposed joints

continuously and grind smooth. Plug weld steel bar stops to frames, except where shown removable. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10-inches oc, unless otherwise indicated.

Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing member, as shown on final shop drawings.

Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.

Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

## **2.3 SHOP PAINTING**

### **A. GENERAL**

Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel that is partially exposed, or the exposed portions and initial two inches of embedded areas only. Do not paint surfaces that are to be welded or are high-strength bolted with friction-type connections. Apply two coats of paint complying with Section 09900 to surfaces that are inaccessible after assembly or erection.

### **B. SURFACE PREPARATION**

After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows: SP-10 “Near-White Blast Cleaning.”

### **C. PAINTING**

Immediately after surface preparation, apply structural steel primer paint in accordance with Section 09900 and manufacturer’s instructions and at a rate to provide dry film thickness of not less than 1.5 mils DFT. Use painting methods, which result in full coverage of joints, corners, edges and exposed surfaces.

**D. ZINC COATING**

Unless noted otherwise, where structural steel (ferrous metal) is exposed to weather, it shall be zinc coated or galvanized by the “hot-dip” method in accordance with ASTM A123. Provide the following minimum coating weight per square foot of actual surface.

- |     |                                 |  |
|-----|---------------------------------|--|
| (a) | Steel 1/8 inch<br>and 3/16 inch | 2.0 Ounces Average<br>1.8 Ounces Minimum |
| (b) | Steel 1/4 inch<br>and heavier   | 2.3 Ounces Average<br>2.0 Ounces Minimum |

Provide galvanized fasteners with zinc-coated items.

**2.4 SOURCE QUALITY CONTROL AND TESTS**

Testing and analysis of components will be performed under provisions of Section 01400.

**PART 3 EXECUTION**

**3.1 ERECTION**

**A. GENERAL**

Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

**B. SETTING BASES AND BEARING PLATES**

Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.

Tighten anchor bolts 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 prior to packing with grout.

Pack non-shrink grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

C. FIELD ASSEMBLY

Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment. Level and plumb individual members of structure within specified AISC tolerances.

Splice members only where indicated and accepted on shop drawings.

D. ERECTION BOLTS

On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.

Comply with AISC Specification for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing member. Ream holes that must be enlarged to admit bolts.

E. GAS CUTTING

Do not use gas-cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members, which are not under stress, as acceptable to the Engineer.

F. TOUCHUP PAINTING

Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils. Painting shall conform to the requirements of Section 09900.



Cleaning and touchup painting of field welds, bolted connections and abraded areas of shop paint on structural steel is included in Section 09900.

G. REPAIR OF GALVANIZED WORK

Galvanized work damaged during installation shall be repaired with a “hot stick method” using “galv-bar.”

**3.2 QUALITY CONTROL**

A. GENERAL

Comply with Section 01400 for independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.

Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

Provide testing agency access to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

Testing agency may inspect structural steel at plant before shipment; however, the Engineer reserves right, at any time before final acceptance, to reject material not complying with specified requirements.

Correct deficiencies in structural steel work that inspections and laboratory test reports indicate as not in compliance with requirements. The performance of additional tests, at the Contractor’s expense, may be necessary to reconfirm any non-compliance of original work, as well as to show compliance of corrected work.

B. SHOP-BOLTED CONNECTIONS

Inspect or test in accordance with AISC specifications.

C. SHOP WELDING

Inspect and test during fabrication of structural steel assemblies, as follows:

Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

Perform visual inspection of all welds.

Perform tests of welds as follows. Inspection procedures listed are to be used at Contractor's option.

CONTRACTOR'S OPTION

Liquid Pentrant Inspection: ASTM E165

Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.

Radiographic Inspection: ASTM E94

Ultrasonic Inspection: ASTM E164

D. FIELD-BOLTED CONNECTIONS

Inspect in accordance with AISC specifications.

E. FIELD WELDING

Inspect and test during erection of structural steel as follows:

Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

Perform visual inspection of all welds.

Perform tests of welds as follows:

Liquid Pentrant Inspection: ASTM E165

Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.

Radiographic Inspection: ASTM E94

Ultrasonic Inspection: ASTM E164

**\*\*\* END OF SECTION \*\*\***

## SECTION 05500

### MISCELLANEOUS METAL FABRICATIONS

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the miscellaneous metal fabrication work including, but is not limited to, the following: preassembled stairs, ladders, handrails, railings, grating, including stair treads and nosings; floor plates and covers, custom fabricated pipe brackets, supports, and pipe sleeves.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
03300	Cast In Place Concrete
09900	Painting

##### 1.3 REFERENCES

This section references the latest revisions of the following documents:

<u>Reference</u>	<u>Title</u>
ASTM A36	Structural Steel
ASTM A53	Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe
ASTM A123	Zinc (Hot-Galvanized) Coatings on Products Fabricated From Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip
ASTM A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A240	Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels
ASTM A283	Carbon Steel Plates, Shapes, and Bars
ASTM A307	Carbon Steel Externally Threaded Standard Fasteners
ASTM A325	High Strength Bolts for Structural Steel Joints
ASTM A500	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes
ASTM A501	Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A653	Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B221	Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

ASTM B241	Aluminum-Alloy Seamless Pipe and Seamless Extruded Steel Tube
NAAMM	National Association of Architectural Metal Manufacturers, "Metal Bar Grating Manual"
AISC	American Institute of Steel Construction
AWS D1.1	Structural Welding Code - Steel
AWS D1.2	Structural Welding Code - Aluminum
SSPC	Steel Structures Painting Council

#### **1.4 SUBMITTALS**

Submit under provisions of Section 01300.

Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

### **PART 2 PRODUCTS**

#### **2.1 MATERIALS**

##### **A. STRUCTURAL STEEL**

Structural steel members and sections as defined in the AISC "Code of Standard Practice" are specified in Section 05120.

##### **B. STEEL CASTINGS**

Comply with ASTM A27. Grade 65-35, medium strength carbon steel.

##### **C. CAST IRON**

Comply with ASTM A48, Class 20.

##### **D. STAINLESS STEEL**

Comply with ASTM A276, Type 316.

##### **E. ALUMINUM ALLOY EXTRUDED BARS, RODS, WIRE, SHAPES AND TUBES**

Comply with ASTM B221, Alloy 6061-6.

##### **F. WELDING MATERIALS**

As specified in Section 05120.

G. ZINC COATING

Comply with ASTM A123 or ASTM A153.

H. FASTENERS, ANCHORS, AND ANCHOR BOLTS

As specified in Section 05120.

I. PAINTING

Comply with Section 09900.

J. GROUT MATERIALS

As specified in Section 03300.

## 2.2 PRODUCTS

A. HANDRAILS AND RAILINGS

Handrails and railings shall be clear satin finish, anodized 1-1/2-inch nominal diameter Schedule 40 extruded aluminum tubing conforming to ASTM B241, Alloy 6063 with concealed aluminum spigot splice connectors and fasteners countersunk and flush. Fasteners shall be 316 stainless steel. Maximum post spacing shall be 6'-0" on center.

Post connections shall be cast aluminum R&B Wagner Interna-Rail or approved equal. Mounting shall be cast aluminum R&B Wagner-Interna-Rail drive on flange or approved equal; other acceptable manufacturers are Golden Railings, Inc., or Alumaguard Corporation.

B. GRATING AND STAIR TREADS

Grating and stair treads shall be serrated, aluminum alloy 6063, rectangular bar grating complying with the requirements of NAAMM "Metal Bar Grating Manual"; in addition, stair treads shall be provided with 1-1/4" corrugated nosings.

Unless noted otherwise on the Plans, minimum size of aluminum grating shall be 1-1/2" x 3/16" bearing bars at 1-3/16-inch on center with cross bars at 4-inches on center for a maximum span of 4'-6". For spans greater than 4'-6", grating shall be designed for 100 psf uniform load and 250 pounds concentrated load and 1/2-inch maximum deflection.

Stair treads shall be designed for 300-pound concentrated load with 33 1/3 percent impact.

Subject to compliance with the requirements, products which may be incorporated in the work include, but are not limited to the following:

AMICO Bar Grating  
IKG Borden  
McNichols Co.  
Seidlehuber Metal Products

## **2.3 FABRICATION**

Fit and shop assemble components in the largest practical size for delivery and installation at site.

### **A. STRUCTURAL STEEL MEMBERS AND SECTIONS**

Fabrication of structural steel members and sections shall comply with Section 05120.

Provide galvanized fasteners with zinc coated items except as noted below. For all items installed in submerged, intermittently submerged, or areas subject to splash and spill, or corrosive atmospheres, fasteners shall be 316 stainless steel. The term fasteners includes nut, bolts, washers, leveling nuts, and U-bolts.

### **B. HANDRAIL AND RAILINGS**

Unless noted otherwise, handrail and railing assemblies shall include a minimum 1/4" x 4" aluminum kick plate. Fabricate components with joints tightly fitted and secured. Fabricate anchors and related components of the same material and finish unless noted otherwise. Coordinate and accurately form components to suit stairs, landings and building structure. All stair stringers shall have handrail installed on them, unless noted otherwise.

### **C. GRATING AND STAIR TREADS**

Fabricate with bearing bars placed edgewise and joined by straight cross bars. Do not notch, slot or cut bearing bars to receive cross bars. Cross bars shall be secured to the main bearing bars to prevent turning, twisting, or coming loose. Each of the cross bars shall be trimmed flush with outside face of bearing bars. Grating shall be fully banded at ends and at all openings. Provide anchorage as indicated on the Drawings.

**D. ACCESSORIES**

Provide necessary accessories as required for complete installation of products. Provide anchors, anchor bolts, plates, angles, hangers, struts, and other items required for connecting stairs to structure.

**E. ANCHORAGE TO SUPPORTING STRUCTURES**

For anchorage to supporting structures, provide 316 stainless steel fasteners for all aluminum items. Provide tapered washers where required to avoid point loading of structural members.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

Verify that field conditions are acceptable and are ready to receive the work.

**3.2 PREPARATION**

Clean and strip primed steel items to bare metal where site welding is required. Supply items required to be cast into concrete or embedded in masonry with setting templates.

Paint embedded aluminum items in accordance with Section 09900.

**3.3 INSTALLATION**

**A. TOLERANCES**

Install items plumb and level, accurately fitted, free from distortion or defects. Comply with the following tolerances:

Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-accumulative.

Maximum Offset From True Alignment: 1/4 inch (6 mm).

Allow for erection loads, and provide sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments. Handrail installation shall be sturdy and without play.



B. BOLTING AND WELDING

Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible. Field weld components as indicated on the Drawings. Perform field welding in accordance with AWS D1.1 or AWS D1.2.

Obtain Owner's approval prior to field cutting or making adjustments not scheduled on the shop drawings.

C. COATINGS

After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete complying with Section 09900. Field galvanizing shall be done by the hot-stick method utilizing Galv-bar, or equal. Spray-on zinc paint is not acceptable.

D. DISSIMILAR MATERIALS

Avoid direct fastening of dissimilar metals to one another. Connections shall include means as required to isolate dissimilar metals from one another. Possible methods of isolation include, but are not limited to, non-metallic bushings/washers at bolts, and epoxy paint coating of contact surfaces. Intended means of isolation shall be noted on the submitted shop drawings. See Section 09900 for epoxy paint requirements.

E. ANCHORING GRATING

All grating shall be mechanically fastened into place. Provide plate fasteners or F-9 fasteners as recommended by the manufacturer. Where removable grating is specified on the Plans, fasteners shall be provided and installed to allow for easy removal of the grating.

**\*\*\* END OF SECTION \*\*\***

**DIVISION 6**  
**WOOD AND PLASTICS**

## SECTION 06100

### ROUGH CARPENTRY

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section shows the extent of rough carpentry work on the Plans, including, but not limited to, the following: wood framing, timber posts and beams, rooftop equipment bases and support curbs, wood nailers and blocking, wood furring, fascia, soffits, and sheathing.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
06190	Prefabricated Wood Trusses
07210	Batt and Rigid Insulation
07410	Metal Roof and Wall Panels

##### 1.3 REFERENCES

This Section references the latest revisions of the following documents:

<u>Reference</u>	<u>Title</u>
ALSC PS 20	American Lumber Standards Committee (ALSC): American Softwood Lumber Standard
APA PRP-108	American Plywood Association (APA): Performance Standards and Qualification Policy for Structural-Use Panels
APA PS 1	American Plywood Association (APA): Product Standard for Construction and Industrial Plywood
ASTM A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM D226	Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
AWC NDS	American Wood Council (AWC): National Design Specification for Wood Construction
AWC WFCM	American Wood Council (AWC): Wood Frame Construction Manual for one- and two-family dwellings
AWPA U1	American Wood-Preservers' Association (AWPA) Standard
WCLIB 17	West Coast Lumber Inspection Bureau (WCLIB): Standard Grading and Dressing Rules for Douglas Fir, Western

Hemlock, Western Red Cedar, White Fir, Sitka Spruce  
Lumber

#### **1.4 SUBMITTALS**

Comply with provisions of Section 01300.

Submit a certificate of compliance from the supplier certifying that the materials provided meet or exceed specified requirements. Certificate shall itemize materials provided on the Project and refer to pertinent specifications.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and underneath temporary coverings including polyethylene and similar materials. For lumber and plywood that is pressure treated with waterborne chemicals, provide a sticker between each course to provide air circulation.

### **PART 2 PRODUCTS**

#### **2.1 GENERAL**

Lumber shall comply with ALSC PS 20 and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

Each piece of lumber shall be factory marked with Grade Stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill that produced the product.

Nominal sizes are indicated on the Drawings, except as shown by detailed dimensions. Provide actual sizes as required by ALSC PS 20, with moisture content specified for each use.

Provide dressed lumber, S4S, unless otherwise indicated. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.

## **2.2 FRAMING LUMBER AND FASCIA BOARDS**

Unless noted otherwise, provide Douglas Fir - Larch No. 2 or better, or Hem-Fir No. 1 or better.

## **2.3 BEAMS, STRINGER, POSTS AND TIMBERS**

Unless noted otherwise on the Plans, provide Douglas Fir - Larch No. 1 or better. Glue Laminated Lumber: Douglas Fir, coast region. Bottom lamination shall be free of unsound knots or defects larger than 1/2-inch diameter. Provide industrial Appearance Grade. Each member shall bear the American Institute of Timber Construction (AITC) stamp. See Drawings for additional requirements.

## **2.4 TRIM BOARDS**

Unless noted otherwise, provide No. 2 Common Boards or better complying with WWPA rules. Where boards are exposed to finish work, provide 19 percent maximum moisture content. Exterior trim shall be cedar, Grade A or better.

## **2.5 MISCELLANEOUS LUMBER**

Provide wood for support or attachment of other work including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, wood trim, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown or required. Provide Standard Grade Hem-Fir or better. Provide 19 percent maximum moisture content for lumber items not specified to receive wood preservative treatment.

## **2.6 SHEATHING**

Provide APA-rated Exposure 1 unless noted otherwise, span rating and thickness as noted on the Plans.

Comply with PS 1 "Product Standard for Construction and Industrial Plywood" for plywood panels and for products not manufactured under PS 1 provisions, comply with APA PRP-108. Factory-mark each panel with APA trademark evidencing compliance with grade requirements.

## **2.7 PLYWOOD OTHER THAN SHEATHING**

### **A. BACKING PANELS**

For Plywood Backing Panels (or Boards) used for mounting electrical, telephone or communications system equipment, provide fire-retardant treated plywood panels with grade designation, APA C-D PLUGGED INT

with exterior glue, in thickness indicated on the Drawings. If not otherwise indicated, provide minimum thickness of 15/32 of an inch.

**B. SOFFITS**

APA A-C Exterior, Exposure 1, thickness as indicated on the Plans, 1/2 inch minimum.

**C. SIDING**

APA-rated siding - 303; exterior thickness, texture and pattern as indicated on the Plans.

**D. MARINE**

APA, A-A exterior thickness as indicated on the Plans. HDO (High Density Overlay) faces are acceptable.

**2.8 MISCELLANEOUS MATERIALS**

**A. FASTENERS AND ANCHORAGES**

Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable federal specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended fasteners.

Where rough carpentry work is exposed to the weather, in ground contact, or in an area of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating per ASTM A153.

**B. BUILDING PAPER**

ASTM D226, Type I; asphalt saturated felt, non-perforated, 30-lb. type.

**C. SILL SEALER GASKETS**

Glass fiber resilient insulation fabricated in strip form for use as a sill sealer; 1-inch nominal thickness compressible to 1/32 of an inch; selected from manufacturer's standard width to suit width of sill members.

## **2.9 WOOD TREATMENT BY PRESSURE PROCESS**

Where lumber or plywood is indicated as “P.T.” or “Treated,” or is specified herein to be treated, comply with applicable requirements of American Wood Preserver’s Association (AWPA) Standard U1.

Pressure-treat above-ground items with waterborne preservatives to comply with AWPA Standard U1. After treatment, kiln dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Pressure treat items indicated on the Plans and all of the following: wood cants, nailer, curbs, top plates, equipment support bases, equipment curbs, plywood, blocking, stripping, and similar members utilized in connection with roofing, flashing, vapor barriers and waterproofing. All wood items including plywood used for or around roof penetrations shall be pressure treated.

## **PART 3 EXECUTION**

### **3.1 GENERAL**

Discard units of material with defects that could impair the quality of the work or with units too small to use in fabricating work with minimum joints or optimum joint arrangement. Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, and similar supports to allow attachment of other work.

Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards. Countersink nail heads on exposed carpentry work and fill holes.

Use common wire nails, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

### **3.2 WOOD NAILERS AND BLOCKING**

Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated.

### **3.3 WOOD FURRING**

Install plumb and level with closure strips at edges and openings. Shim with wood as required to obtain specified tolerance for finished work.

#### **A. FURRING FOR PLYWOOD PANELING**

Unless otherwise indicated, provide 1-inch x 3-inch furring at 2-feet on center, horizontally and vertically. Select furring for freedom from knots capable of producing bent over nails and resulting damage to paneling.

#### **B. FURRING FOR GYPSUM DRYWALL**

Unless otherwise indicated, provide 1-inch x 2-inch furring at 16-inch on center, vertically.

#### **C. SUSPENDED FURRING**

Provide size and spacing shown, including hangers and attachment devices. Level to a tolerance of 1/8 inch in 10 feet.

### **3.4 WOOD FRAMING, GENERAL**

Provide framing members of sizes and on spacings shown, and frame openings as shown, or if not shown, comply with recommendations of the AWC WFCM. Do not splice structural members between supports. Anchor and nail as shown, and to comply with the AWC NDS.

Firestop concealed spaces of wood framed walls and partitions at each floor level and at the ceiling line of the top story. Where firestops are not automatically provided by the framing system used, use closely fitted wood blocks of nominal 2-inch-thick lumber of the same width as framing members.

### **3.5 STUD FRAMING**

Provide stud framing of size and spacing indicated or, if not otherwise indicated, of the following sizes and spacings. Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Provide single bottom plate and double top plates using 2-inch-thick members with widths equaling that of studs. Nail or anchor plates to supporting construction.



Unless noted otherwise, provide the following minimum framing:

1. For exterior walls provide 2" x 6" wood studs spaced 24-inches on center.
2. For interior partitions and walls provide 2" x 4" wood studs spaced 16-inches on center.

Construct corners and intersections with not less than three studs. Provide miscellaneous blocking and framing as shown and as required for support of facing materials, fixtures, specialty items and trim.

Provide continuous horizontal blocking row at mid-height of walls and partitions 8 feet high and greater, using 2-inch-thick members of same width of wall or partitions.

Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.

For non-bearing partitions, provide double-jamb studs and headers not less than 4-inches deep for openings 3 feet or smaller in width, and not less than 6-inches deep for wider openings.

For load-bearing partitions, provide double-jamb studs for openings 6 feet or smaller in width, and triple-jamb studs for wider openings. Provide headers of depth shown.

Provide diagonal bracing in stud framing of exterior walls, except as otherwise indicated. Brace both walls at each external corner, full story height, at a 45-degree angle, using either a let-in 1" x 4" or 2" x 4" blocking or metal diagonal bracing. Omit bracing where plywood sheathing, siding and/or gypsum wallboard are indicated to be provided.

### **3.6 FLOOR AND ROOF JOIST FRAMING**

Provide framing of sizes and spacings shown. Install with crown edge up and support ends of each member with not less than 3 inches of bearing on wood or metal, or masonry. Attach to wood bearing members by toe nailing or metal connectors; frame to wood supporting members with metal framing connectors. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 4 feet. Do not notch in middle third of joists; limit notches to 1/6 depth of joist, 1/3 at ends. Do not bore holes larger than 1/3 depth of joist or locate closer than 2 inches from top or

bottom. Provide solid blocking (2-inches thick by depth of joist) at ends of joists unless flush framed to supporting member.

At interior supports, for end bearing of 4 inches (nominal) or less, lap members framing from opposite sides of support (beams, girders or partitions) not less than 6 inches or securely tie opposing members together with strap tie. Provide solid blocking (2-inches thick by depth of joist) over supports.

Provide solid blocking between joists under jamb studs of partition walls and/or, provide double joists separated by solid blocking under partition walls.

Provide bridging between joists where nominal depth-to-thickness ratio exceeds 4, at intervals not to exceed 8 feet max. Use bevel-cut 1" x 4" or 2" x 4" wood bracing, double-crossed and nailed both ends to joists, or use solid wood bridging 2-inch thick by depth of joist, end-nailed to joist.

### **3.7 RAFTER AND CEILING JOIST FRAMING**

#### **A. CEILING JOISTS**

Provide member size and spacing shown, and as previously specified for floor joist framing. Face nail to ends of parallel rafters.

Where principal ceiling joists are at right angle to rafters, frame as indicated with additional short joists from wall plate to first joist at spacing equal to principal ceiling joists; nail to ends of rafters and to top plate and to principal ceiling joists.

#### **B. RAFTERS**

Provide member size and spacing shown. Notch to fit exterior wall plates and toe nail or use special metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing (if any), and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

At valleys, provide valley rafter of size shown, or if not shown, provide rafter twice as thick as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafter.

At hips, provide hip rafters of size shown, or if not shown, provide of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafters.

Provide collar beams (ties) as shown, or if not shown, provide 1" x 6" boards between every third pair of rafters. Locate below ridge member, 1/3 of distance to ceiling joists. Cut ends to fit slope and nail to rafters. Provide special framing as shown for eaves, overhangs, dormers, and similar conditions, if any.

### **3.8 TIMBER FRAMING**

Provide wood beams and girders of the size and spacing shown. Install with crown edge up and provide not less than 4-inch bearing on supports. Provide continuous members unless shown; tie together over supports if not continuous.

Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2-inch air space between sides and ends of wood members and supporting wall. Five-quarter cut members built into masonry construction.

Where built-up beams or girders of nominal 2-inch dimension lumber on edge are shown, fasten together with two rows of 16d nails spaced not less than 16-inches on center. Locate one row near top edge and other near bottom edge. Locate end joints in members over supports; for continuous members, stagger ends at quarter points between supports.

Provide wood posts of the sizes shown. Provide metal anchoring and attachment devices as shown.

### **3.9 INSTALLATION OF SHEATHING**

#### **A. GENERAL**

Comply with applicable recommendations contained in the APA "Engineered Wood Construction Guide," for types of construction panels and applications indicated.

#### **B. FASTENING METHODS**

Fasten panels as indicated on the Plans. Include metal H clips between sheathing panels.

#### **C. PLYWOOD BACKING PANELS**

Nail to supports with minimum 10d at 6-inches on center edge nailing and 12-inches on center at intermediate framing.

**\*\*\* END OF SECTION \*\*\***

## SECTION 06190

### PREFABRICATED WOOD TRUSSES

#### PART 1 GENERAL

##### 1.1 SCOPE

The extent of Prefabricated Wood Trusses work is shown on the drawings and shall include all labor and materials for the fabrication and installation of the type and configuration of prefabricated wood trusses shown on the Drawings.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
04200	Masonry
07210	Batt and Rigid Insulation

##### 1.3 REFERENCES

This Section references the latest revisions of the following documents:

<u>Reference</u>	<u>Title</u>
ASTM A653	Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A879	Steel Sheet, Zinc-Coated by the Electrolytic Process
ASTM A924	General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
TPI	Truss Plate Institute
ANSI/TPI 1	National Design Standard for Metal Plate Connected Wood Trusses Construction
WCLIB	West Coast Lumber Inspection Bureau: Standard Grading Rules for West Coast Lumber
WWPA	Western Wood Products Association

##### 1.4 SUBMITTALS

Comply with provisions of Section 01300.

###### A. PRODUCT DATA

Submit fabricator's technical data covering lumber, metal plates, hardware, fabrication process, treatment (if any), handling, and erection.

Submit certificate, signed by an officer of fabricating firm, indicating that trusses to be supplied for project comply with indicated requirements.

**B. SHOP DRAWINGS**

Submit shop drawings showing species, sizes and stress grades of lumber to be used; pitch, span, camber, configuration and spacing for each type of truss required; type, size, material, finish, design values, location of metal connector plates; and bearing and anchorage details.

Provide calculations, which have been signed and stamped by a Structural Engineer licensed in the State of Washington.

**C. SINGLE SOURCE RESPONSIBILITY FOR CONNECTOR PLATES**

Provide metal connector plates from a single manufacturer.

**1.5 QUALITY ASSURANCE**

**A. TPI STANDARDS**

Comply with applicable requirements and recommendations of the following Truss Plate Institute (TPI) publications:

“National Design Standard for Metal Plate Connected Wood Truss Construction.”

“BCSI B1 – Guide for Handling, Installing, Restraining and Bracing Trusses.”

“Commentary for Permanent Bracing of Metal Plate Connected Wood Trusses.”

**B. WOOD STRUCTURAL DESIGN STANDARD**

Comply with applicable requirements of “National Design Specification for Wood Construction” published by American Wood Council (AWC).

**C. MANUFACTURER’S QUALIFICATIONS**

Trusses shall be manufactured by a firm which is a member of TPI and which complies with TPI quality control procedures for manufacture of connector plates published in TPI “National Design Standard for Metal Plate Connected Wood Truss Construction.” Trusses shall be designed to support all superimposed dead and live loads indicated, with design



Provide lumber to actual sizes required by PS 20 to comply with requirements indicated below:

Dressed, S4S, unless otherwise indicated.

Seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inch or less in nominal thickness, unless otherwise indicated.

Factory mark each piece of lumber with type, grade, mill and grading agency.

### **2.3 FRAMING LUMBER**

Unless noted otherwise, provide Douglas Fir - Larch No. 2 or better, or Hem-Fir No. 1 or better.

### **2.4 METAL CONNECTOR PLATES, FASTENERS, AND ANCHORAGES**

Fabricate connector plates from metal complying with the following requirements:

#### **A. HOT-DIP GALVANIZED STEEL SHEET**

Structural (physical) quality steel sheet complying with ASTM A653, Grade 33; zinc coated by hot-dip process to comply with ASTM A924, Designation G60; minimum coated metal thickness indicated but not less than 0.036 inch.

#### **B. ELECTROLYTIC ZINC-COATED STEEL SHEET**

Structural (physical) quality steel sheet complying with ASTM A879 Designation 30Z, and, for structural properties, with ASTM A653, Grade 33; zinc-coated by electro-deposition; with minimum coated metal thickness indicated but not less than 0.047 inch.

### **2.5 FASTENERS AND ANCHORAGES**

Provide size, type, material, and finish indicated for nails, screws, bolts, nuts, washers and other anchoring devices.

### **2.6 FABRICATION**

Cut truss members to accurate lengths, angles, and sizes to produce close fitting joints with wood-to-wood bearing in assembled units.





**DIVISION 7**

**THERMAL AND MOISTURE PROTECTION**

## SECTION 07210

### BATT AND RIGID INSULATION

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the furnishing of all labor, materials, tools, and equipment required to install batt and rigid insulation, as indicated on the Plans and as specified herein.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals

##### 1.3 REFERENCES

This Section references the latest revisions of the following document:

<u>Reference</u>	<u>Title</u>
ASTM C578	Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C665	Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C1289	Standard Specification for Faced Rigid, Cellular Polyisocyanurate Thermal Insulation Board
ASTM C1320	Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.

##### 1.4 PERFORMANCE REQUIREMENTS

Materials of this Section shall provide continuity of thermal and vapor and air barriers at building enclosure elements.

## **PART 2 PRODUCTS**

### **2.1 APPROVED MANUFACTURERS**

Owens Corning, Johns Manville, CertainTeed, DOW, or approved equal.

### **2.2 MATERIALS**

#### **A. BATT INSULATION**

Type III preformed, foil-faced, glass fiber batt or roll conforming to ASTM C665, to the thicknesses needed to meet the R-values shown on the Plans and as required by code.

#### **B. RIGID INSULATION**

Type IV rigid, closed cell extruded polystyrene foam board insulation conforming to ASTM C578, to the thicknesses needed to meet the R-values shown on the Plans and as required by code.

#### **C. VAPOR BARRIER**

Polyamide (nylon) vapor retarding, 2 mil, sheeting with a variable permeance ranging from 1 perm, or less, up to 10 perms, or greater, based on varying levels of ambient humidity; MemBrain Continuous Air Barrier & Smart Vapor Retarder by CertainTeed, or equal.

#### **D. TAPE**

Pressure sensitive, aluminum foil tape; Specialty Tape #425 by 3M, or equal.

#### **E. INSULATION FASTENERS**

Galvanized steel impale spindles and clips on 2-inch square flat bases with self adhering backing and length to suit insulation thickness. Include galvanized steel retaining washer(s) of not less than 1-1/2-inches in diameter capable of securely and rigidly fastening insulation in place; by Gemco, or equal.

#### **F. BUILDING WRAP**

Mechanically attached water-resistive, vapor permeable air barrier membrane system including primary sheet membrane, self-adhered flashing tape, and flashing primer (as needed). Entire system shall be

provided by a single manufacturer. Tyvek CommercialWrap by DuPont, WrapShield IT by VaproShield, or equal.

**G. INSULATION BAFFLES**

Rigid polystyrene or PVC insulation baffles; Raft-R-Mate by Owens-Corning, AccuVent by Brentwood, or equal.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

Verify site conditions before beginning installation. Verify that substrate and adjacent materials are ready to receive insulation, and free of all projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

**3.2 GENERAL**

Comply with insulation manufacturer's written instructions applicable to products and applications.

Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

Extend insulation to envelop entire area to be insulated with vapor barriers placed to face the interior (warm) side of the envelope. Fill all voids with insulation, fit tightly around all obstructions and tight to the exterior side of mechanical and electrical services within the plane of the insulation. Remove projections that interfere with placement. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-values.

All miscellaneous voids shall have insulation installed to prevent gaps in insulation using either fiberglass batt compacted to approximately 75 percent of normal maximum volume, or spray polyurethane foam applied according to the manufacturer's written instructions.

Prior to installation of finished surfaces, all vapor-retarder joints and ruptures shall be taped and sealed in each continuous area of insulation to ensure an airtight installation.

### **3.3 INSTALLATION BELOW GRADE**

On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions.

Stagger all joints and butt all panels together for tight fit.

### **3.4 INSTALLATION IN FRAMED CONSTRUCTION**

Install blanket insulation in all cavities formed by framing members. Use insulation widths and lengths that fully fill the cavities. If more than one length is required to fill cavities, provide lengths that will produce a snug fit between ends. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members, and lap all ends and side flanges of facings over framing members.

Prior to installation of attic insulation, install eave insulation baffles between roof framing members on the underside of roof sheathing in insulated attic spaces at vented eaves.

For metal-framed wall cavities, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs. For unfaced blankets, locate vapor barrier joints over member faces and extend vapor barrier tight to the full perimeter of adjacent window and door frames, as well as other items interrupting the plane of membrane. Fully tape seal in place. Provide airspace at exterior plane of insulation for ventilation as recommended by manufacturer.

For wood-framed wall cavities, install blankets according to ASTM C1320 and as specified herein. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

**\*\*\* END OF SECTION \*\*\***

## SECTION 07410

### METAL ROOF PANELS

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes, but is not necessarily limited to, furnishing and installing of all metal roofing, metal fascia, gutters, downspouts, and accessories as indicated on the Plans and specified herein.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
06100	Rough Carpentry
06190	Prefabricated Wood Trusses
07900	Caulking and Sealants
09900	Painting

##### 1.3 SUBMITTALS

Submit in accordance with Section 01300 and as specified herein.

###### A. PRODUCT DATA

Submit manufacturer's technical product data, installation instructions, and recommendations for Metal Roof Panels used. Include data substantiating that materials comply with requirements.

###### B. SAMPLES

Prior to ordering products, submit manufacturer's standard color samples for Owner's selection.

###### C. SHOP DRAWINGS

Show panel layout, trim installation, and panel attachment. Include gutters and downspouts.

**D. WARRANTY**

**1. Manufacturer's Product Warranty**

Manufacturer's standard coating performance warranty, as available for specified installation and environmental conditions.

**2. Contractor's Warranty**

Warrant panels, flashings, sealants, fasteners, and accessories against defective materials and/or workmanship, to remain watertight and weatherproof with normal usage for 2 years following project substantial completion date.

**1.4 QUALITY ASSURANCE**

**A. INSTALLER'S QUALIFICATIONS**

Installation of panels and accessories by installers with a minimum of 5-years documented experience in metal panel projects of this nature.

**B. MANUFACTURER'S QUALIFICATIONS**

Manufacturer shall have a minimum of 10-years experience supplying metal roofing/siding to the region where the work is to be done.

**C. REGULATORY AGENCY REQUIREMENTS**

Comply with IBC and local Building Code requirements if more stringent than those specified.

**1.5 PRODUCT DELIVERY, STORAGE AND HANDLING**

Protect panels against damage and discoloration. Handle panels with non-marring slings and do not bend panels. Store panels above ground, with one end elevated for drainage. Protect panels against standing water and condensation between adjacent surfaces. If panels become wet, immediately separate sheets, wipe dry and allow to air dry. Remove any strippable film prior to installation and do not allow to remain on panels in extreme cold, heat or in direct sunlight.

## **PART 2 PRODUCTS**

### **2.1 APPROVED MANUFACTURER**

The Bryer Company, Taylor Metal Products, or approved equal.

Panel Designations:

Roof: Interlocking, 2-inch high standing seam panels with a net coverage of 18 inches, factory applied seam sealants, and panel surface striations. The Bryer Company, "TBC-Ultra," or equal.

Soffits: Hidden fastener, low-profile, ventilated flush panel with net coverage of 12 inches and two pencil ribs. The Bryer Company "TBC-Flush," or equal.

### **2.2 MATERIALS**

#### **A. PANELS**

##### **1. Base Metal**

Steel conforming to ASTM A924/ASTM A792 Grade 40 or ASTM A446 Grade C, thickness 22 gauge.

##### **2. Coatings**

Protective coatings conform to ASTM A653, Class G-90.

##### **3. Finish**

Exterior finish includes a 0.2 mil thick corrosion-resistant primer and a 0.8 mil thick finish coat of Polyvinylidene Fluoride (PVF<sub>2</sub>), full 70 percent Kynar 500®/Hylar 5000® for a total 1.0 mil dry film thickness.

##### **4. Color**

Manufacturer's standard selection of not less than 12 colors based on physical color chip samples.

##### **5. Sidelap sealant**

Factory applied butyl sealant at all panel-to-panel surfaces.



## B. ACCESSORIES

### 1. Concealed Clips

Galvanized steel conforming to ASTM A653, Class G-90, 16-gauge clips designed to allow thermal movement of panel and configured to secure panel per design conditions.

### 2. Fasteners

Self-tapping screws, bolts, nuts and other acceptable fasteners per manufacturer's requirements. Exposed fasteners shall be corrosion resistant, color-matched with neoprene gasket.

### 3. Sealants (Field Applied)

Gunnable caulk and tape sealants per Specification Section 07900

### 4. Profile Closures

Neoprene or polyethylene foam, die-cut or formed to panel configuration.

### 5. Trim and Flashing

Material, gauge, and finish to match panels. Profiles shall be as indicated in the Plans and as require to weather seal the structure. Lead or copper flashing is not acceptable for use.

### 6. Underlayment

Self-adhered ice and water shield conforming to ASTM D1970.

## C. GUTTERS AND DOWNSPOUTS

Provide gutters and downspouts of formed from flat sheets of the same material as roof panels. Gutters are to be continuous and seamless. Downspouts are to be rectangular. Downspout anchorage shall conform to SMACNA requirements. Fasteners shall be same material and finish as panel, with soft neoprene washers.

**D. FABRICATION**

Unless otherwise shown on the Plans or specified herein, fabricate panels in continuous one-piece lengths and fabricate flashings and accessories in longest practical lengths.

Roofing panels shall be factory formed. Field formed panels are not acceptable.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

Contractor shall inspect installed work of other trades and verify that such work is complete to a point where this work may continue. Verify that installation can be performed in accordance with approved shop drawings and manufacturer's instructions.

**3.2 PREPARATION**

**A. FIELD MEASUREMENTS**

Verify prior to installation. If field measurements differ from Plan dimensions, notify Engineer prior to fabrication.

**B. PROTECTION**

Treat, or isolate with protective material, any contacting surfaces of dissimilar materials to prevent electrolytic corrosion, comply with Section 09900. Require workmen who will be walking on roofing panels to wear clean, soft-soled shoes that will not pick up stones or other abrasive material, which could cause damage and discoloration.

**C. SURFACE PREPARATION**

Clean and dry surfaces prior to applying sealant.

**3.3 INSTALLATION**

**A. PANELS**

1. Follow metal panel manufacturer's directions and printed instructions.

2. Install roof panel seams vertically.
3. Install wall panel seams: vertically.
4. Lap panels away from prevailing wind direction.
5. Do not stretch or compress panel side-lap interlocks.
6. Secure panels without warp or deflection.

**B. ALLOWABLE ERECTION TOLERANCE**

Maximum Alignment Variation: 1/4 inch in 40 feet.

**C. FLASHING**

1. Follow manufacturer's directions and Engineer-approved shop drawings.
2. Overlap roof panels at least 6 inches.
3. Install flashings to allow for thermal movement.
4. Remove any strippable protective film, if used, immediately preceding flashing installation.

**D. CUTTING AND FITTING**

1. Provide neat, square and true. Torch cutting is prohibited where cut is exposed to final view.
2. Openings 6 inches and larger in any direction: Shop fabricate and reinforce to maintain original load capacity.
3. Where necessary to saw cut panels, debur and treat with galvanic paint coating to match factory color.

**3.4 CLEANUP AND CLOSEOUT**

**A. PANEL DAMAGE AND FINISH SCRATCHES**

Do not apply touch-up paint to damaged paint areas that involve minor scratches. Panels or flashings that have severe paint and/or substrate damage shall be replaced as directed by the Engineer.

B. CLEANING AND REPAIRING

At completion of each day's work and at work completion, sweep panels, flashing and gutters clean. Do not allow fasteners, cuttings, filings, or scraps to accumulate. Remove debris from project site upon work completion, or sooner, if directed by the Owner.

**\*\*\* END OF SECTION \*\*\***







## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

Prior to commencing installation, the Contractor shall inspect installed work of other trades and verify that such work is complete to a point where this work may continue. Verify that the installation may be made in accordance with approved shop drawings and manufacturer's instructions and that the condition of substrate is suitable for the installation.

### **3.2 PREPARATION**

#### **A. FIELD MEASUREMENTS**

Verify prior to installation. If field measurements differ from the Plans, notify the Engineer prior to fabrication.

#### **B. SURFACE PREPARATION**

Examine, clean, and repair as necessary any substrate conditions that would be detrimental to proper installation. Do not begin installation until unacceptable conditions have been corrected.

### **3.3 INSTALLATION**

#### **A. PANELS**

##### **1. General**

Install products in accordance with the latest printed instructions of the manufacturer, with all components true and plumb.

##### **2. Nailing**

Nail horizontal panels by placing nail in center of slot. Drive nails straight, leaving 1/16-inch space between nail head and flange of panel.

##### **3. Spacing**

Allow space between both ends of siding panels and trim for thermal movement. Overlap horizontal panel ends 1/2 the width of factory precut notches.



4. Joints in Horizontal Siding

Stagger lap joints in uniform pattern as successive courses of siding are installed.

B. ERECTION TOLERANCE

Maximum Alignment Variation: 1/4 inch in 40 feet

**3.4 CLEANUP AND CLOSEOUT**

A. PANEL DAMAGE AND FINISH SCRATCHES

Panels that have severe damage or finish scratches shall be replaced at the Contractor's expense and shall not be field repaired.

B. CLEANING

At the completion of each day's work and at work completion, sweep panels and trim free of dirt and debris. Do not allow work scraps to accumulate and remove waste on a daily basis.

**\*\*\* END OF SECTION \*\*\***

## SECTION 07900

### CAULKING AND SEALANTS

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the furnishing of all labor, materials, tools, and equipment required to install caulking and sealants, as indicated on the Plans and as specified herein.

All exterior wall joints and interior and exterior joints between all differing or dissimilar materials and at windows, doors, roof penetrations, louvers and similar types of openings shall receive sealants to make the joint air and watertight. This includes concrete to CMU, concrete to wood, CMU to wood, concrete to sheet metal, CMU to sheet metal, etc.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
03300	Cast-in-Place Concrete
07410	Metal Roof and Wall Panels
08110	Hollow Metal Doors and Frames

##### 1.3 REFERENCE STANDARDS

This Section references the latest revisions of the following documents:

<u>Reference</u>	<u>Title</u>
AAMA 800	Sealant Manual, Specifications and Test Methods for Sealants
ASTM C834	Standard Specification for Latex Sealants
ASTM C920	Standard Specification for Elastomeric Joint Sealants
ASTM C1193	Standard Guide for Joint Sealants
ASTM C1311	Standard Specification for Solvent Release Sealants
ASTM D5249	Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

ASTM D7174 Standard Specification for Preformed Closed-Cell Polyolefin Expansion Joint Fillers for Concrete Paving and Structural Construction

NSF/ANSI 61 Drinking Water System Components – Health Effects

## **PART 2 PRODUCTS**

### **2.1 POLYURETHANE SEALANTS**

Provide a one-component, gunnable grade, non-sag, solvent-free polyurethane sealant. The sealant shall cure under the influence of atmospheric moisture. Sealant shall meet ASTM C920, Type S, Grade NS, Class 35, under uses NT, T, M, G, I, A, and O. Performance characteristics shall include a 175 psi 21-day tensile strength, a minimum 500-percent ultimate elongation, and a maximum Shore “A” Hardness of 45.

Polyurethane sealants shall be Sikaflex-1a, as manufactured by the Sika Corporation, or equal by Tremco, Inc. or BASF Corporation.

### **2.2 SILICONE SEALANTS**

Provide a one-component, gunnable grade, neutral cure, silicone sealant. Sealant shall meet ASTM C920, Type S, Grade NS, Class 50, under uses NT, M, G, A and O. Performance characteristics shall include a 200 psi 21-day tensile strength, a minimum 700-percent ultimate elongation, and a maximum Shore “A” Hardness of 25.

Silicone sealants shall be Sikasil WS-295, as manufactured by the Sika Corporation, or equal by Tremco, Inc. or BASF Corporation.

### **2.3 ACRYLIC LATEX CAULK**

Provide a one-component, gunnable grade, pure acrylic latex sealant. Sealant shall meet ASTM C834, Type OP, Grade -18 °C. Performance characteristics shall include a maximum 25-percent shrinkage, and a movement capability of plus/minus 12.5-percent.

Acrylic latex sealants shall be Tremflex 834, as manufactured by the Tremco, Inc. or equal by BASF Corporation.

## **2.4 TAPE SEALANT**

Provide a 100-percent solid, isobutylene preformed sealant tape. Tape sealant shall meet the American Architectural Manufacturer's Association AAMA 807.3 standard. Performance characteristics shall include a density of 1.5 and a minimum peel adhesion of 8 pounds per inch.

Tape sealant shall be Sikalastomer-95, as manufactured by the Sika Corporation, or equal by Tremco, Inc. or BASF Corporation.

## **2.5 PREFORMED FLEXIBLE JOINT MATERIAL**

Provide a closed-cell, polyolefin preformed foam joint material. Foam joint material shall meet ASTM D7174. Performance characteristics shall include an expansion recovery greater than 99-percent, a maximum 50-percent compression strength of 15 psi, and a maximum water absorption of 0.25-percent by volume.

Foam joint material shall be Ceramar, as manufactured by W.R. Meadows, or equal.

## **2.6 PREFORMED FLEXIBLE JOINT BACKER MATERIAL**

Provide a closed-cell, polyolefin preformed foam backer rod material. Backer rod material shall meet ASTM D5249 and shall be compatible with the proposed cold-applied sealant.

Backer rod material shall be Kool-Rod, as manufactured by W.R. Meadows, or equal.

## **2.7 PRIMERS**

Provide primer materials made by or recommended by the sealant manufacturer for the conditions of the application, including the materials to be sealed at the joints and the type of sealant or caulking material to be used.

# **PART 3 EXECUTION**

## **3.1 GENERAL**

All sealant and primer work shall comply with ASTM C1193 and with the manufacturer's written instructions.

The Contractor shall confirm that the proposed sealant and primer materials are compatible with any concrete curing compound used, or the Contractor shall

lightly sandblast and thoroughly clean concrete joint surfaces prior to application of sealant materials.

All priming and sealant work shall be done under temperature and moisture conditions that are within the requirements of the manufacturer's written instructions.

All exterior dissimilar materials shall be sealed with elastomeric sealants at the joints between the different materials.

## **3.2 APPLICATION OF SEALANTS**

### **A. PREPARATION OF JOINTS**

Inspect profiles and surfaces of all joints prior to application. Verify joint dimensions are adequate for development of the sealant movement capability. All joints shall be solvent cleaned, dry, and free of dust, oils and grease before receiving backing materials and sealant. Floor joints shall be wire brushed, free of laitance or other residues. Aluminum or other metal surfaces to be in contact with sealants shall be wiped clean with xylol or an MEK solvent to remove any coatings or contamination. Joint sealants shall be installed before other surface finishes are applied. Proceed with joint sealant work only once conditions meet the manufacturer's requirements.

### **B. BACKINGS**

Install filler and backer materials in as long of lengths as practicable. Stretch and force into joints with tool designed for that purpose, to a uniform depth, as indicated on the Plans or as required by the manufacturer, allowing for installation of sealant and caulking. Provide filler material in slab shapes for joints 1/2 inch or more in depth, and in 3/4 inch or more wide joints to receive sealing material. Provide extruded rod backer material in all other joints to receive sealant. Filler or backer material shall be of a depth as required to bring the top surface to within 1/2 inch of the slab surface, or as indicated on the Plans. All joints shall include a suitable bond breaker between backing materials and sealant.

### **C. MASKING**

Both sides of joints shall be masked with tape to prevent soiling floor, slab, or wall beyond limits of the joint.

**D. PRIMING**

Apply primer to all surfaces of joints in contact with sealant materials. Apply full strength and undiluted in a uniform coating of surface. Allow to set or cure prior to proceeding. Do not prime surfaces at back of joint.

**E. APPLICATION**

Sealant shall be gun applied, giving the joint a full bead of sealant. Skin beads are not acceptable. Tool the bead immediately after application to ensure a firm and full contact with the inner faces of the joint. Joints in sills and other wash surfaces shall be filled slightly convex to obtain a flush joint when dry. Entire perimeter of openings in concrete surfaces shall be sealed. Do not apply sealants to wet or damp surfaces nor in temperatures below 50 degrees F, and as required by the manufacturer. Strike off excess sealant with tooling stick or a knife so that finished bead is slightly below surface. Remove excess sealant as work progresses. Sealants in masonry wall joints are to be a maximum of 1/2-inch deep and not less than 1/4 inch in each dimension. When applying sealant, do not permit thickness of sealant to exceed 1/2 of the width of the joint. Any joints over 1/2-inch wide shall be reported to the Owner and instructions for correcting the applications will be given.

**3.3 CLEANUP**

Upon completion, the Contractor shall remove and dispose of masking materials. Remove any excess materials and clean adjacent surfaces free from any soiling or staining resulting from the sealing and caulking operations.

**\*\*\* END OF SECTION \*\*\***

**DIVISION 8**  
**DOORS AND WINDOWS**











## SECTION 08310

### METAL ACCESS HATCHES

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section consists of the Contractor furnishing and installing 1 aluminum access hatch and accessories as shown on the Plans and as specified herein.

##### 1.2 QUALITY ASSURANCE

Access hatches shall be guaranteed against defects in material and/or workmanship for a period of 10 years by the manufacturer.

##### 1.3 EQUIPMENT LIST

The metal access hatches to be installed are as follows:

<u>Location</u>	<u>Clear Opening</u>
Site 2 Control Valve Vault	72"x96"

#### PART 2 PRODUCTS

##### 2.1 APPROVED MANUFACTURERS

Metal access hatches shall be as manufactured by Halliday Products, Inc., Bilco, L. W. Hatch, or equal.

##### 2.2 ACCESS HATCH

Access hatches shall be Halliday H2W series (double leaf), or equal. The hatches shall have a 1/4-inch-thick one-piece mill finish, extruded aluminum channel frame, incorporating a continuous concrete anchor. A 1-1/2-inch drainage coupling shall be located in the front left corner of the channel frame, unless shown otherwise on the Plans. A bituminous coating shall be applied to the frame exterior where it comes in contact with concrete. The door panels shall be 1/4-inch aluminum diamond plate reinforced to withstand a live load of H-20 designation. The doors shall open to 90 degrees and automatically lock with a stainless steel hold-open arm shall incorporate an enclosed stainless steel compression spring assist. The doors shall close flush with the frame and rest on a built-in neoprene cushion/gasket. Hinges and all fastening hardware shall be stainless steel. The unit shall lock with a stainless steel slam lock with removable

key and have a non-corrosive handle. The unit shall be guaranteed against defects in material and/or workmanship for a period of 10 years.

### **PART 3 EXECUTION**

Units shall be installed as specified herein and as shown on the Plans. The units shall be connected with drain piping as shown on the Plans, and shall be installed according to the manufacturer's recommendations for safe and proper storage.

**\*\*\* END OF SECTION \*\*\***

## SECTION 08330

### COILING DOORS

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section consists of furnishing and installing electric operated rolling door with steel insulated panels as indicated on Plans and specified herein. The Contractor shall also provide and install operating hardware and supports.

##### 1.2 RELATED SECTIONS SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
04200	Masonry
07900	Caulking and Sealants
Division 16	Electrical

##### 1.3 SUBMITTALS

Submittals shall be in accordance with Section 01300 of this Specification.

###### A. PRODUCT DATA

Submit manufacturer's product data and installation instructions for coiling door. Include specific data prepared for this Project.

###### B. SHOP DRAWINGS

Submit shop drawings for approval prior to fabrication. Include detailed plans, deviations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials.

##### 1.4 OPERATION AND MAINTENANCE DATA

The Contractor shall provide manufacturer's operation and maintenance data; include data for transmission, shaft and gearing, lubrication frequency, spare part sources.

## **1.5 QUALITY ASSURANCE**

### **A. MANUFACTURER**

Rolling door shall be manufactured by a firm with a minimum of 5-years experience in the fabrication and installation of rolling doors. Manufacturers proposed for use, which are not named in these Specifications, shall submit evidence of ability to meet performance and fabrication requirements specified, and include a list of five projects of similar design and complexity completed within the past 5 years.

### **B. INSTALLER**

Installation of rolling door shall be performed by an authorized representative of the manufacturer.

### **C. SINGLE-SOURCE RESPONSIBILITY**

Provide doors, guides, and related primary components from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

### **D. PRE-INSTALLATION CONFERENCE**

Schedule and convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures, and construction operations.

## **1.7 WARRANTY**

Provide a manufacturer's 2-year warranty for the door and operator system.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

Wayne Dalton or approved equal.

### **2.2 MATERIALS**

800C Series Insulated Service Door.

#### **A. CURTAIN**

Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.

1. Flat profile. The front slat shall be fabricated of 18-gauge galvanized steel. The back slat shall be 24-gauge galvanized steel.
2. Slat cavity shall be filled with CFC-free foamed-in-place, polyurethane insulation for an R-value of 7.7.

#### **B. FINISH**

Slats and hood shall be galvanized steel in accordance with ASTM A653 and receive rust-inhibitive, roll coating process, including bonderizing, 0.2-mils-thick baked-on prime paint, and 0.6-mils-thick baked-on polyester (powder coated) top coat. Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.

#### **C. COLOR**

Powder coating finish in color as selected by the Owner from manufacturer's standard colors.

#### **D. WINDLOAD DESIGN**

Design and size components to withstand loads caused by pressure and suction of wind acting normal to the plane of wall as calculated in accordance with the design parameters shown on the Contract Drawings, current applicable code(s), and for a minimum of 20 PSF.



E. WEATHERSEALS

Vinyl bottom seal, exterior guide and internal hood seals; with optional air infiltration package to reduce air infiltration to less than 1.0 cfm per square foot door area.

F. BOTTOM BAR

Two prime painted galvanized steel angles, minimum thickness 1/8-inch bolted back to back to reinforce curtain in the guides.

G. GUIDES

Three galvanized structural steel angles with minimum thickness of 3/16 inch. Guides shall be weatherstripped with a vinyl weather seal at each jamb, on the exterior curtain side.

H. BRACKETS

Hot rolled galvanized steel to support counterbalance, curtain, and hood.

I. COUNTERBALANCE

Helical torsion spring type designed for standard 20,000 cycle life design. Counterbalance shall be housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance shall be adjustable by means of an adjusting tension wheel.

J. HOOD

Galvanized steel, 24-gauge hood with intermediate supports as required. Provide with internal hood baffle weatherseal.

K. ELECTRIC MOTOR OPERATION

1. Provide UL listed electric operator, size as recommended by manufacturer to move door in either direction at not less than 2/3 feet nor more than 1 foot per second, 1 HP maximum, with positive locking/holding system. The electric operator must comply with the following requirements:

a. Entrapment protection: NEMA 4, dual-sided photo eyes, and NEMA 4, dual-sided light curtain.

b. Operator Controls

Push-button and key operated with open, close and stop buttons, for both interior and exterior locations where indicated on the Plans.

c. Motor voltage: 115/230 60Hz

2. Motors shall be recognized or labeled and listed by a recognized electrical testing laboratory approved by the Washington State Department of Labor and Industries, or the motor shall be specifically approved by the Washington State Department of Labor and Industries for installation on the project.
3. Motors shall meet the efficiency requirements of the Washington State Energy Code (Washington Administrative Code, Title 51, Chapter 51-11) Table 4-, regardless of whether or not a particular motor is exempted from meeting this efficiency by the Washington Energy Code.
4. Provide manual chain hoist back up operation in the event of electric operation failure
5. Provide four remote control door openers for each motorized coiling door.
6. Elite H-Series by Liftmaster, or equal.

L. LOCKING

Interior bottom bar slide boltlock for manually operated doors. Chain keeper locks for chain hoist operation.

Interior slide bolt lock for electric operation with interlock switch.

M. WALL MOUNTING CONDITION

Face-of-wall mounting.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

The Contractor shall verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits. Beginning of installation means installer acceptance of existing surfaces.

### **3.2 PREPARATION**

The Contractor shall prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

### **3.3 INSTALLATION**

The Contractor shall install door unit assembly in accordance with manufacturer's instructions. Anchor assembly to wall construction and building framing without distortion or stress. Securely brace door tracks suspended from structure. Secure tracks to structural members only. Fit and align door assembly including hardware, level, and plumb, to provide smooth operation. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900. The electrician shall provide all conduit and wire necessary to make the door push button station and safety devices work and function. See E-sheets for more details.

### **3.4 TOLERANCES**

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation from Plumb: 1/16 inch.
- C. Maximum Variation from Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch with the use of a 10-foot-long straight edge.

### **3.5 MANUFACTURER'S FIELD SERVICES**

Prepare, adjust and startup system. Ensure the operation and adjustments to door assembly for smooth operation.

### **3.6 ADJUSTING**

The Contractor shall adjust door assembly to smooth operation.

### **3.7 CLEANING**

The Contractor shall clean door and frames. Remove labels and visible markings. Touchup damaged coatings and finishes and repair minor damage.

### **3.8 PROTECTION OF FINISHED WORK**

The Contractor shall protect finished work after the installation. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

**\*\*\* END OF SECTION\*\*\***

## SECTION 08700

### FINISH HARDWARE

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section specifies that the Contractor shall provide complete finish hardware and suitable fastenings for the project. Quantities listed in any instance are for supplier convenience only and are not guaranteed.

Finish hardware includes items known commercially as “builders’ hardware” required, for swinging doors. Hardware specified in the same section as the door and/or doorframe will be furnished by the supplier of that Section.

All hardware furnished in this Section shall comply with the requirements of all applicable codes. All items specified in this Section shall be furnished by a factory-authorized distributor maintaining parts, stocks, and services for standard specified items.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
08110	Hollow Metal Doors and Frames

##### 1.3 REFERENCES

This Section references the latest revisions of the following documents:

<u>Reference</u>	<u>Title</u>
UL	Building Materials List

#### PART 2 PRODUCTS

##### 2.1 APPROVED MANUFACTURER’S

Finish hardware shall be as manufactured by the suppliers listed in the following sections.

##### 2.2 BUTTS

Butts shall be 4-1/2" x 4-1/2" for 3'-0" and under and 5" x 4-1/2" for over 3'-0", except as required for 180-degree swing and shall be of the type listed. Doors up

to and including 90 inches in height shall have 1-1/2 pair and doors over 90 inches in height shall have two pair. For unusual size or weight doors, furnish type, size, and quantity recommended by the butt manufacturer. All exterior-outswinging doors shall have non-removable pins. Butts shall be of the concealed bearing type with anti-friction, self-lubricating hinges. Butts shall be as manufactured by McKinney, or equal.

### **2.3 LOCKSETS**

Locksets shall Grade 1 mortise locksets with 2-3/4-inch backsets and shall be as manufactured by Best (no others will be allowed). All locksets and latchsets shall be the product of one manufacturer. All locksets and latchsets shall be heavy-duty mortise type UL approved for use on fire doors and 3/4-inch antifriction latch bolt. Functions as indicated in the hardware groups. Provide curved lip strikes. Deadbolt functions shall be 1-inch projection.

Locksets and latchsets shall be furnished with sufficient strike lip to protect trim. (note: 3/4-inch latch bolts require 3/4-inch minimum clearance for trim, otherwise extended lip strikes must be furnished).

All locks shall have wrought box strikes.

### **2.4 GASKETS AND THRESHOLDS**

Gaskets and thresholds shall be as specified in the hardware groups and shall be as manufactured by Pemko, or equal.

### **2.5 KEYING**

All cylinder items shall be furnished with visual key control with key code stamped on the face of the keys and marked on the back or side of the cylinders. All standard cylinder items shall be furnished with construction-keyed cylinders.

The Contractor shall provide final keying for all locksets and shall coordinate the keying with the Owner to match their current keying protocols

### **2.6 KEY QUANTITIES**

Keys shall be furnished in the following quantities:

<b><u>Type</u></b>	<b><u>Quantity</u></b>
MKs	6 each
Construction Keys	6 each
Change keys per keyed cylinder	2 each

Control keys 2 each

## 2.7 HARDWARE GROUPS

### A. MANUFACTURER'S LIST

<u>Manufacturer</u>	<u>Abbreviation</u>
Best	BT
Hanchett Entry Systems	HES
McKinney	MK
Pemko	PE

### B. Refer to door schedule and related information concerning the following hardware groups:

#### HW1 (exterior single door)

	Butts TCA 3386, 626	MK
1 ea.	45H Lockset 7AB 3J, 626	BT
1 ea.	1E74 7-Pin IC Cylinder, 626	BT
1 ea.	Electric Strike 1600CS DLM, 630	HES
1 ea.	Threshold 2715, CPK	PE
1 ea.	Door Bottom 210, CPK	PE
1 set	Gaskets 2891, 290, CPK	PE

#### HW2 (privacy door)

	Butts TCA 3386, 626	MK
1 ea.	45H Lockset 0L 3J, 626	BT
1 ea.	Threshold 2715, CPK	PE
1 ea.	Door Bottom 210, CPK	PE
1 set	Gaskets 2891, 290, CPK	PE

## PART 3 EXECUTION

### 3.1 INSTALLATION

Refer to A.S.A.H.C., B.H.M.A., and S.D.I. for mounting heights.

Unless a conflict arises, the following are standard mounting heights on some products. If a question or conflict should arise, the hardware supplier, if requested, shall assist the Contractor and Owner in determining mounting heights. All measurements are from finish floor except top butt.

A. BUTTS

Top 11-3/4-inch center of butt to top of door. Intermediate equal distance between top and bottom butts. Bottom 13-inch center of butt.

B. KNOB LOCKS

40-5/16 inch to center of strike

C. DEADLOCKS

60 inch to center of strike.

**3.2 ADJUSTING**

Hardware shall be adjusted for correct operation.

After installation of hardware and before the building is accepted, Contractor shall inspect the installation and certify that the hardware is correctly installed in accordance with the manufacturer's recommendations. Hardware installer shall make any necessary adjustments.

**\*\*\* END OF SECTION \*\*\***



**DIVISION 9**

**FINISHES**

## SECTION 09250

### GYPSUM WALLBOARD

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section consists of all labor, materials, and equipment for all gypsum wallboard, zinc-coated trim, taping, spackling, and texturing necessary to complete all the work indicated on the Plans and as specified. The work shall include installation of gypsum board, exterior and interior grounds, corner beads, taping, spackling, sanding, and texturing of all joints and screw heads to obtain finished walls ready for painting.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals

##### 1.3 REFERENCES

This Section references the latest revisions of the following documents:

<u>Reference</u>	<u>Title</u>
ASTM C36	Specification for Gypsum Wallboard
ASTM C79	Test Method for Gypsum Wallboard
ASTM C514	Specification for Nails for the Application of Gypsum Wallboard
ASTM C630	Specification for Water-Resistant Gypsum Backing Board
ASTM C840	Specification for Application and Finishing of Gypsum Wallboard
ASTM C1002	Specification for Steel Drill Screws for the Application of Gypsum Wallboard
ASTM C1047	Specification for Accessories for Gypsum Wallboard

##### 1.4 QUALITY ASSURANCE

All gypsum wallboard products and joint treatment products shall be obtained from a single manufacturer.

## **PART 2 PRODUCTS**

### **2.1 APPROVED MANUFACTURERS**

Gypsum wallboard products and joint treatment products shall be as manufactured by National Gypsum Company, Georgia Pacific, the USG Group, or approved equal.

### **2.2 GYPSUM WALLBOARD**

Heavy duty, moisture and abuse resistant gypsum wallboard with reinforcing layers at each face shall conform to ASTM C1629 and ASTM C1396, Type X. Thickness shall be 5/8 inch.

### **2.3 TRIM ACCESSORIES**

Provide manufacturer's standard trim accessories of types indicated for drywall work, formed of galvanized steel unless otherwise indicated, with either knurled and perforated or expanded flanges for nailing and beaded for concealment of flanges in joint compound. Provide corner beads, L-type edge trim-beads, U-type edge trim-beads, and one-piece control joint beads. Unless specifically noted as "exposed," all trim accessories shall be beaded type to be concealed with joint compound.

### **2.4 JOINT TREATMENT MATERIALS**

Provide materials complying with ASTM C475, ASTM C840 and recommendations from the Manufacturer for the applications indicated. Provide 2-1/2-inches wide, perforated tape for joints. Provide two separate grades of ready-mixed, vinyl-type joint compound. One type shall be for bedding tapes and filling depressions. The second type shall be for taping and sanding.

### **2.5 FASTENERS**

Screws shall conform to ASTM C1002 with heads, threads, points, and finish as recommended by the manufacturer.

## **PART 3 EXECUTION**

### **3.1 GENERAL**

All workmanship and materials shall be of the best quality and any defective work shall be removed and replaced by the Contractor at no additional expense to the Owner. Keep the premises free of accumulations of debris and dust connected with this work and protect adjacent finished surfaces from damage by this work.

The Contractor shall establish and maintain application and finishing environment in accordance with ASTM C840. For non-adhesive attachment of gypsum wallboard to framing, maintain not less than 40 degrees F.

### **3.2 INSTALLATION**

All drywall sheets shall be set with staggered joints and screws and/or nails set deep enough to receive a cover of spackle, spaced in accordance with Wallboard Manufacturer's standard specifications. Install approved zinc-coated corner molds at openings and terminations of wallboards. Cut all wallboard close to and around wall penetrations and electrical outlets. Provide a complete, covered installation in all areas where gypsum wallboard is to be installed.

### **3.3 FINISHING**

After the wallboard has been installed, it shall be finished. Apply joint compound or bedding compound and embed tape leaving uniform thickness of materials underneath tape. Cover screw heads smooth with finished surface of board after each application of joint material. After initial application has been complete, it shall be allowed to dry and then sanded smooth.

Additional coats of joint compound shall be applied and finish sanded until a Level 5 finish has been achieved.

Obtain Owner's approval prior to applying paint.

### **3.4 ESCUTCHEONS**

Provide escutcheons around all pipe, conduit, and similar types of penetrations through gypsum wallboard walls and ceiling.

**\*\*\* END OF SECTION \*\*\***

## SECTION 09260

### INSULATED WALL PANELS

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the insulated wall panels and necessary fasteners and accessories shown on the Plans and as specified herein.

The work shall include all labor, materials, and equipment for the complete installation and finished appearance of the insulated wall panels.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
06100	Rough Carpentry
07210	Batt and Rigid Insulation
07900	Caulking and Sealants
08110	Hollow Metal Doors and Frames

##### 1.3 REFERENCES

This Section references the latest revisions of the following documents:

<u>Reference</u>	<u>Title</u>
ASTM E84	Flame Spread
ASTM D570	Water Absorption
ASTM D648	Heat Deflection temperature
ASTM D695	Compressive Strength
ASTM D696	Coefficient of lineal thermal expansion
ASTM D790	Flexural modulus
ASTM D2240	Shore hardness
ASTM D3029	Dart drop impact Strength

##### 1.4 QUALITY ASSURANCE

All insulated wall panel products and accessories, shall be obtained from a single manufacturer.

## 1.5 SUBMITTALS

Comply with provisions of Section 01300.

### A. PRODUCT DATA

Submit manufacture's technical data and installation sheets for project compliance.

### B. PRODUCT SAMPLE

Submit available product finishes and color for Owner's selection.

## 1.6 DELIVERY, STORAGE, AND HANDLING

Handle and store product with care, and in accordance with manufacturer's instructions to avoid warps, gauges and scratches to panels. Panels shall be stored on a clean, dry surface.

Time delivery and installation of product to avoid extended on-site storage and to avoid delaying work of other trades.

## PART 2 PRODUCTS

### 2.1 APPROVED MANUFACTURERS

Subject to compliance with requirements, manufacturers which may be incorporated in the work include, but are not limited to, the following:

Parkland Plastics; [www.parklandplastics.com](http://www.parklandplastics.com)

### 2.2 PRODUCT

Insulex insulated wall panels shall be composite panels constructed of a plastic laminate bonded to a rigid foam insulation substrate. The laminate surface shall be 100 percent waterproof; mold/mildew resistant; impervious to most chemicals and non-yellowing or color change in a corrosive environment.

The plastic laminate shall comply with the following:

Flame Spread, ASTM E84:	Class A
Water Absorption, ASTM D570:	0.05%
Tensile Strength, ASTM D638:	1,400 psi

Flexural Strength, ASTM D790: 3,900 psi

Insulation: Provide thickness as required to achieve the insulation values indicated on the Plans

Size: 48" x 96" minimum size

Finish and Color: Matte/Bright White

Owner has the option to change finish and color based on available finish and color samples submitted.

### **2.3 TRIM ACCESSORIES**

Provide manufacturer's standard moldings: inside corner, isc; outside corner, osc; divider; and cap, as required for a complete finished appearance.

Provide necessary caulking and sealants in conjunction with moldings per manufacturer's recommendations.

### **2.4 ADHESIVES AND FASTENERS**

Panels shall be fastened with adhesive and mechanical fasteners.

Provide high quality cartridge style non flammable construction adhesive and nylon rivet fasteners in compliance with manufacturer's installation recommendations.

## **PART 3 EXECUTION**

### **3.1 GENERAL**

All workmanship and materials shall be of the best quality and any defective work shall be removed and replaced by the Contractor at no additional expense to the Owner. Keep the premises free of accumulations of debris and dust connected with this work and protect adjacent finished surfaces from damage by this work.

### **3.2 INSTALLATION**

Prior to installation, panels shall be preconditioned for 24 hours at temperature and moisture level typical for the area of installation. Install panels directly over masonry. Provide additional framing as required. Support framing shall be structurally sound, level and true. Provide 1/8-inch to 3/16-inch clearance

between the top and bottom of panels to allow for movement. Cut and prefit panels as required.

For adhesives, fasteners, and sealants follow manufacture's instructions. After panels are installed with adhesive, install rivets starting from the center of panel. Work outwards securing the perimeter last. Arrange fasteners on 16-inch centers with outer fasteners placed about 1 inch from panel edges. Stagger rivet rows 8-inch centers.

Exposed substrate will absorb moisture that may cause swelling, deterioration of substrate and weaken the laminate bond. To provide a moisture resistant wall surfacing, a quality caulk/sealant shall be used in conjunction with the moldings. Refer to manufacturer's installation guide lines.

**\*\*\* END OF SECTION \*\*\***



## SECTION 09653

### RESILIENT WALL BASE

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the resilient base material and accessories as shown on the Plans and as specified herein.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
09250	Gypsum Wall Board

##### 1.3 SUBMITTALS

###### A. PRODUCT DATA

Rubber Wall Base.

###### B. SAMPLES FOR INITIAL SELECTION

Manufacturer's standard sample sets consisting of sections of units showing the full range of colors and patterns available for each type of product indicated.

###### C. SAMPLES FOR VERIFICATION

In manufacturer's standard sizes, but not less than 12 inches (300 mm) long, of each product color and pattern specified.

##### 1.4 QUALITY ASSURANCE

###### A. INSTALLER QUALIFICATIONS

Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.

**B. SOURCE LIMITATIONS**

Obtain each type and color of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification and shipping and handling instructions.
- B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 degrees F (10 and 32 degrees C).
- C. Move products into spaces to lay flat where they will be installed at least 48 hours before installation with HVAC systems active, unless longer conditioning period is recommended in writing by manufacturer.

**1.6 PROJECT CONDITIONS**

- A. Maintain a temperature of not less than 70 degrees F (21 degrees C) or more than 95 degrees F (35 degrees C) in spaces to receive resilient products for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After post-installation period, maintain a temperature of not less than 55 degrees F (13 degrees C) or more than 95 degrees F (35 degrees C).
- B. Do not install products until they are at the same temperature as the space where they are to be installed.

**PART 2 PRODUCTS**

**2.1 RESILIENT WALL BASE**

**A. RUBBER WALL BASE**

Products complying with ASTM F1861, Type TP, Group 1.

## 2.2 MANUFACTURERS

### A. AVAILABLE PRODUCTS

Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:

1. Products

- a. Roppee Corporation
- b. Burke
- c. Tarkett

2. Color and Pattern

As selected by Owner from manufacturer's full range of colors and patterns produced for rubber wall base complying with requirements indicated.

- a. Allow one color.

3. Style: Cove with top-set toe.

4. Minimum Thickness: 1/8 inch (3.2 mm).

5. Height: 4 inches (101.6 mm).

6. Lengths: Coils in lengths standard with manufacturer, but not less than 96 feet (29.26 m).

7. Outside Corners: Formed on job.

8. Inside Corners: Formed on job.

9. Ends: Premolded.

10. Surface: Smooth.

## **2.3 RESILIENT ACCESSORIES**

### **A. RUBBER ACCESSORIES**

Provide necessary accessories as required per manufacturer's recommendations.

## **2.4 INSTALLATION ACCESSORIES**

### **A. TROWELABLE LEVELING AND PATCHING COMPOUNDS**

Latex-modified, portland-cement-based formulation provided or approved by resilient product manufacturer for applications indicated.

### **B. ADHESIVES**

Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements, including those for maximum moisture content. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

#### **A. GENERAL**

Comply with manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.

**B.** Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

**C.** Remove coatings, including curing compounds and other substances that are incompatible with adhesives and that contain soap, wax, oil or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

- D. Broom and vacuum clean substrates to be covered immediately before installing resilient products. After cleaning, examine substrates for moisture, alkaline salts, carbonation or dust. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.3 INSTALLATION**

#### **A. GENERAL**

Install resilient products according to manufacturer's written installation instructions.

- B. Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas as scheduled.
  - 1. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned. Minimum length for fill-in pieces along a run of wall shall be 48-inches.
  - 2. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
  - 3. Do not stretch base during installation.
  - 4. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
  - 5. Form outside corners on job, from straight pieces of maximum lengths possible, without whitening at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
  - 6. Form inside corners on job, from straight pieces of maximum lengths possible, by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

- C. Place resilient products so they are butted to adjacent materials and bond to substrates with adhesive. Install reducer strips at edges of flooring that would otherwise be exposed.

### **3.4 CLEANING AND PROTECTING**

- A. Perform the following operations immediately after installing resilient products:
  - 1. Remove adhesive and other surface blemishes using cleaner recommended by resilient product manufacturers.
  - 2. Sweep or vacuum horizontal surfaces thoroughly.
  - 3. Do not wash resilient products until after time period recommended by resilient product manufacturer.
  - 4. Damp-mop or sponge resilient products to remove marks and soil.
- B. Protect resilient products against mars, marks, indentations and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods recommended in writing by resilient product manufacturer.
- C. Clean resilient products not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer's written recommendations.

**\*\*\* END OF SECTION \*\*\***

## SECTION 09900

### PAINTING

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section covers the furnishing and installation of protective coatings, complete-in-place. Special shop coatings and/or factory-applied finishes on manufactured or fabricated items may be specified elsewhere. Regardless of the number of paint coats previously applied, at least two field coats of paint shall be applied to all surfaces unless otherwise specified herein. Field painting is not required for factory prefinished equipment items such as pumps, blowers, motors, etc. Touchup of the factory applied coatings may be required.

The word “paint” as used herein shall be taken to include all protective coatings and incidental materials as required with the exception that anodized aluminum or zinc galvanized coatings shall not be considered as paint.

Unless specifically noted otherwise in these Specifications or on the Plans, all work performed under this Contract (both new work and modifications to existing facilities) shall be painted. If an existing wall or ceiling (or similar surface) is modified in some way, the entire wall or ceiling surface is to be painted.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
03300	Concrete
04200	Masonry
Division 5	Metals
08110	Hollow Metal Doors and Frames
Division 11	Equipment
Division 13	Special Construction
Division 14	Conveying Systems
Division 15	Mechanical
Division 16	Electrical

### **1.3 REFERENCED STANDARDS**

The following standards are referenced and shall be considered a part of these Specifications:

American National Standards Institute (ANSI):

- A159.1, Surface Preparation Specifications;
- Z53.1, Safety Color Code for Marking Physical Hazards

American Society for Testing and Materials (ASTM):

- D4263, Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
- E84, Standard Test Method for Surface Burning Characteristics of Building Materials

National Fire Protection Association (NFPA):

- 101, Life Safety Code

Steel Structures Painting Council (SSPC):

- SP-1, Solvent Cleaning
- SP-2, Hand Tool Cleaning
- SP-3, Power Tool Cleaning
- SP-5, White Metal Blast Clearing
- SP-6, Commercial Blast Cleaning
- SP-7, Brush-off Blast Cleaning
- SP-10, Near-White Blast Cleaning
- SP-11, Power Tool Cleaning
- SP-13 Surface Preparation for Concrete Surfaces
- VIS-89, Visual Standard

### **1.4 DEFINITIONS**

#### **A. PAINT**

Includes fillers, primers, sealers, emulsions, oils, alkyds, latex, enamels, thinners, stains, epoxies, vinyls, urethanes, shellacs, varnishes and any other applied coating specified within these Specifications or shown on the Plans.

#### **B. FINISHED ROOM OR SPACE**

One that has a finish called for on Room Finish Schedule, or is indicated on the Plans, or is specified herein, to be painted.



## C. PAINTING COVERAGE RATE

Coverage's expressed in SF/GAL/coat are the manufacturer's published theoretical coverage's in square feet per gallon per coat.

## 1.5 SUBMITTALS

In addition to the general submittal requirements listed in Section 01300, the following shall be submitted:

1. Written acknowledgment and certification that products submitted meet requirements of standards referenced in this Section.
2. Manufacturer's application instructions for primer and finish coats.
3. Manufacturer's surface preparation instructions.
4. Manufacturer's full line of color samples for color selection by Owner.
5. If products being used are manufactured by a company other than the specified reference standard, the Contractor must provide a complete comparison of the proposed products with the specified reference products per Part 2.1 requirements, including application procedure, coverage rates, and verification that product is designed for intended use. Information must be provided that demonstrates that manufacturer's products are equal to the performance standards of products manufactured by the Tnemec Company, which is the reference standard.
6. Manufacturer's approval of protective coating systems applicator.
7. List of Applicator's experience and qualifications. A minimum of 5-years of experience in the painting of water facilities required.

## PART 2 PRODUCTS

### 2.1 APPROVED MANUFACTURERS

The following is an approved coating systems manufacturers list subject to compliance with the Specifications contained herein:

1. Ameron Protective Coatings Division.
2. Sherwin Williams.
3. Tnemec Company.
4. Or equal.

The specified coating shall be understood as establishing the type and quality of coating desired. Other manufacturers' products will be accepted provided sufficient information is submitted to allow the Engineer to determine that the coatings proposed are equivalent to those named. Proposed coatings shall be submitted for review in accordance with these Specifications. Requests for review of equivalency will not be accepted from anyone except the Contractor, and such requests shall not be considered until after the Contract has been awarded.

No substitutions shall be allowed that change the number of coats, thickness or generic type of paint required. All materials shall be brought to the jobsite in the original sealed and labeled containers of the paint manufacturer and shall be subject to inspection by the Engineer.

No coating materials other than those specified shall be brought to the jobsite. Thinners, driers and oils brought to the jobsite shall be only those recommended and approved by the paint manufacturer.

All paint shall conform to the applicable air quality regulations at the point of application. Any paint material which cannot be guaranteed by the manufacturer to comply, whether specified by product designation or not, shall not be used.

It shall be the responsibility of the Contractor to ensure the compatibility of the field painting products which will be in contact with each other or which will be applied over shop painted or previously painted surfaces. Paint used in successive field coats shall be produced by the same manufacturer. Paint used in the first field coat over shop painted or previously painted surfaces shall cause no wrinkling, lifting, or other damage to the underlying paint.

All paint used for intermediate and finish coats shall be guaranteed by the paint manufacturer to be fumeproof and suitable for water plant atmospheres containing hydrogen sulfide. Any paint that cannot be so guaranteed shall not be used. Paint shall be lead-free and mercury-free.

Tnemec Company products are the reference standard and Tnemec designations for product type are used herein. Requirements for an approved equal product are listed below:

1. For approval of an equal manufacturer. The Contractor shall provide to the Owner in writing a detailed side-by-side comparison of the proposed equal Products Characteristics, Performance Characteristics, and Application Conditions for each Tnemec coating specified in this specification. For consideration for approval this written comparison shall be certified and notarized by an officer of the proposed manufacturer as true and correct.

2. For Products Characteristics this detailed side-by-side comparison shall include for example, but not limited to, Volume Solids, Weight Solids, VOC, Mix Ratio, Zinc Content in Dry Film (by Weight), Spreading Rate per coat, Drying Schedule, Shelf Life and Flash Point.
3. For Performance Characteristics this detailed side-by-side comparison shall include for example, but not limited to, Abrasion Resistance, Corrosion Weathering, Direct Impact Resistance, Dry Heat Resistance, Flexibility, Moisture Condensation Resistance, Pencil Hardness, Salt Fog Resistance, Slip Coefficient and Wet Heat Resistance
4. In addition to the detailed side-by-side comparison for approval of an equal manufacturer, The Contractor shall provide to the Owner in writing five similar installations that have had the proposed or equal coating system and date coating system was put into service. In addition the installations names, locations, and owner's name with contact person and telephone number shall be provided.
5. For consideration for approval as an equal coating system the detailed side-by-side comparison shall be submit, with successful bidder's Shop Drawing at the time of the Preconstruction Conference, along with any proposed monetary adjustments to the contract price. As with all shop drawings, final approval rests with the Owner.
6. As a minimum standard any equal coating system shall have a 5-year service history on its coating system.

## **2.2 PAINT SYSTEMS**

### **A. NON-SUBMERGED METAL AND STRUCTURAL STEEL**

#### **1. Scope**

This Section shall apply to all metal and structural steel, including soldier pile steel, which is not submerged or subject to splashing from sewage, water, sludge, oil and grease or other corrosive materials unless specified otherwise.

#### **2. Surface Preparation**

Commercial blast cleaning, SSPC-SP-6.

3. Coatings

Shop Primer System:

Coat One

Product: Omnithane Series 1

MDFT: 2.5 to 3.5 mils

Field Finish System:

Coat One

Product: Hi-Build Epoxoline Tnemec Series N69

MDFT: 4.0 to 6.0 mils

Coat Two

Product: Endura-Shield Tnemec Series 1095

MDFT: 3.0 to 5.0 mils

Total MDFT: 9.5 to 14.5 mils

B. COATING OF FACTORY NON-APPROVED FINISHES

1. Scope

This Section shall apply to items which have a factory finish which is not an approved corrosion resistant finish.

2. Surface Preparation

Factory coating is to remain. Provide clean surfaces, lightly sand 100 percent of the surfaces, then provide solvent cleaning, SSPC-SP-1.

3. Coatings

Primer System:

Coat One

Product: Typoxy Tnemec Series N27

MDFT: 2.0 to 3.0 mils

Finish System:

Coat One

Product: Endura-Shield Tnemec Series 1095

MDFT: 3.0 to 5.0 mils

Total MDFT: 5.0 to 8.0 mils

C. DUCTILE IRON PIPE AND FITTING MATERIALS

1. Scope

This Section shall apply to exposed ductile iron pipe, fittings and materials that are not continuously or intermittently submerged.

2. Surface Preparation

Provide surface profile in accordance with ASTM D 4417, Method C

3. Coatings

Primer System:

Coat One

Product: Omnithane Series 1

MDFT: 2.5 to 3.5 mils

Finish System:

Coat One

Product: Hi-Build Epoxoline Tnemec Series N69

MDFT: 4.0 to 6.0 mils

Coat Two

Product: Endura-Shield Tnemec Series 1095

MDFT: 3.0 to 5.0 mils

Total MDFT: 9.5 to 14.5 mils

D. GALVANIZED SURFACE TOUCHUP

1. Scope

This Section shall apply to all galvanized surfaces, which have received minor damage to the galvanized surface during construction.

2. Surface Preparation

Power tool cleaning, SSPC-SP-3.

3. Coatings

Paint System:

Product: PerimePrime Tnemec Series 394  
MDFT: 3.0 to 5.0 mils

Total MDFT: 3.0 to 5.0 mils

E. GYPSUM WALLBOARD

1. Scope

This Section shall apply to all exposed gypsum wallboard.

2. Surface Preparation

Sandpaper smooth, dust and contaminant free.

3. Coatings

Primer System:

Coat One

Product: Elasto-Grip FC, Tnemec Series 151-1051  
MDFT: 1.5 to 2.5 mils

Finish System:

Coat One

Product: Enduratone, Tnemec Series 1029  
MDFT: 2.0 to 4.0 mils

Coat Two

Product: Enduratone, Tnemec Series 1029  
MDFT: 2.0 to 4.0 mils

Total MDFT: 5.5 to 10.5 mils

F. METAL DOORS, FRAMES AND TRIM

1. Scope

This Section shall apply to all interior and exterior hollow metal doors, frames and trim.

2. Surface Preparation

All hollow metal doors and frames shall be bonderized, pickled or phosphatized, which will serve as the primer for and shall be compatible with the finish coats to be applied in the field. Prior to field coat application, the surface shall be solvent cleaned SSPC-SP-1, and shall be clean, dry and free of all dirt, oil, grease and any other contaminants.

3. Coatings

Primer System:

Coat One

Product: FC Typoxy, Tnemec Series 27

MDFT: 3.0 to 5.0 mils

Finish System:

Coat One

Product: Endura-Shield, Tnemec Series 73

MDFT: 3.0 to 5.0 mils

Total MDFT: 6.0 to 10.0 mils

G. CONCRETE BLOCK MASONRY (INTERIOR)

1. Scope

This Section shall apply to all interior concrete block masonry (CMU) surfaces unless otherwise specified in these Specifications.

2. Surface Preparation

Clean, dry, and free of contaminants.

3. Coatings

Primer System:

Product: Masonry Filler Tnemec Series 1254 WB

MDFT: 80 to 100 sf/gal/coat application rate. Need to provide a smooth, continuous, pinhole free, void-free film, prior to application of finish coating system.

Finish System:

Coat One

Product: Hi-Build Epoxoline II, Tnemec Series N69

MDFT: 4.0 to 6.0 mils

Coat Two

Product: Hi-Build Epoxoline II, Tnemec Series N69

MDFT: 4.0 to 6.0 mils

Total MDFT: 8.0 to 12.0 mils (for finish system only)

H. BURIED CONCRETE EXTERIOR SURFACES

1. Scope

This Section shall apply to buried exterior concrete surfaces where noted on the Drawings. Coat following installation of pipe penetrations and grout, and prior to caulking.

2. Surface Preparation

Concrete surfaces shall be clean and dry. Allow 28 days cure time for concrete, or until surface passes the ASMT D4263 Plastic Mat test (may be less than 28 days for various grout mixes).

SSPC SP13 preparation of concrete surfaces to a standard profile of ACRI CSP 3-5 on all concrete surfaces to be coated. For recoating and repair, mechanically abrade coating surface to provide the ACRI CSP 3-5 standard profile.

Grout all joints, pipe penetrations, lift holes, and hardware pockets with Tnemec Series 218 MortarClad, prior to providing surface filler coat.

3. Coatings

Surface Filler:

Product: Tnemec Series 218 Mortar Clad

MDFT: Apply 1/32 inch and to fill any bugholes and surface voids flush to plan of concrete. Provided a monolithic, pinhole-free surface. Provide multiple coats of filler as required.



Finish System (1):

Product: Tnemec Series 141 PotaPox  
MDFT: 16.0 mils DFT

High Water Table Alternative Finish System (2):

Product: Tnemec Series 264 Elasto-Shield  
MDFT: 70.0 to 80.0 mils DFT

I. EXTERIOR SIDING, SOFFITS AND TRIM

1. Scope

This Section shall apply to all exposed to view exterior siding, soffits and trim for buildings and structures. Color shall be selected by the Owner.

2. Surface Preparation

Surfaces shall be clean and dry. Sand wood as required.

3. Coatings

Primer System:

Product: Electrogrip, Tnemec Series 151  
MDFT: 1.5 to 2 mils

Finish System:

Coat One:

Product: Envirocrete, Tnemec Series 156  
MDFT: 3 to 4 mils

Coat Two:

Product: Envirocrete, Tnemec Series 156  
MDFT: 3 to 4 mils

Total MDFT: 9 mils

**2.3 COLORS**

A. GENERAL

Paint colors used for the finish coatings on process equipment, piping and building surfaces shall conform to the following schedules. All finishes shall be glossy unless otherwise specified. Finish coatings, which are applied in the shop by the manufacturer, shall conform with this color

schedule wherever possible. Factory coatings which are damaged during shipment or installation, or which are not of suitable color, as determined by the Engineer, shall be recoated in the field in accordance with these Specifications. Color samples shall be submitted to the Engineer for approval prior to application of any field coatings.

B. PIPING COLOR SCHEDULE

Piping Identification: Exposed piping and piping in accessible chases shall be identified with lettering or tags designating the service of each piping system, shall have flow directional arrows, pressure zone clearly indicated, and shall be color coded as scheduled below.

Piping scheduled to be color coded shall be completely painted with the indicated colors, except surfaces specified to be unpainted shall have segments painted with the specified coding color long enough to accommodate the required lettering and arrows. All other piping specified to be painted shall match adjacent surfaces, unless otherwise approved by the Engineer.

Location: Lettering and flow direction arrows shall be provided near equipment served, adjacent to valves, on both sides of walls and floors where pipe passes through, at each branch or tee, and at intervals of not more than 50 feet in straight runs of pipe. If, in the opinion of the Engineer, the foregoing requirements will result in an excessive number of labels or arrows on a run of pipe, the number required can be reduced.

Metal Tags: Where the outside diameter of pipe or pipe covering is 5/8 inch or smaller, metal tags shall be provided instead of lettering. Tags shall have the specified identifying lettering stamped in, and shall be fastened to the pipe with suitable chains. Metal tags and chains shall be aluminum or stainless steel. Where tags are used, pipe shall be color coded as specified.

Lettering: Lettering on piping shall be painted, stenciled, or snap-on markers. Snap-on markers shall be plastic sleeves as manufactured by Brady "Brady snap-on B-915," Seton "Setmark," or equal. Letter sizes shall be as follows:

<u>Outside Diameter of Pipe or Covering</u>	<u>Minimum Height of Letters</u>
5/8 inch and smaller	Metal tags - 1/4 inch
3/4 inch through 4 inch	3/4 inch
5 inch and larger	2 inches

Color Coding and Lettering Schedule: All piping for the following services shall be color coded and identified using the process names given below. Where scheduled, bands shall be 6-inches-wide spaced along the pipe at 5-foot intervals.

<u>Process</u>	<u>Abbreviation</u>	<u>Color of Pipe</u>	<u>Color of Letters</u>
Drain	D	Dark Gray	White
Potable Water	W	Dark Blue	White
Vent	V	Dark Gray	White

All exposed piping shall be color coded and lettered. Pipes not tabulated above shall be color coded and lettered as determined by the Engineer.

Electrical conduit shall be painted to match adjacent ceiling or wall surfaces as approved by the Engineer. Vent lines shall be painted to match surfaces they adjoin, otherwise gray.

All valves shall be identified with a valve identification number. Contractor shall provide a computer file (Excel spreadsheet) with this information to the Engineer.

In addition, special painting of the following items shall be required:

<u>Item</u>	<u>Color</u>
Hoist Hooks and Blocks	Yellow and Black Stripes

### **PART 3 EXECUTION**

#### **3.1 GENERAL**

It is the intent of these Specifications that materials and workmanship be provided such that the highest quality job is obtained. The completed work, prior to acceptance, must be free from runs, skips, mars and any other disfiguring mark due to faulty workmanship or care of the completed work.

It is the responsibility of the Contractor to ensure that all surfaces are prepared in accordance with the written recommendations and directions of the paint manufacturer whose paint is applied.

Approval of conditions shall be obtained from the Engineer prior to applying any or all coats of paint; however, such approval shall not relieve the Contractor of their responsibility of conformance with these Specifications and conformance with the manufacturer's recommendations.

It shall be the responsibility of the Contractor to prevent settling of dust or the occurrence of other conditions detrimental to the finished quality of the job and to repair any damaged paint at no additional cost to the Owner.

Materials or equipment delivered with prime coats shall be touched up as required prior to the application of additional coating(s).

The Contractor shall apply each coating at the rate and in the manner specified by the paint manufacturer. If material has thickened or must be diluted for application by spray gun, the coating shall be built-up to the same thickness achieved with undiluted material. Deficiencies in film thickness shall be corrected by the application of an additional coat(s) of paint. Film thickness shall be determined when dry by the Engineer with a magnetic dry film thickness gauge. The thickness gauge shall be calibrated with test shims.

Where thinning is necessary, only the products of the manufacturer furnishing the paint and for the particular purpose shall be allowed. All thinning shall be done strictly in accordance with the manufacturer's instructions as well as with the full knowledge and approval of the Engineer.

No paint shall be applied when the surrounding air temperature, as measured in the shade, is below 40 degrees F. No paint shall be applied when the temperature of the surface to be painted is below 35 degrees F. Paint shall not be applied to wet or damp surfaces and shall not be applied in rain, snow, fog or mist or when the relative humidity exceeds 85 percent. No paint shall be applied when it is expected that the relative humidity will exceed 85 percent or that the air temperature will drop below 40 degrees F within 18 hours after the application of the paint. Dew or moisture condensation should be anticipated and if such conditions are prevalent, painting shall be delayed until conditions improve to be certain that the surfaces are dry prior to application of paint. No paint shall be applied when the ambient temperature is less than 5 percent F. above the dewpoint. Further, the day's painting shall be completed well within advance of the probable time of day when condensation will occur, in order to permit the paint film an appreciable drying time prior to the formation of moisture.

Manufacturer's recommended drying time shall be construed to mean "under normal conditions." Where conditions are other than normal because of the weather or because painting must be done in confined spaces, longer drying times shall be necessary. The manufacturer's recommendations for recoating time intervals shall be strictly adhered to.

Adequate ventilation, which will effectively remove solvents, shall be provided for proper drying of paints on interior surfaces. A minimum of 7-consecutive calendar days at 70 degrees F following the application of the final coat on submerged surfaces shall be required before submergence. Longer periods shall

be allowed prior to submergence if recommended by the paint manufacturer or if weather conditions require a longer curing time.

### 3.2 MIXING AND THINNING

Paint shall be thoroughly mixed each time any is withdrawn from the container. Paint containers shall be kept tightly closed except while paint is being withdrawn.

Paint shall be factory mixed to proper consistency and viscosity for hot weather application without thinning. Thinning will be permitted only as necessary to obtain recommended coverage at lower application temperatures. Only thinners approved by the paint manufacturer shall be used. In no case shall the wet film thickness of applied paint be reduced, by addition of paint thinner or otherwise, below the thickness recommended by the paint manufacturer.

### 3.3 SURFACE PREPARATION

#### A. GENERAL

Surfaces shall be dry and thoroughly cleaned of foreign materials with all defects filled or removed. All trades employed shall leave the surfaces of their work in such a condition that only minor cleaning, sanding and filling is required of the painting trade for surface preparation.

Hardware, switchplates, machined surfaces, nameplates, lighting fixtures and all other surfaces not to be painted shall be removed or otherwise protected. Drop cloths shall be provided, where necessary, to avoid spotting of surfaces adjacent to the item being painted. Working parts of electrical equipment shall be protected from damage during surface preparation and painting operations.

Ferrous metal cleaning shall be in accordance with Steel Structures Painting Council Specifications (SSPC).

<u>Description</u>	<u>SSPC</u>
White Metal Blast Cleaning	SP-5
Commercial Blast Cleaning	SP-6
Brush-Off Blast Cleaning	SP-7
Near-White Blast Cleaning	SP-10
Preparation of Concrete	SP-13

The words “blast cleaning” or equivalent phrases of equal intent shall be taken to refer to the applicable SSPC specification when used in the paint manufacturer’s recommendations or these Specifications.

Hand tool cleaning shall be used when power tool cleaning is not possible. Hand and power tool cleaning shall be in accordance with SSPC Specifications SP-2, SP-3 or SP-11, respectively.

The blast cleaning profile depth shall be not less than 1 mil or greater than 2 mils. In the case of equipment to which the manufacturer applies a primer coating in the shop after fabrication, the blast profile depth needs to be as noted above.

**B. WOOD**

The Contractor shall sandpaper smooth, then remove dust. After prime coat has dried, seal all knots, pitch and resinous sapwood. The Contractor shall putty nail holes and minor defects prior to painting.

**C. FERROUS METAL, GALVANIZED METAL AND HOLLOW METAL SURFACES**

The Contractor shall assure that fabrication, welding or burning is completed prior to the sandblasting operation. The Contractor shall chip or grind off flux, splatter, slag or other laminations left from welding. The Contractor shall remove all mill scale. The Contractor shall grind smooth rough welds and other sharp projections.

The Contractor shall near-white blast clean, in accordance with SSPC SP-10, submerged surfaces and surfaces to 12 inches above highest liquid level, and areas subject to splash or spillage.

The Contractor shall commercial blast clean, in accordance with SSPC SP-6, all interior and exterior structural steel surfaces, surfaces located 12 inches above submerged areas, and surfaces located in areas not subject to splash or spillage where exposed to open bodies of liquids.

The Engineer reserves the right to accept preparation of these surfaces in accordance with SSPC SP-3 for areas not practical or possible to sandblast to SSPC SP-6 requirements.

The Contractor shall near-white blast clean, in accordance with SSPC SP-10 surfaces, subject to heat in excess of 600 degrees F. The Contractor shall power tool or hand clean in accordance with SSPC SP-2 or SSPC SP-3. The Contractor shall apply prime coat on cleaned surfaces within 2 hours of cleaning. The Contractor shall solvent clean galvanized surfaces in accordance with SSPC SP-1.

D. EQUIPMENT

The Contractor shall sandblast the following equipment items or surfaces in accordance with applicable SSPC standards whether prime coated or not:

Shop primed surfaces, which have 2 percent or more of the primed surface damaged.

If catalyzed epoxy prime coat has been exposed to sunlight for longer than 60 days.

E. GYPSUM WALLBOARD

The Contractor shall repair minor irregularities left by finishers, avoid raising the nap of the paper and verify that the moisture content is less than 8 percent before painting. Contractor shall install sealant as required at edges of wallboard where it abuts different materials prior to painting.

F. CONCRETE AND CONCRETE BLOCK MASONRY

The Contractor shall allow new concrete and concrete block masonry to cure for a minimum of 28 days and shall verify that the moisture content contained in the concrete is stable and not in motion. The Contractor shall verify by performance of a Wet Matt Test per ASTM D4263. The Contractor shall fill concrete surface cracks and irregularities with Portland cement grout to provide a uniform surface texture and shall fill concrete block masonry surface with an epoxy block filler as specified. As a minimum, the Contractor shall brush off blast clean surfaces. The Contractor shall prepare the surface as specified elsewhere in these Specifications.

C. CONCRETE BLOCK MASONRY

The Contractor shall verify that the moisture content is acceptable as noted above, shall remove existing paint that has a tendency to powder, peel or shatter when scraped with a knife, shall hydroblast or sandblast the surfaces of any previous coatings, shall fill cracks and irregularities with portland cement grout to provide a uniform surface texture compatible with new concrete and shall fill concrete block masonry surfaces with a block filler.

## G. PREPARATION BY SANDBLASTING

The Contractor shall not sandblast surfaces that will be wet after blasting and before painting. The Contractor shall apply primer to sandblasted surfaces the same day that the surface is blasted and before rusting occurs. The Contractor shall reblast surfaces allowed to set overnight prior to priming or surfaces that show rust bloom.

The sand shall be clean, water washed, with controlled particle size and high silica content. The sand shall have sharp, angular surfaces and contain no clay particles or other extraneous matter.

The profile depth of sandblasted surfaces shall be not less than 1 mil or greater than 2 mils, unless required otherwise by the coating manufacturer.

Compressed air for blasting shall be free of water and oil. The Contractor shall provide accessible separators and traps, shall confine sandblast sand to the area being blasted, shall provide shields of polyethylene sheeting or other such barriers to confine sand and shall plug pipes, holes or openings before sandblasting and keep them plugged until the sandblasting operation is complete and the sand is removed.

The Contractor shall protect nameplates, valve stems, rotating equipment, motors and other items that may be damaged from sandblasting. The Contractor shall reblast surfaces not meeting the requirements of these Specifications.

## 3.4 APPLICATION

### A. GENERAL

The Contractor shall mix and apply coatings by brush, roller or spray in accordance with the manufacturer's installation instructions. Spraying equipment shall be inspected and approved in writing by the coating manufacturer. The Contractor shall provide complete coverage's to the mil thickness specified. The thickness specified shall be dry film mil thickness. All paint systems are "to cover." In situations of discrepancy between the manufacturer's square footage coverage rates and mil thickness, mil thickness requirements govern. When color or undercoats show through, the Contractor shall apply additional coats until paint film is of uniform finish and color. The Contractor shall not apply consecutive coats until the Engineer has had an opportunity to observe and approve previous coats.



The Contractor shall apply materials under adequate illumination, shall evenly spread and flow on to provide full, smooth coverage, shall work each application of material into corners, crevices, joints and other difficult to work areas, shall avoid degradation and contamination of blasted surfaces and avoid intercoat contamination, shall clean contaminated surfaces before applying next coat and shall immediately smooth out runs or sags, or remove and recoat entire surfaces. The Contractor shall assure that preceding coats are dry before recoating, shall recoat within the time limits specified by the coating manufacturer and shall allow coated surfaces to cure prior to allowing traffic or other work to proceed.

The Contractor shall coat all aluminum surfaces in contact with dissimilar materials. All fabricated and structural steel shall have prime coat(s) applied in the shop and finish coat(s) applied in the field.

During application of either prime or finish coats, brush coat all weld seams, edges, angles, fasteners and other irregular surfaces to insure a monolithic film, pinhole free surface. Finish coats of paint shall be uniform in color and sheen without streaks, laps, runs, drips, sags or missed areas.

All submerged or intermittently submerged materials shall have surface preparation and coatings applied prior to installation unless otherwise approved by the Engineer. All pipe, pipe supports, and pipe hangers that will be painted shall have surface preparation and coatings applied prior to installation.

#### B. PRIME COAT INSTALLATION

The Contractor shall prime all surfaces indicated to be painted, shall touch-up damaged primer coats prior to finish coats and shall assure field-applied coatings are compatible with factory-applied coatings. If coatings are not compatible, and if approved in writing by the Engineer, the Contractor shall apply a 2-mil-thick universal barrier coat recommended by the paint manufacturer prior to applying field coats or completely remove factory coatings and reprime.

The Contractor shall prime ferrous metals bedded in concrete to a minimum of 1 inch below exposed surfaces. The Contractor shall backroll all primer coats applied to existing or new CMU block. The Contractor shall assure sandblasting operations do not result in the embedment of sand particles in paint film. The Contractor shall brush or spray bolts, welds, edges and difficult access areas with primer prior to primer application over the entire surface being coated. The Contractor shall

backroll concrete, masonry, gypsum board and plaster surfaces with a roller if the primer has been spray applied.

### C. FINISH SCHEDULE

All work performed under this Contract (both new work and modifications to existing facilities) shall be painted. If the finish schedule requires wall surfaces to be painted in a particular space, the Contractor shall paint all appurtenant surfaces unless specifically noted not to be painted on the Plans. These items to be painted shall include:

1. Pipe supports, and equipment supports.
2. Insulated or wrapped piping, valves, fittings, hydrants and appurtenances except where covered by lagging.
3. Insulated or wrapped ductwork and appurtenances.
4. Conduit and appurtenances.
5. Ferrous metals.
6. Exposed woodwork.
7. Copper and brass surfaces.
8. Inside and/or outside of ferrous metal tankage.
9. New machinery and equipment except:
  - a. Electrical panels;
  - b. Switchboards;
  - c. Switchgear;
  - d. Safety switches;
  - e. Motor starter equipment;
  - f. Busways;
  - g. Raceways.

The Contractor shall paint the following surfaces in areas not considered as finished areas:

1. Insulated or wrapped piping, valves, fittings, yard or fire hydrants and appurtenances.
2. Insulated or wrapped ductwork and appurtenances.
3. Exposed wood.
4. New machinery and equipment.
5. Machinery and equipment in sumps, pits, boxes, channels, wetwells and structures.

The Contractor shall paint all exposed interior and exterior surfaces including:

1. Soffits.
2. Insulated or wrapped piping, valves, fittings, yard or fire hydrants and appurtenances except when covered by lagging.
3. Insulated or wrapped ductwork and appurtenances except when covered by lagging.
4. Conduit and appurtenances.
5. Exterior and interior surfaces of ferrous metal tankage.
6. Ferrous metals.
7. Exposed wood.
8. Plaster surfaces.
9. Concrete block to be sealed, paint interior surfaces only.

The Contractor shall not paint the following elements unless specifically noted on the Plans to be painted:

1. Stainless steel surfaces except as required to identify piping.
2. Exposed to view aluminum surfaces.

3. Galvanized metal surfaces.
4. Fiberglass surfaces except fiberglass piping and piping appurtenances.
5. FRP ductwork unless gel coat color is not acceptable to the Owner.
6. Interior of pipe, ductwork, and conduits.
7. Moving parts of mechanical and electrical units.
8. Code labels and equipment identification and rating plates.
9. Piping, ductwork, or pipe conduit when enclosed between suspended ceiling and overhead slabs or located in pipe chases or surfaces to be lagged.
10. Factory-finished furniture, laboratory casework, metal toilet partitions, kitchen units, lockers, shop and storage equipment or miscellaneous items that have preapproved factory applied finishes.
11. Prefaced masonry, burnished masonry units, or glass masonry.
12. Structural steel or steel deck required to be fireproofed.
13. Contact surfaces of friction-type connections.
14. Pipe and/or duct lagging.

### **3.5 FIELD QUALITY CONTROL**

The Contractor shall be responsible for performing, testing and assuring conformance with all requirements of these Specifications.

The Contractor shall maintain daily records showing:

- Start date of work in each area.
- Date of application for each following coat.
- Moisture content and surface temperature of substrate. Also record weather conditions, ambient air temperature and dew point.

- Provisions utilized to maintain temperature and humidity of work area within paint manufacturer's recommended ranges.

The Contractor shall measure the surface temperature of items to be painted with surface temperature gauges specifically designed for such use. The Contractor shall measure substrate humidity with humidity gauges specifically designed for such use. The Contractor shall measure wet paint with wet film thickness gauges. The Contractor shall measure paint dry film thickness with a Mikrotest gauge calibrated against the National Bureau of Standards "Certified Coating Thickness Calibration Standards." The Engineer may direct measurement of paint thickness at any time during the project to ensure conformance with these Specifications. A sufficient number of dry film thickness measurements shall be made so that there is approximately one measurement for each 100 square feet of surface area painted.

Where a wall or ceiling or other type of surface is disturbed and patched, the Contractor shall repaint entire wall or ceiling. The Contractor shall provide wet paint signs as necessary. The Contractor shall touch up damaged finish coats using the same material as specified for the finish coat.

At the conclusion of all painting activities, Contractor shall submit a painting field test report to the Engineer showing the above information plus results of wet film and dry film thickness tests. Provide four copies of final test report.

### **3.6 PAINTING SITE**

Either shop painting or field painting and surface preparation shall be acceptable when painting work is performed in conformance with this Section, unless the painting is activity specified elsewhere in these Specifications.

### **3.7 PAINT THICKNESS**

All paint thicknesses specified herein are minimum dry film thickness (MDFT). The thickness of paint over metallic surfaces shall be measured with a magnetic thickness gauge; paint thickness over wood or masonry shall vary in accordance with surface texture, but in no case shall the manufacturer's recommended coverage rate be exceeded. The minimum thicknesses given are total coating thickness for the coating specified, including multiple coats of the same material, where applicable.

**\*\*\* END OF SECTION \*\*\***

**DIVISION 10**  
**SPECIALTIES**

## SECTION 10800

### TOILET AND BATH ACCESSORIES

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes furnishing and installing all toilet, bath, and restroom accessories as shown on the Plans, and as specified herein.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals

##### 1.3 REFERENCES

This Section references the latest revisions of the following documents:

<u>Reference</u>	<u>Title</u>
ANSI A117	Accessible and Usable Buildings and Facilities
ASTM A123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A167	Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A269	Seamless and Welded Austenitic Stainless Steel Tubing for General Service
ASTM A366	Steel, Carbon, Cold-Rolled Sheet, Commercial Quality

##### 1.4 REGULATORY REQUIREMENTS

Conform to ANSI A117 code for access for the handicapped.

#### PART 2 PRODUCTS

##### 2.1 APPROVED MANUFACTURERS

All toilet and bath accessories shall be as manufactured by Bobrick Washroom Equipment Inc., or equal.

## 2.2 FIXTURE SCHEDULE

<u>Fixture</u>	<u>Type and Location</u>
Toilet Tissue Dispenser	B-76867, Provide one each at each water closet; surface mounted
Two-Wall Grab Bar	B-6897, Provide one at each water closet
Vertical Grab Bar	B-5806x18, Provide one at each water closet
Hand Towel Dispenser/ Receptacle	B-3699, Provide one at each lavatory; surface-mounted
Soap Dispenser	B-2111, Provide one at each lavatory; surface-mounted
Mirror w/ Shelf	Bobrick B-166, 24" x 36"; Provide one at each lavatory

## 2.3 MATERIALS

### A. SHEET STEEL

ASTM A366.

### B. STAINLESS STEEL SHEET

ASTM A167, Type 304.

### C. TUBING

ASTM A269, stainless steel.

### D. ADHESIVE

Contact type, waterproof.

### E. FASTENERS, SCREWS, AND BOLTS

Hot dip galvanized, tamper-proof, and security type.

## 2.4 FABRICATION

Weld and grind joints of fabricated components, smooth. Exposed surfaces shall be formed from single sheet of stock, free of joints. Form surfaces flat without distortion. Maintain surfaces without scratches or dents.





**DIVISION 11**

**EQUIPMENT**

## SECTION 11000

### EQUIPMENT GENERAL PROVISIONS

#### PART 1 GENERAL

##### 1.1 SCOPE

The provisions of this Section apply to all Sections of Divisions 11, 13, 14, 15, and 16, unless specifically revised therein.

The Contractor shall direct the attention of all subcontractors and suppliers of equipment and related appurtenances for the work to the applicable provisions in the Contract Provisions wherever they may occur.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
01600	Materials and Equipment
01800	Testing, Commissioning and Training
03300	Cast-in-Place Concrete
09900	Painting
Division 11	Equipment
Division 13	Special Construction
Division 14	Conveying Systems
Division 15	Mechanical
Division 16	Electrical

##### 1.3 STANDARDS FOR THE WORK

Pipe, fittings, wiring and supports shall be provided to produce complete, operable systems with all elements properly interconnected as shown in schematic diagrams or to provide specified operations. If a specific dimensioned location is not shown for interconnections or smaller system elements, the Contractor shall select appropriate locations and show them on Shop Drawing submittals for review.

Equipment and material shall be new and without imperfections and shall be erected in a neat and workmanlike manner; aligned, leveled, cleaned and adjusted for satisfactory operation; installed in accordance with the recommendations of the manufacturers and the best standard practices for this type of work so that connecting and disconnecting of piping and accessories can be readily made and so that all parts are easily accessible for inspection, operation, maintenance and









## **PART 2 PRODUCTS**

### **2.1 DESIGN**

All equipment shall be designed for the service intended, of rugged construction, of ample strength for all stresses which may occur during fabrication, transportation, erection and during continuous or intermittent operation, shall be adequately stayed, braced and anchored, and shall be installed in a neat and workmanlike manner. Appearance, safety, and utility shall be given consideration in the design of equipment. Materials of construction shall be cathodically compatible.

### **2.2 STANDARD REQUIREMENTS**

#### **A. MATERIALS**

Design, fabricate and assemble equipment and systems with new materials and in accordance with acceptable engineering and shop practices. Manufacture individual parts to standard sizes and gauges so repair parts can be installed in the field. Make like parts of duplicate units interchangeable. Do not place equipment in service at any time prior to delivery except as required for factory or shop tests.

#### **B. UNIFORMITY**

Unless otherwise specified, equipment or material of the same type or classification used for the same purpose shall be the product of the same manufacturer and shall be the same model.

#### **C. SEISMIC REQUIREMENTS**

Supports and anchorage of equipment(s) shall comply with the requirements of the 2018 *International Building Code* (IBC) Section 1613 and ASCE 7-16 *Minimum Design Loads for Buildings and Other Structures*, Chapter 13 Seismic Design for Nonstructural Components, as referenced and amended by the IBC. For the following design parameters:

- Risk Category IV
- Site Class C
- The component Importance Factor:  $I_p = 1.5$
- Design response acceleration coefficients:

$$S_{DS} = 1.015g$$

$$S_{D1} = 0.445g$$



- Seismic Design Category D

## D. STANDARDS

Provide equipment and materials suitable for service conditions and meeting standard requirements of ANSI, ASME, AWWA, ASTM, NEMA, IBC, NPC, UL and OSHA.

### 2.3 LUBRICATION

Provide lubricants of types recommended by equipment manufacturers, in quantities sufficient for a minimum of 1-year's consumption prior to completion, testing and final acceptance.

### 2.4 EQUIPMENT BASES AND BEDPLATES

Mount equipment assemblies on a single heavy cast iron or welded steel bedplate on a grout or concrete base unless otherwise shown or specified. Provide bases and bedplates with machined support pads, vibration pads, tapered dowels for alignment or mating of adjacent items, adequate openings to facilitate grouting, and openings for electrical conduits. Corners shall be rounded or chamfered and ground smooth. Continuously weld seams and contact edges between steel plates and shapes, and grind welds smooth. Do not support machinery or piping on bedplates other than that which is factory installed. Provide leveling screws in equipment bases and bedplates to aid in leveling prior to grouting.

### 2.5 ANCHORS AND FASTENERS

Each equipment manufacturer shall furnish the required anchor bolts, nuts and washers of adequate design for securing bases and bedplates to concrete bases. Provide anchor bolts of length to allow for 1-1/2 inch of grout under baseplates and adequate anchorage into structural concrete unless otherwise shown or specified. The manufacturer shall submit to the Engineer design calculations regarding recommended sizing and type of anchor bolts, nuts, and washers for securing the equipment, in accordance with the project seismic requirements.

Anchor and assembly bolts and nuts shall be of ample size and strength for the purpose intended. All nuts, bolts and washers shall be Type 316 stainless steel. All leveling nuts shall be Type 316 stainless steel.

All motor-driven equipment shall be furnished with cast-in-place anchor bolts or drilled-in anchors set with epoxy adhesive. Do not provide expansion type anchors for motor-driven equipment, or equipment or piping subject to vibration.

Expansion type anchors are not to be used for any submerged applications unless specifically noted on the Plans.

Anchor all non-motor-driven equipment with cast-in-place anchor bolts or drilled-in anchors set with epoxy adhesive except that, where specifically allowed by note on the Plans, expansion type anchors may be used.

## **2.6 SAFETY GUARDS**

Cover belt or chain drives, fan blades, couplings, exposed shafts and other moving or rotating parts on all sides with safety guards conforming to all applicable Federal, State, and local codes and regulations; conform to the most restrictive requirement. Design guards for easy installation and removal, complete with necessary supports, accessories, and fasteners, all hot-dip galvanized. Design guards in outdoor locations to prevent entrance of rain and dripping water. Provide tachometer test opening in line with ends of shafts. Typically, guards shall be expanded metal on a structural steel frame except that outdoor guards may be of solid material. Provide spring loaded hinged doors with latch for service and lubrication access.

All pipes, manifolds, heaters, and other surfaces, which have a surface temperature sufficient to burn human tissue, shall be covered with a thermal insulating material or otherwise guarded against contact.

Guards shall comply with the requirements of these Specifications, WISHA Standards, and “The Principles and Techniques of Mechanical Guarding” (OSHA 2057, 1973), whichever is more stringent.

## **2.7 LIFTING EYES**

All equipment weighing over 100 pounds shall be supplied with lifting eyes. Parts of equipment assemblies, which are normally serviced separately, such as motors, shall have individual lifting eyes.

## **2.8 ELECTRICAL COMPONENTS**

Equipment shall be manufactured, fabricated and installed in a manner which permits conduit connection to electrical power and control equipment from below the connection point, terminal box, or connection box without offsets or bends such that the conduit will drain away from the equipment.

Electric motors, control panels, accessories, etc., shall conform to the requirements of Divisions 11, 12, 13, 14, 15 (Equipment items) and Division 16, Electrical.

If any motor fails during the warranty period, the Contractor shall replace the motor with a new motor. Rewinding a failed motor shall not be acceptable.

All electrical components shall be recognized or labeled and listed by a recognized electrical testing laboratory for the application, or approved by the Washington State Department of Labor and Industries for installation on the Project.

## **2.9 MOTOR PROTECTIVE DEVICE COORDINATION AND DOCUMENTATION**

The Contractor shall maintain a spreadsheet or database list of the motor characteristics that are necessary to size, select, and/or set the various motor protective devices, such as thermal overloads, breaker trip devices, motor protection relays, etc. This list shall also include any additional information needed to set-up, program or adjust the variable frequency drive which serves motor driven equipment such as minimum speed, acceleration, etc. The list shall be sent with each equipment submittal for motor driven equipment and shall be updated to reflect the motor information for the submitted equipment

The Contractor shall record the size and/or settings of each motor protective device at the time of startup and after any subsequent adjustments on the motor characteristics list described in the preceding paragraph.

In addition, the Contractor shall take a digital photo of each motor nameplate when the motor arrives at the jobsite. Each digital photo shall be emailed to the Engineer, noting any discrepancy between the motor nameplate data and the submitted motor data.

## **2.10 NAMEPLATES/DATA PLATES/IDENTIFICATION**

Each piece of equipment and its driver shall be furnished with a stainless steel metal nameplate fastened to the item in an accessible position. This nameplate shall contain the manufacturer's name, equipment rating, capacity, size, model, serial number and speed. Data for motors shall be NEMA standard. All information written or printed shall be in English. Each item of equipment shall bear a different serial number. Measurement units shall be given for ratings and capacity.

Nameplates for tanks and pressure vessels shall give working pressure, test pressure, vessel plate thickness and ASME Code data.

Each piece of rotating equipment shall have a direction of rotation arrow.

Each piece of equipment shall be labeled using a plastic laminate label with the functional name and number of the equipment shown on the Plans or provided by the Engineer. Name and number shall correspond to those used on Motor Control Centers and Panels.

Labels shall be fastened to the equipment base or other acceptable location. The letters shall be at least 1/2-inch high with a border trim on all sides not less than 1/4 inch. Color shall be green background with white letters. Fasteners shall be brass or stainless steel screwed into inserts, anchor shields or tapped holes in equipment or base.

Units of measure shall be shown on the indicating and totalizing dials of all meters, gauges and other measuring devices.

## **2.11 PROTECTION AGAINST ELECTROLYSIS**

Where dissimilar metals are used in conjunction with each other, suitable insulation shall be provided between adjacent surfaces so as to eliminate direct contact and any resultant electrolysis. The insulation shall be bituminous impregnated felt, heavy bituminous coatings, non-metallic separators or washers. Connections of dissimilar piping materials shall utilize dielectric unions, flanges, couplings or bushings.

## **2.12 PAINTING**

Painting of all equipment shall be in accordance with Section 09900 of these Specifications.

## **2.13 NOISE**

Mechanical and electrical equipment shall not create sound levels that are in excess of that permitted by WISHA for 8 hours per day worker exposure unless otherwise noted for the specific piece of equipment involved.

## **2.14 VIBRATION AND CRITICAL SPEED LIMITATIONS**

Mechanical and electrical equipment shall meet the vibration and critical speed limitation requirements described in Section 11010.

## **2.15 PRESSURE GAUGE CONNECTIONS**

Provide tapped and plugged suction and discharge gauge connections on the pump nozzles or flanges. Where this is not possible, provide gauge connections on the piping immediately adjacent to the pump.

## **2.16 PUMP SEAL WATER**

The Plans show a seal water system applicable to some pump installations. The Contractor shall review each pump installation with the pump manufacturer and shall provide seal water installations in strict accordance with the manufacturer's recommendations at no additional cost to the Owner.

## **PART 3 EXECUTION**

### **3.1 INSPECTION**

Inspect each item of equipment for damage, defects, completeness, and correct operation before installing. Inspect previously installed related work and verify that it is ready for new equipment installation.

### **3.2 PREPARATION**

Prior to installing equipment, ensure that the areas are clean and that concrete or masonry operations are completed. Maintain the areas in a broom-clean condition during installation operations. Clean, condition, and service the equipment in accordance with the Operation and Maintenance Instruction Manuals and specific requirements included in applicable Sections of these Specifications.

### **3.3 SPARE AND LOOSE PARTS**

Prior to equipment startup provide an inventory of spare and loose parts supplied under the project. Turn over inventory and parts to the Owner. The Owner's written acknowledgment of receipt is required for project completion. Loose parts are defined as items such as special tools, keys, safety equipment, and portable equipment.

### **3.4 INSTALLATION**

#### **A. EQUIPMENT**

Equipment shall conform to the approved submittals and Operation and Maintenance Instruction Manuals. Employ skilled craftsmen experienced in installation of the types of equipment specified. Use specialized tools and equipment, such as precision machinist levels, dial indicators, gauges, and micrometers, as applicable. Produce acceptable installations free of vibration or other defects.

**B. ANCHOR BOLTS**

Deliver bolts with templates or setting drawings and verify that bolts are correctly located before structural concrete is placed. Prior to assembly, the Contractor shall coat all stainless steel bolts and nut threads with anti-seizing compound.

**C. BASE AND BEDPLATE GROUTING**

Do not place grout until initial fitting and alignment of connected piping is completed. Level and align equipment on the concrete foundations, then entirely fill the space under base or bedplates with grout. Bevel exposed grout at 45-degree angle, except around exposed grout at horizontal surfaces for drainage. Trowel or point exposed grout to a smooth, dense finish and damp cure with burlap for 3 consecutive days. When grout is fully hardened, remove jacking screws and tighten nuts on anchor bolts. Check the installation for alignment and level, and perform corrective work as required to conform to the tolerances given in the applicable Operation and Maintenance Instruction Manual.

The Contractor shall make an allowance of at least 1-1/2 inches for grout under the equipment bases, whether or not shown on the Plans. Shims used to level and adjust the bases shall be steel. Shims may be left embedded in the grout, in which case they shall be installed neatly and so as to be as inconspicuous as possible in the complete work. Unless otherwise authorized, all grout shall be a non-shrink, non-metallic grout as stated in Section 03300.

Where practicable, the grout shall be placed through the grout holes in the equipment base and worked outward and under the edges of the base and across the rough top of the concrete foundation to a peripheral form so constructed as to provide a suitable chamfer around the top edge of the finished foundation.

**D. PRESSURE GAUGES**

Pressure gauges shall be installed on all pump discharge piping at a location where the gauges can be easily read. The gauges shall be located upstream of the isolation valves, if possible. Gauges shall be installed on other equipment items as specified. The gauges are specified in Division 13 and shall be installed as detailed on the Plans.







Provide the instruction program at the Owner's convenience before contract closeout. The Contractor shall audio- and video-record all training sessions, and also provide the Owner with any audio-visual training materials the manufacturer utilizes (i.e., DVDs, PowerPoint presentations, videocassettes etc.). Cost of instruction and audio-visual training materials shall be included in the bid price for the equipment.

### **3.7 SOUND LEVEL TESTING**

Measure the sound level developed by all mechanical and electrical equipment provided under the Contract Provisions. Perform testing in all rooms and spaces containing such equipment during the final operation test program with all equipment operating. Use OSHA approved instruments and record the highest sound levels developed when measured according to OSHA standards in each room and space. Deliver a certified copy of records to the Engineer.

**\*\*\* END OF SECTION \*\*\***

**DIVISION 13**  
**SPECIAL CONSTRUCTION**

## SECTION 13110

### JOINT BONDING

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. This section specifies the requirements for the installation of corrosion monitoring equipment and electrical bonding of the ductile iron pipeline joints for the new water mainlines at locations shown in the drawings. Specifically, the work will include the following:
1. Providing for electrical continuity of ductile iron pipeline components.

##### 1.2 QUALITY ASSURANCE/QUALITY CONTROL

###### A. REFERENCE STANDARDS

This Section incorporates by reference the latest revision of the following documents. In case of conflict between the requirements of this Section and that of the listed document, the requirements of this Section shall prevail.

<u>Reference</u>	<u>Title</u>
NACE SP0169	Control of External Corrosion on Underground or Submerged Metallic Piping Systems
NACE TM0497	Measurement Techniques Related to Criteria for Cathodic Protection on Underground or Submerged Metallic Piping Systems

- B. Commissioning of the newly installed corrosion monitoring test stations and pipeline electrical continuity testing shall be completed by an individual who holds current certification by NACE International as, at a minimum, a Cathodic Protection Technician (CP2).

##### 1.3 SUBMITTALS

- A. Test plan for continuity testing
- B. Test Results

## **1.4 DEFINITIONS**

- A. AWG  
American Wire Gauge
- B. NACE  
National Association of Corrosion Engineers

## **PART 2 PRODUCTS**

### **2.1 JUMPER BOND CABLE AND TEST LEAD WIRES**

- A. Jumper bond cables installed across pipeline joints and in-line pipeline equipment shall be #2 AWG stranded conductor with HMWPE type insulation. Cables must be marked with conductor size and insulation type.
- B. Test lead wires shall be #10 AWG stranded copper conductor with RHW type insulation. Test leads connected to the 24-inch water main shall have blue insulation. Test leads connected to the existing water main shall have orange insulation.

### **2.2 THERMITE WELDING MATERIAL**

- A. Wire sleeves, welders, and weld cartridges shall be sized according to the weld manufacturer's recommendation for wire size and pipe diameter. Welding materials and equipment shall be the product of a single manufacturer. Interchanging materials of different manufacturers will not be acceptable. NOTE: Thermite weld charges and graphite molds must be manufactured for use on ductile iron piping material.
- B. Adapter sleeves shall be used as required to match welder size and wire size. Prefabricated factory sleeve joint bonds or bond wires with formed sleeves in the field are acceptable. Attach field formed sleeves with the appropriate size and type hammer die furnished by the thermite weld manufacturer.
- C. MANUFACTURERS
  - 1. Erico Products, Inc., (Cadweld), Cleveland, OH
  - 2. Continental Industries, Inc. (Thermo-Weld), Tulsa, OK

- D. The thermite weld cap with coating and suitable primer shall be type Handy Cap with Royston Primer 747, as manufactures by Royston Laboratories, Inc. or approved equal.

## **2.3 COMMISSIONING TEST EQUIPMENT**

- A. Use the following equipment when commissioning the newly installed test stations:
  - 1. High impedance (minimum 10M $\Omega$ ) digital multimeter.
  - 2. Test leads and alligator clips as required.

## **PART 3 EXECUTION**

### **3.1 ELECTRICAL BONDING**

- A. Ductile iron bell and spigot pipeline joints, valves, tees, and other metallic pipeline equipment shall be made electrically continuous through the installation of jumper bonds exothermically welded across each connection joint at locations shown in the Drawings. The installation of two jumper bonds are required for all pipes and fittings with a diameter of 16 inches or greater. Only one jumper is required for pipes and fittings less than 16 inches in diameter.
- B. Observe proper safety precautions, welding procedures, thermite weld material selection, and surface preparation recommended by the welder manufacturer. Assure that the pipe wall is of sufficient thickness so the exothermic weld process will not damage the integrity of the pipe wall.
- C. After the weld connection has cooled, remove the slag, visually inspect, and physically test cables by tapping with a hammer. Remove and replace defective connections.
- D. Coat all thermite welds in accordance with the manufacture's recommendations.
- E. After installation has been completed, verify that the pipeline section is electrically continuous using a current response or other pre-approved testing technique. Notify Project Representative three days in advance of testing.
- F. The Project Representative will also provide independent verification that electrical continuity exists along the lengths of the pipelines. If a discontinuity is found, excavate the pipeline and repair the defective

jumper bond installation. Backfill the pipeline using the described backfilling procedures outlined in the project specifications.

**\*\*\* END OF SECTION \*\*\***

## SECTION 13426

### MAGNETIC FLOW METERS

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes furnishing and installing magnetic flow meters as shown on the Plans and as specified herein. The flow meters shall include all necessary accessories and hardware for a complete and workable installation.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
01800	Testing, Commissioning, and Training
11000	Equipment General Provisions
Division 16	Electrical

##### 1.3 EQUIPMENT LIST

Equipment numbers are as follows:

<u>Item</u>	<u>Equipment Number</u>
451 Control Valve Station Flow Meter	MFM 01

##### 1.4 PERFORMANCE REQUIREMENTS

The magnetic flow meters shall have an accuracy of  $\pm 0.5$  percent of the actual flow rate at velocities of 1.5 ft/sec or greater.

The flow meters shall be provided with the following size and flow range for the specified application and location.

Flow Meter	Flange Diameter (inches)	Flow Range (gpm)	Transmitter Location
MFM 01	12	25-8000	Integral

The liquids to be measured will be potable water with a temperature of approximately 50 degrees F.

## **1.5 DELIVERY, STORAGE AND HANDLING**

All equipment shall be completely factory assembled, crated and delivered to protect against damage during shipment.

All equipment delivered to the site shall be stored as specified in accordance with the manufacturer's instructions.

## **1.6 WARRANTY**

In addition to the warranty required in the General Conditions, the equipment manufacturer shall provide an extended warranty covering defects in material and workmanship for 2 years following the date of substantial completion. The warranty shall be in printed form, shall apply to all similar units, and shall include parts and labor.

## **PART 2 PRODUCTS**

### **2.1 APPROVED MANUFACTURERS**

The magnetic flow meters and transmitter shall be Siemens SITRANS 5100W/MAG 6000, or approved equivalent equipment manufactured by Endress & Hauser, Krohne or Toshiba. No other manufacturers shall be accepted.

### **2.2 GENERAL**

The magnetic flow meters shall be of the low frequency and short form coil design. The field principle of electromagnetic induction shall produce a positive DC pulsed signal directly and linearly proportional to the liquid flow rate. The metering tube shall be constructed of Type 316 stainless steel with Class 150 ANSI flanged end connections. Electrodes can either be protruding (bullet nose) or flush for the meters, but shall be of Type 316 stainless steel, Hastelloy®, or zirconium construction. The material of construction of the liner shall be NBR hard rubber, Neoprene rubber or chloroprene rubber. The meter shall secure its power from the transmitter. No electronics shall be mounted in the metering tube of the magnetic flow meter.

The transmitters shall be integral to the flow head where specified in Part 1.4. Provisions for remotely mounting the transmitter shall be provided where the transmitter is specified to be remote. Transmitter shall be interchangeable without reprogramming the meters or disconnecting the cables. The transmitters shall convert the output signal from the flow meters and transmit the signal via an isolated analog 4-20 mA signal directly proportional to flow rate. The transmitter shall have automatic zero correction. The transmitters shall be designed to



operate from a 24 VDC, power source. The transmitters shall generate power for the flow tube.

The transmitters shall produce a totalization of flow dry contact output pulse signal or opto-isolated transistor pulse signal, which is directly and linearly proportioned to totalization of flow and which is suitable for use with a 24 VDC discrete input with an input impedance of at least 2 k $\Omega$ . The minimum pulse duty cycle shall be adjustable to be at least 250 ms.

The magnetic flow meter tube and transmitter shall be NEMA 4X classified. The units shall be listed and labeled by a electrical testing laboratory recognized by the Washington State Department of Labor and Industries or be acceptable to the Washington State Department of Labor and Industries for installation on this project.

Each meter system shall be wet-calibrated at the manufacturer's facility against the master system. A calibration certificate shall be furnished for each meter.

Provide grounding rings or grounding electrodes with each flow meter as required to maintain the specified accuracy.

The flow meters shall be capable of accidental submergence to 3 feet for a period of 30 minutes.

### **2.3 ANALOG INSTRUMENTATION**

The flow meters shall be of the manufacturer's latest design. The equipment shall have 4 to 20 milliamperes standard DC (direct current) isolated floating outputs and shall conform to ISA 50.1. Each output shall be provided with adjustments for gain and bias. The resultant output shall be 4-20 mA DC into approximately 750 ohms. Accuracy shall be  $\pm 0.25$  percent of full scale output.

Analog instruments shall operate without loss of loop accuracy due to electromagnetic interference, resistive or inductive losses or similar problems related to field interconnection of components when connected with shielded 2/conductor #18 gauge copper wire in the manner shown on the Plans.

### **2.4 SPARE PARTS**

The Contractor shall supply one spare transmitter.

All spare parts shall be suitably identified and effectively protected from moisture and corrosion with appropriate wrappings or coatings or a combination thereof. All parts shall be furnished in sturdy labeled boxes.

## **2.5 FACTORY TESTING**

The equipment shall be fully tested at the manufacturer's plant before shipment. Tests shall insure that the equipment will operate as desired under anticipated field conditions. Certified copies of test report(s) shall be submitted to the Engineer prior to shipment.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

The flow meters shall be installed as shown on the Plans and in accordance with the Manufacturer's recommendations and instructions. If ground rings are required to maintain the specified accuracy, they shall be installed with the units and bonded to grounding conductor where recommended or required by the Manufacturer.

### **3.2 FIELD TESTING**

The Contractor shall perform the field testing described in Sections 01800 and 11000.

The field test shall insure that the equipment will operate as desired under field conditions. The manufacturer shall provide a formal test procedure and report forms for recording data. The Contractor shall submit the report forms to the Engineer prior to operational testing.

Any defects in the equipment or failure to meet requirements of the Specification shall be promptly corrected by the Contractor.

### **3.3 MANUFACTURER'S SERVICES**

The services of a factory-trained representative of the magnetic flow meter manufacturer shall be provided. Services shall include a minimum of 1 day onsite. Services shall include inspection of the installation, initial configuration, programming, startup, and adjustments and instruction of the Owner's personnel in operation and maintenance. Instruction and training of the Owner's personnel shall not take place until startup is completed and the magnetic flow meters are fully operational and shall be at a time and location agreed to by the Owner. The cost of these services shall be included in the bid price.

The representative shall provide for two additional service calls during the initial 2 years of equipment operation.

**\*\*\* END OF SECTION \*\*\***

## SECTION 13600

### SURVEILLANCE AND ACCESS CONTROL SYSTEM

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section shall consist of the furnishing, installation, and testing of complete access control system as show on the Plans and described herein.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
08700	Finish Hardware
Division 16	Electrical

##### 1.3 REFERENCES

<u>Reference</u>	<u>Title</u>
NEC	National Electric Code
IPC	Ingress Protection Code
IEEE 802.3at PoE	Standard for Ethernet

##### 1.4 EQUIPMENT LIST

Equipment numbers are as follows:

<u>Item</u>	<u>Equipment Number</u>	<u>Type</u>
Camera, Interior	01 CAM 01	Dome
Camera, Exterior	01 CAM 02	Bullet

##### 1.5 QUALIFICATIONS

The access control installation contractor shall be regularly engaged in the installation of commercial and/or industrial access and surveillance systems.

##### 1.6 SUBMITTALS

Submittals shall be provided in accordance with Section 01300 of this Specification. In addition to the minimum requirements listed in Section 01300, the Contractor shall provide the following information, which shall be prepared by a qualified professional with expertise in access control system.

## **PART 2 PRODUCTS**

### **2.1 DOOR ACCESS CONTROLLERS**

Door access controllers shall be wall mounted digital controller for managing door security by communicating between door card readers and electric door strikes/locks. Controller shall be enclosed within a metal cabinet. Controller shall include relays for controlling up to four doors via 12 or 24 VDC, Ethernet network connections, and built-in power supply with 12-Volt, 4.5 Ah sealed lead acid rechargeable battery. Door access controllers shall be provided with request-to-exit devices and a minimum 10-year cloud software license for virtual controller access and management. Door access controllers shall be Verkada AC41. No others will be allowed.

### **2.2 DOOR CARD READERS**

Door card readers shall be wall mounted device for scanning key cards. Door card readers shall be Verkada AD33. No others will be allowed.

### **2.3 SURVEILLANCE CAMERAS**

#### **A. INDOOR DOME CAMERA**

Indoor dome cameras shall be enclosed video camera designed for indoor surveillance. The camera shall include a 5 MP sensor. Indoor dome cameras shall be Verkada CD52-512-HW. No others will be allowed.

#### **B. OUTDOOR BULLET CAMERA**

Outdoor bullet camera shall be enclosed video camera designed for outdoor surveillance. The camera shall include a 5 MP. Outdoor bullet camera shall be Verkada CB52-512E-HW. No others will be allowed.

#### **C. CLOUD SOFTWARE LICENSE**

Surveillance cameras shall be provided with a minimum 10-year software license for virtual camera access and management to be added to the Owner's existing licensing agreement.

## **PART 3 EXECUTION**

### **3.1 DELIVERY, STORAGE, AND HANDLING**

All equipment shall be completely factory assembled, crated, or boxed and delivered to protect against damage during shipment.

All exposed components shall be covered to prevent the entrance of moisture. Finished metal surfaces shall be properly protected to prevent rust and corrosion.

All equipment delivered to the site shall be stored in accordance with the manufacturer's recommendations.

### **3.2 INSTALLATION**

Install all components per manufacturer's recommendations or as shown on the Plans, whichever is the more stringent. Installation of cable and conduit for each system shall be coordinated with other trades to ensure adequate space for piping placement.

### **3.3 CLEANING**

Clean dirt and debris from all surfaces.

### **3.4 TESTING**

#### **A. OPERATIONAL TESTING**

Contractor shall perform thorough operational testing of all equipment in order to verify that all equipment is fully operational and has been installed correctly. This will include transmission of signal(s) to their destination. A checklist of all equipment, whether or not this equipment was tested, and whether or not the equipment successfully completed the operational testing phase shall be provided. Once testing is completed, provide written certification to the Engineer that all equipment has successfully passed the operational testing within 5 working days of test completion.

#### **B. SYSTEM ACCEPTANCE TESTING**

The Contractor shall perform final acceptance testing of all surveillance and access control system equipment in the presence of the Owner, and if desired, the Engineer. Acceptance testing shall verify that all components are able to operate as complete, workable systems and will provide their necessary functions(s). The Contractor shall be responsible for providing

all personnel, lifts, tools, testing devices, radios, and all other equipment that may be necessary to complete the testing procedures. After completion of the acceptance testing, all noted deficiencies shall be remedied within 72 hours. Depending on the number of deficiencies noted, the Owner may request additional acceptance testing. All associated costs incurred as a result of additional acceptance testing shall be the responsibility of the Contractor.

### **3.5 TRAINING**

Training shall be provided by factory trained representatives from both the fire alarm system manufacturer and the security system manufacturer. Training shall cover the operation, maintenance, and troubleshooting of each type of device provided within both the surveillance and access control systems. At a minimum, training shall include basic operational function for the typical regular use of the respective equipment.

**\*\*\* END OF SECTION \*\*\***

**DIVISION 14**  
**CONVEYING SYSTEMS**

## SECTION 14620

### TROLLEY HOISTS

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes furnishing and installing new trolley and trolley hoists as shown on the Plans and as specified herein.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
05120	Structural Steel
09900	Painting
Division 11	Equipment
Division 15	Mechanical
Division 16	Electrical

##### 1.3 EQUIPMENT LIST

Equipment numbers are as follows:

<u>Item</u>	<u>Equipment Number</u>
451 Control Valve Facility Trolley Hoist	01 TH 01

##### 1.4 PERFORMANCE REQUIREMENTS

The trolleys and hoists shall have the following characteristics:

<b>Hoist</b>	<b>Capacity (tons)</b>	<b>Lifting Height (ft)</b>	<b>Max. Headroom (inches)</b>
01 TH 01	1.5	12	22

Lifting height shall be defined as the distance between the bottom of the trolley beam to the floor of the facility. The Contractor shall provide adequate length of lifting chain to satisfactorily meet the lifting height. Maximum headroom shall be defined as the distance between the bottom of the trolley beam and highest elevation of the trolley hoist hook.



## **1.5 SUBMITTALS**

In addition to the general Submittal requirements, the following shall be submitted:

- A. The make, model, and weight of each trolley and hoist equipment assembly.
- B. Complete catalog information, descriptive literature, materials of construction, and specifications on trolley and hoist systems, monorail track stops, wheels, shafting, gear and bearings, hooks, brakes, and accessories.

## **1.6 WARRANTY**

The manufacturer shall provide a warranty. The warranty shall be valid for a period of 2 years, beginning on the date of substantial completion.

## **PART 2 PRODUCTS**

### **2.1 APPROVED MANUFACTURERS**

The trolley, hoist, and bridge crane (Specification Section 14630) shall be provided by a single manufacturer to ensure coordination and compatibility of the equipment.

### **2.2 TROLLEY**

#### **A. HAND GEARED TROLLEYS**

The Trolley Hoists shall have hand-gearred trolleys. The Trolleys shall have a rigid lug suspension.

The rigid mount trolleys shall be designed for especially for use with lug suspended hoists. The trolleys shall attach directly to lug brackets on the hoists, thereby forming an integral trolley-hoist combination.

The trolley shall be of all steel construction. The wheels shall have hardened treads and operate on ball bearings for easy travel.

The hand chain operated wheel shall turn a pinion which meshes with wheel gears for ease of operation and accurate spotting. The chain guide shall keep the chain aligned with the wheel and help prevent fouling. The wheel gears and drive pinion shall have machine cut teeth.

The trolleys shall be equipped with anti-tilt rollers designed to eliminate tilting of the trolley on the beam when operating with a light load or no load.

## **2.3 HOIST**

### **A. MANUAL HOISTS**

The hoists shall be hand chain hoists. The hoist frame shall be impact resistant, lightweight, heat-treated, permanent mold cast aluminum alloy. The frame shall be designed primarily for rigidity to hold the gears and bearings in perfect alignment. The frame shall be provided with covers enclosing all operating parts protecting them from dirt and weather.

The hand chain wheel shall be a two-piece pressed steel weldment treated for corrosion resistance. The chain wheel, in addition to having pockets accurately formed to receive the links of the hand chain, shall also form a part of an overload device. The overload device shall be calibrated for the capacity of the hoist and factory installed as an added measure of protection for the load, hoist, and operator.

The gearing shall be single reduction straight spur gears. The gears and pinions shall be generously proportioned and precision cut from alloy steel and heat-treated for maximum strength and durability. All gears shall be grease packed in a grease tight gearcase.

The hoist shall be equipped with an automatic, screw actuated, Weston-type load brake that shall hold under all conditions and permit fine smooth control in lowering. The brake shall be self-adjusting with long wearing friction washers.

The load sprocket and gear shall be machined from a one-piece forging. The chain guide shall be heat-treated, spring steel, flexible guide which shall provide heat-treated smooth surfaces that flex in the frame, controlling the load without binding.

The load chain shall be closely calibrated chain links of special analysis alloy steel formed and heat-treated for unusual strength case hardened for long wear and usage. The links shall be accurately formed to fit the pockets of the load sprocket. The hoist shall also be equipped with a hoist chain container.

The hand chain shall be welded steel plated for corrosion resistance. The chain links shall be accurately formed to fit the pockets of the chain wheel for gag-resistant operation in the chain wheel and guide arrangement.

The hooks shall be drop forged steel and shall be tough and ductile so that they will open noticeably when subjected to excessive overload. The hooks shall be equipped with hook latches.

## **2.4 ACCESSORIES**

### **A. GREASE FITTINGS**

The manufacturer shall extend all grease fittings into one location on the platform side of the trolley, so that it shall be possible to service all lubrication areas from this location.

### **B. LIFTING LUGS**

Equipment weighing over 100 pounds shall be provided with lifting lugs.

## **2.5 FACTORY TESTS**

The hoist systems shall be assembled and given no-load running tests at the factory prior to shipment. The factory test results shall be included in the O&M manual.

## **2.6 FIELD TESTS**

The Contractor shall conduct field load tests with the equipment in its installed position. Tests shall include a load test in compliance with OSHA requirements and demonstration to the Engineer that under this maximum load condition the equipment performs satisfactorily throughout the complete range of operation. Provide a written report to the Engineer of the field test results.

## **2.7 DATA PLATES**

Data plates shall contain the manufacturer's name, hoist size and type, serial number, capacity, and other pertinent data in accordance with Section 11000 (2.9). Data plates shall not be painted.

## **2.8 PAINTING**

Exposed metal surfaces of equipment and accessories specified herein shall be shop primed. Preparation of metal surface and application of manufacturer's standard primer shall be as specified in Section 09900 of these Specifications.

Final painting shall be as specified in Section 09900 (2.2.B) of these Specifications. The type of primer shall be coordinated with the final paint system. All factory painted equipment shall have documentation provided on the

equipment concerning the paint applied, coating thickness, product name and date of coating application.

### **PART 3 EXECUTION**

#### **3.1 GENERAL**

Trolley Hoist erection, including hoist and trolley assembly, field wiring, installation and starting shall be in accordance with the manufacturer's printed instructions.

The equipment shall be provided with all necessary lubrication fittings and lubrication. Before the initial startup at the final installation, all bearings, gears, etc., shall be lubricated in accordance with the manufacturer's recommendations.

**\*\*\* END OF SECTION \*\*\***

## SECTION 14630

### BRIDGE CRANES

#### PART 1 GENERAL

##### 1.1 SCOPE

There shall be furnished and installed one manual bridge crane, complete with hoist and trolley, as shown on the Drawings and specified herein. The bridge crane specified herein, the trolley, and trolley hoist (Specification Section 14620) shall be provided by a single manufacturer to ensure coordination and compatibility of the equipment.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
05120	Structural Steel
09900	Painting
11000	General Requirements for Equipment
14620	Trolley Hoists
Division 15	Mechanical
Division 16	Electrical

##### 1.3 EQUIPMENT LIST

Equipment numbers are as follows:

<u>Item</u>	<u>Equipment Number</u>
451 Control Valve Facility Bridge Crane	01 BC 01

##### 1.4 PERFORMANCE REQUIREMENTS

The bridge crane shall have the following characteristics:

<b>Hoist</b>	<b>Capacity (tons)</b>	<b>Span (ft)</b>
01 BC 01	1.5	17'-4"

## **1.5 QUALITY ASSURANCE**

In addition to the general Operations and Maintenance Manual requirements, the following shall be submitted with the O&M Manual:

- A. The manufacturer's certificate of compliance that the factory-applied coating system(s) are identical to the requirements specified herein.
- B. Special shipping, storage, protection and handling instructions.
- C. The manufacturer's printed installation instructions.
- D. Field test procedures.
- E. Suggested spare parts list to maintain the equipment in service.
- F. A list of special tools required for checking, testing, parts replacement and maintenance with current price information.
- G. A list special tools, materials and supplies furnished with the equipment for use prior to and during startup and for future maintenance.

## **1.6 SUBMITTALS**

In addition to the general Submittal requirements, the following shall be submitted:

- A. The make, model, weight of each trolley and hoist equipment assembly.
- B. Complete catalog information, descriptive literature, materials of construction, and specifications on trolley and hoist systems, monorail track stops, wheels, shafting, gears and bearings, hooks, brakes, and accessories.
- C. Shop painting systems.

## **1.7 WARRANTY**

The manufacturer shall provide a warranty. The warranty shall be valid for a period of 2 years, beginning on the date of substantial completion.

## **PART 2 PRODUCTS**

### **2.1 APPROVED MANUFACTURERS**

The bridge cranes shall be as manufactured by Yale, Budgit, Washington Crane and Hoist, Harrington, Gorbelt, or equal.

### **2.2 BRIDGE**

The crane bridges shall be of a single girder, overhung design.

The Bridge Crane shall meet the performance requirements of Section 1.4.

Bridge end trucks shall be of heavy steel channel box section weldments equipped with rail sweeps. End trucks shall be provided with lugs to prevent the crane from falling in the event of wheel or axle failure. The girder shall be rigidly welded to the end trucks at right angles to provide correct alignment. End truck wheels shall be high carbon steel, single flanged with crowned heads. Wheel axles shall be of the fixed type made of high carbon steel. Gear reduction shall be at the wheel, and heat treated alloy steel driver pinions shall mesh with integral gears on the driver wheel. A keyway, with set screw, shall connect the drive shaft to the driver pinion.

The bridge shall be manually operated.

### **2.3 TROLLEY**

Trolley shall be provided as described in Section 14620 of these specifications.

### **2.4 HOIST**

Hoists shall be provided as described in Section 14620 of these specifications.

### **2.5 ACCESSORIES**

Equipment Identification Plates: A 16-gauge stainless steel identification plate shall be securely mounted on the equipment in a readily visible location. The plate shall bear the 1/4-inch die-stamped equipment identification number indicated in these specifications and/or shown on the Drawings. The equipment identification number shall be mounted on each of the separate components of the equipment to facilitate assembly in the field.

Grease Fittings: The manufacturer shall extend all grease fittings into one location on the platform side of the trolley. It shall be possible to service all lubrication areas from this location.

Lifting Lugs: Equipment weighing over 100 pounds shall be provided with lifting lugs.

Anchor Bolts and Fasteners: Shall be 316 stainless steel.

## **2.6 PAINTING**

Exposed metal surfaces of equipment and accessories specified herein shall be shop primed. Preparation of metal surface and application of manufacturer's standard primer shall be as specified in Division 9 of these Specifications.

Final painting shall be as specified in Division 9 of these Specifications. The type of primer shall be coordinated with the final paint system. All factory painted equipment shall have documentation provided on the equipment concerning the paint applied, coating thickness, product name and date of coating application.

## **PART 3 EXECUTION**

### **3.1 EQUIPMENT INSTALLATION**

Bridge crane system erection, including hoist and/or trolley assembly, installation and starting shall be in accordance with the manufacturer's printed instructions.

The equipment shall be provided with all necessary lubrication fittings and lubrication. Before initial startup at the final installation, all bearings, gears, etc., shall be lubricated in accordance with manufacturer's recommendations.

### **3.2 FACTORY TESTS**

The bridge crane trolley hoist system shall be assembled and given no-load running tests at the factory prior to shipment. Running tests shall be performed with the control that will operate the hoist or trolley in service.

### **3.3 FIELD TESTS**

The Contractor shall conduct field tests with the equipment in its installed position. Tests shall include a load test in compliance with OSHA requirements and demonstration to the Engineer that under this load condition the equipment shall perform satisfactorily throughout the complete range of operation.



### **3.4 MANUFACTURER**

A representative of the bridge crane manufacturer shall be provided to inspect the installation, make any field adjustments necessary to ensure proper system operation, and instruct the Owner's personnel on proper operation and maintenance. Services shall include 2 days (two visits) on site for the supervision of equipment startup, testing and instruction of the Owner's personnel in the operation and maintenance of the equipment. One trip shall be for installation inspection, certification and testing; and one trip shall be for startup and training. Instruction and training of the Owner's personnel shall not take place until startup is completed and the bridge cranes are fully operational and shall be at a time and location agreed to by the Owner. The cost of these services shall be included in the bid price.

**\*\*\* END OF SECTION \*\*\***

**DIVISION 15**  
**MECHANICAL**

## SECTION 15050

### PIPING SYSTEMS

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section describes exposed process and utility piping, fittings, supports, and accessories shown on the Plans, described in these Specifications and as required to completely interconnect all equipment with piping for complete and operable systems inside of buildings and vaults.

The Contractor shall direct the attention of all subcontractors and suppliers of piping systems and related appurtenances for the work to the applicable provisions in the Contract Documents wherever they may occur.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
01800	Testing, Commissioning and Training
02300	Earthwork
02500	Water Distribution
02534	Storm Sewers
02535	Sanitary Sewer
09900	Painting
Division 11	Equipment
Division 13	Special Construction
Division 15	Mechanical
Division 16	Electrical

##### 1.3 STANDARDS FOR THE WORK

Pipe, fittings, and supports shall be provided to produce complete, operable systems with all elements properly interconnected as shown in schematic diagrams or to provide specified operations. If a specific dimensioned location is not shown for interconnections or smaller system elements, the Contractor shall select appropriate locations and show them on Shop Drawing submittals for review.

Piping systems and materials shall be new and without imperfections and shall be erected in a neat and workmanlike manner; aligned, leveled, cleaned and adjusted for satisfactory operation; installed in accordance with the best standard practices for this type of work so that connecting and disconnecting of piping and accessories

can be readily made and so that all parts are easily accessible for inspection, operation, maintenance and repair. In order to meet these requirements minor deviation from the Plans may be made as approved by the Engineer.

#### 1.4 PIPE MATERIALS

The materials to be utilized for the various pipe sizes and applications on the project shall be as follows, unless otherwise noted on the Plans or herein:

Drain	D	SDR 35 PVC or CPEP, as noted, see 02534-2.2/2.3
Perforated Drain	D	Perforated SDR 35 PVC, See 02535-2.2
Sewer	S	SDR 35 PVC, See 02535-2.2
Potable Water <3"	W	Brass or Copper, S, unless otherwise noted
Potable Water ≥3"	W	Ductile Iron, FL
Vent	V	See 15400-2.2

- (1) Buried Ductile Iron pipe shall have push on joints while all fittings and valves shall be mechanical joints. All buried ductile iron pipe shall be restrained unless otherwise shown on the Plans.

#### 1.5 SUBMITTALS

Submittal data shall be supplied in accordance with Section 01300. Detailed installation drawings of all piping and connected equipment shall be submitted. The drawings shall include all piping, valves, fittings, pipe support locations and types, seismic bracing, and appurtenances.

Submit data to show that the following items conform to the Specification requirements:

- A. Pipe, fittings, and accessories.
- B. Valves.
- C. Couplings and couplers.
- D. Pipe supports and seismic braces as required herein.

Submit certified test reports as required herein and by the referenced standards.

### PART 2 PRODUCTS

#### 2.1 GENERAL

Pipe sizes are nominal inside diameter unless otherwise noted.

All materials delivered to the job site shall be new, free from defects, and marked to identify the material, class and other appropriate data such as thickness for piping.

Acceptance of materials shall be subject to strength and quality testing in addition to inspection of the complete product. Acceptance of installed piping systems shall be based on inspection and leakage tests as specified in Part 3 Execution of this Section.

All water piping shall be certified under NSF 61 and NSF 372 for potable water use.

## **2.2 DUCTILE IRON PIPE AND FITTINGS**

### **A. GENERAL**

Ductile iron pipe shall be centrifugal cast pipe conforming to AWWA C151, Class 52, unless otherwise noted, cement mortar lined in accordance with, AWWA C104. All flanged spools shall be Class 52.

All above ground piping shall be flanged unless otherwise specified or indicated.

Flanges shall comply with AWWA C110/C115, Class 150. Flange gaskets shall be full face. Approved adaptor flanges shall be used instead of flanges where shown on the Plans. Flange gaskets shall be rated for 350 psi and shall be Flange-Tyte, or equal. Flange bolts shall be corrosion-resistant alloyed steel.

Fittings shall be ductile iron and shall comply with AWWA C110 or AWWA C153, cement mortar lined, 350-psi minimum pressure. Fittings shall be flanged. Fittings shall not be “Tyton” or other push-on type joint.

The exterior surface of ductile iron pipe and fittings inside of buildings, structures, and vaults shall be painted in accordance with Section 09900 of the Specifications.

## **2.3 PVC PIPE AND FITTINGS**

### **A. PRESSURE PIPE**

All PVC pipe and fittings 3 inch and smaller shall be Schedule 80. Pipe shall be constructed of material that meets or exceeds ASTM D2241 and D1784 and Commercial Standard CS 256. Joints shall be solvent weld

with press fit. Fittings shall conform to ASTM D2466 and D2467 for socket type and ASTM D2464 for threaded pipe.

All PVC pipe 4-inch and larger shall be PVC, Cast Iron pipe equivalent O.D., Pressure Class 305, conforming to the requirements of AWWA C900. Pipe joints shall be gasketed. Solvent-cement joints will not be acceptable. Fittings for PVC pipe 4-inch and larger shall be ductile iron, as specified in Part 2.2 of this Section.

Provisions for pipe expansion shall be as recommended by the pipe manufacturer.

Bolts for PVC pipe, where required, shall be 316 stainless steel, ASTM A193, Grade B8M, hex head with ASTM A194, Grade 8M hex nuts. Washers of the same material shall be supplied.

## **2.4 COPPER PIPE**

See Section 15400-2.1.

## **2.5 HOSES**

The Contractor shall furnish hoses, nozzles and fittings sized for each yard hydrant and hose bib where shown on the Plans and as described below.

### **A. HOSE**

Washdown hose shall be a flexible discharge hose with a minimum working pressure of 250 psi. Size shall be 1-1/4 inch, 1 inch, or 3/4 inch as shown on the Plans. Each section shall be 50-feet long have male and female brass couplings with adapters sized to fit yard hydrants and hose bibs. Each Hose shall have a nozzle.

### **B. NOZZLES, 1-1/4-INCH AND 1-INCH SIZE**

Nozzles to fit 1-1/4-inch and 1-inch hoses shall be one-piece bronze, with inlet size to match base, 8-inch-long nozzle and 5/16-inch outlet.

### **C. NOZZLES, 3/4-INCH SIZE**

Nozzles to fit 3/4-inch hoses shall be adjustable thermoplastic, with inlet size to match base.

## **2.6 CORPORATION STOPS AND METER SETTERS**

Corporation stops and the single meter shutoff valves shall be Mueller, Ford, or A.Y. McDonald with the type and style noted on the Plans or approved equal. Corporation stops shall be capable of 250 psi working pressure.

## **2.7 SERVICE SADDLES**

Saddles shall be single strap (3/4- and 1-inch services) stainless steel, female iron pipe thread outlet, and shall be Style 202NS as manufactured by Romac Industries, Inc., or equal.

## **2.8 MISCELLANEOUS FITTINGS**

### **A. FLANGED COUPLING ADAPTERS**

Flanged coupling adapters shall be Smith-Blair Type 912 Dresser Style 127, or equal.

### **B. ADAPTER FLANGES**

Adapter flanges for ductile iron pipe shall be manufactured of high strength ductile iron, ASTM A536, Grade 65-45-12. Flange dimensions shall be in accordance with ANSI B16.1, 125-lb. pattern. Gasket shall be Buna-N. Setscrews shall be AISI 4140, high strength, low alloy steel. The adapter flanges shall be Uni-Flange Series 400, or equal.

### **C. DISMANTLING JOINT**

Dismantling joint shall be Romac DJ400 or approved equal.

### **D. DIELECTRIC INSULATED UNIONS**

Dielectric insulated unions shall be used to connect dissimilar metals. They shall separate the metals so that the passage of more than one percent of the galvanic current, which would exist with metal to metal contact, is prevented. Unions shall be of the same material as the pipe to which attached, and pressure and temperature ratings shall be no lower than that of the piping system in which it is installed.

## **PART 3 EXECUTION**

### **3.1 PIPING INSTALLATION**

#### **A. GENERAL HANDLING AND PLACING**

All piping constructed on this project shall be performed in accordance with the Uniform Plumbing Code. These Plans do not detail all items such as complete venting, etc.; however, it is understood that this work shall be included as a part of this Section and all costs included in the various prices bid.

Pipe and accessories shall be handled in such a manner as to insure delivery on site in sound, undamaged condition. Particular care taken not to injure pipe coating. No other pipe or material of any kind shall be placed inside of lined pipe or fitting after lining has been applied. All pipe and fittings shall be unloaded, stored, handled in such a manner as to insure against damage. Dropping of pipe or fittings shall be cause for rejection.

The types and sizes of pipes to be used shall be as specified herein and as shown on the Plans. Where sizes of small pipe are omitted from the plans and not mentioned in the Specifications, the sizes to be used shall correspond to plumbing code requirements. In any event, undesignated pipe sizes shall be proper for the function to be performed and as accepted by the Engineer.

All pipe shall be carefully placed and supported at the proper lines and grades and where possible shall be sloped to permit complete drainage. Piping runs shown on the Plans shall be followed as closely as possible, except for minor adjustments to avoid architectural and structural features. If major relocations are required, they shall be approved by the Engineer.

Unions shall be installed in all threaded joint piping to facilitate the removal of sections for maintenance and repair in accordance with the best trade practice. Unions shall be ground joint, malleable iron type. Where unions connect dissimilar materials, the union shall be protected from reaction with dissimilar metals by installation of insulating materials and dielectric unions at contact points.

The interior of all piping shall be cleaned after assembly and before connecting to equipment.

All piping for which no location dimensions are shown shall be installed in a neat and workmanlike manner in accordance with best trade practice.



Wherever possible runs and rises shall be grouped and kept parallel. Properly lay out all miscellaneous piping to clear obstructions such as passageways, equipment, larger sized pipes, ventilation ducts, lights, etc.

Whenever pipe requires field cutting to fit in line, work shall be done by a machine in a satisfactory manner so as to leave a smooth end at right angles to axis of pipe.

All pipe shall be installed in strict accordance with manufacturer's recommendations and/or specifications, and best commercial trade practice. Any special tools required for laying, jointing, cutting, etc., shall be supplied and properly used. All pipe shall be kept thoroughly clean until acceptance of completed work, and shall conform accurately to lines and grades given. At all times during pipe laying operations keep trench free of water either by pumping, bailing, or drainage. Seal end of line with a tight-fitting plug when pipe is not being laid.

Valves shall have interiors cleaned of all foreign matter and inspected, both in open and closed positions prior to installation.

All pipes running through concrete walls below water surface or where subject to groundwater pressure shall be assembled as shown on the plans. Pipes running through concrete not subject to water pressure may be installed through standard steel sleeves, one or two pipe sizes larger than pipe in question. The pipe shall be free of all dirt and grease and thoroughly cleaned to insure a tight bond with the concrete.

All above ground outside pipe carrying liquids shall be insulated.

All buried, submerged, or intermittently submerged piping that is bolted together or uses bolts to hold materials together shall use 316 stainless steel nuts, bolts, and washers. This requirement applies to a distance of 12 inches above the highest water level in any tank, channel, or structure. Otherwise, bolts, nuts, and washers may be hot-dip galvanized steel.

## B. GENERAL EXPOSED PIPING INSTALLATION

Unless shown otherwise, piping shall be installed parallel to building lines, plumb, and level.

Piping shall be installed without springing or forcing.

All pipe flanges shall be set level, plumb, and aligned. All flanged fittings shall be true and perpendicular to the axis of the pipe. All bolt holes in flanges shall straddle vertical centerline of pipes.

Flexible couplings shall be provided for all piping connections to motor-driven equipment and where otherwise shown in the Plans. The Contractor may install additional flexible couplings at approved location to facilitate piping installation, provided that he submits complete details describing location, pipe supports, and hydraulic thrust protection.

Unions or flexible couplings shall be installed where shown on the Plans and at all non-motor-driven equipment to facilitate removal of the equipment.

Where equipment drain connections are provided, they shall be valved, with the discharge pipe carried to the nearest floor drain, drain trench, or sump. Where no receptacle for drain exists, drain valves shall be piped to 1 inch above the floor. Drain piping and valve materials shall conform to the requirements of the system served.

All exposed or submerged piping shall be painted and color-coded in accordance with Section 09900, unless otherwise specified.

## **3.2 PVC PIPING**

### **A. GENERAL**

PVC piping socket weld connections shall be made up in accordance with the pipe manufacturer's recommendations and as follows:

Where pipe is cut, remove all burrs and ream inside to provide smooth flow line. Bevel the plain end pipe 1/16 inch to 1/32 inch. Joints shall be first cleaned with cleaner before making up. Apply primer to the female joint. Apply primer to the male joint. Reapply primer to the female joint. Apply glue to the male joint. Apply glue to the female joint. Reapply glue to the male joint. Join pipe quickly with a 1/4 turn. If joint cannot be made up to full depth of socket, cut out and discard. Wipe off excessive cement. Hold for 30 seconds and do not move for 15 minutes after making up joint. Pipe joining below 40 degrees F will not be permitted. Cleaner and cement types shall be as recommended by the manufacturer for the size of pipe being used.

## **3.3 FLANGED PIPING**

Flanged joints shall be made in accordance with best trade practice. Screwed flanges for piping shall be run until pipe projects beyond face and no more than one thread is exposed on backside. All flange faces shall then be machined so as

to be perfectly parallel. All flanged pipe shall be accurately dimensioned; no “drawing-up” will be allowed. Gaskets shall be full face, rubber.

### **3.4 THREADED PIPING**

Threads for threaded joint piping shall be neatly cut with sharp tools and jointing procedure shall conform to best practice. Before jointing, all scale shall be removed from pipe by some suitable means such as pounding. After cutting, all pipe shall be reamed. All pipe shall be screwed together with an application of approved pipe compound applied to all male threads. Once a joint has been tightened, it shall not be backed off unless threads are recleaned and new compound applied. This application neatly made; all compound, dirt thoroughly wiped off outside of every joint.

Unions shall be installed in all threaded joint piping to facilitate removal of sections for maintenance, repair in accordance with best trade practice. All such unions shall be included in bid price whether shown on Plans or not.

### **3.5 COPPER PIPE**

All copper water service lines shall be tested, cleaned, and chlorinated, as described below. All waste, vent or drainage lines shall be flushed clean, and shall be tested by plugging the lowest point and filling the waste, vent or drainage piping with water to the level of the top of the vent pipe, but no joint in the system shall be submitted to a test of less than 10 feet of head. Under this condition, all joints shall remain watertight for a period of not less than 1 hour.

### **3.6 PIPE SUPPORTS**

Provide all necessary supports, tie rods, bracing, brackets or other types of supports which may be required, as shown on the Plans, or as specified in Section 15066.

### **3.7 TESTING**

#### **A. GENERAL**

Where new piping systems are being connected to existing piping systems the existing piping systems shall be tested prior to connecting to the new pipe to the existing piping. Once the new piping system has been connected to the existing piping system the entire system shall be tested again.

All piping systems will be tested to demonstrate leak tightness prior to acceptance. The Contractor shall provide all equipment and labor

necessary to perform all testing required herein, the costs to be included in the lump sum bid price.

Each particular piping system shall be tested as hereinafter specified. All leaks shall be repaired or defective material replaced and the test repeated as directed by the Engineer. After compliance with test requirements and approval of the Engineer, the field painting, where required, may be started. All pressure testing shall be done prior to any finish painting or pipe insulating.

The Contractor shall be responsible for repair of any damage resulting from or caused by leak testing.

All thrust blocks shall be in place for at least 7 days to allow concrete to cure before testing. Install adequate blocking or other means of resisting test pressure.

**B. PRESSURIZED LIQUID PIPING**

See specification Section 02500.

**C. DISINFECTION**

See specification Section 02500.

**\*\*\* END OF SECTION \*\*\***

## SECTION 15066

### PIPE AND CONDUIT SUPPORT SYSTEM

#### PART 1 GENERAL

##### 1.1 DESCRIPTION OF WORK

The work specified in this Section includes pipe and conduit hangers, brackets, and supports. Pipe and conduit support systems shall be furnished complete with all necessary inserts, bolts, nuts, rods, washers, structural attachments, and other accessories as shown on the Plans and specified herein.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
01600	Materials and Equipment
01800	Testing, Commissioning, and Training
09900	Painting
15050	Piping Systems
15400	Plumbing
16050	Basic Electrical Materials and Methods
16130	Raceways and Boxes

##### 1.3 REFERENCES

All pipe and conduit support materials and methods shall conform to the latest, applicable requirements of documents listed hereafter. In case of conflict between this section and the listed documents, the requirements of this Section shall prevail.

ANSI A13.1	Piping and Piping System
ANSI B31.1	Power Piping
ASME	Boiler and Pressure Vessel Code
ANSI/MSS SP-58	Pipe Hangers and Supports C Materials, Design and Manufacture
ANSI/MSS SP-69	Pipe Hangers and Supports C Selection and Application
SMACNA	Seismic Restraint Manual C Guidelines for Mechanical Systems
IPC	International Plumbing Code

## **1.4 SUBMITTALS**

In accordance with the requirements of Section 01300, submit the following project data prepared by a licensed Professional Engineer:

- A. Manufacturer's technical data for all hangers, brackets, supports and documentation of conformance with appropriate standards and these specifications.
- B. Location of pipe and conduit support, including type of structural and pipe attachments, shown on detail drawings and/or specified under paragraph 1.5 of Section 15050.

## **PART 2 PRODUCTS**

### **2.1 GENERAL**

The Contractor shall design, provide, and install pipe and conduit support systems, which include hangers, brackets, supports, anchors, expansion joints, and structural attachments. The support system shall be pipe rack, trapeze pipe hangers or individual pipe clamps, hangers, supports and structural attachments as specified herein. The support system shall be designed in conjunction with the pipe and conduit to be supported. Seismic restraints shall be provided in accordance with SMACNA Manual as referenced in paragraph 1.3.

In certain locations, pipe supports, anchors, and expansion joints have been indicated on the Plans, but no attempt has been made to indicate every pipe support, anchor, and expansion joint. It shall be the Contractor's responsibility to provide a complete system of pipe and conduit supports. Pipe support schedule under paragraph 2.7 of this Section sets forth minimum requirements for pipe supports.

### **2.2 PIPE RACKS AND TRAPEZE HANGERS**

Pipe and conduit racks and trapeze hangers shall be constructed of galvanized steel channels, rods, posts, post base, clamps, brackets, fittings, and accessories for supporting pipes in equipment and pump rooms. All components for pipe and conduit rack and trapeze shall be Unistrut or equal.

### **2.3 PIPE CLAMPS AND HANGERS**

In areas where pipe racks and trapezes are not used, pipe shall be supported with clamp hangers and stanchion saddle support system. The clamps and hangers shall be fastened to threaded rods hanging from structural attachments. Pipe supports shall be selected for the size and type of pipe to which they are applied.

Strap hangers will not be acceptable. Threaded rods shall have sufficient threading to permit the maximum adjustment available in the support item.

All pipe clamps and hangers, including all accessories, shall be galvanized steel for indoor use and Type 316 stainless steel for outdoor use.

Pipe and conduit clamps and hangers shall be as manufactured by Anvil or equal and shall be as follows:

Type	Pipe Size (In.)	Pipe Material	Anvil Figure
Swivel Ring, Split Type	3/4 to 8	All type	104
Split Clamp	1/2 to 3	All type	138R
Adjustable Ring	1/2 to 6	All type	97
Adjustable Ring	1/2 to 4	Copper	CT-269
Adjustable Clevis	3 to 24	All type	590
Pipe Clamp	3 to 42	All type	216
Socket Clamp	4 to 24	Cast Iron	595
Pipe Stanchion	4 to 24	All Type	63
Stanchion Saddle	4 to 36	All type	259
Adjustable Saddle Support	3 to 36	All type	264
Riser Clamp	2 to 24	All type	40
Adjustable Pipe Roll	6 to 12	Stainless Steel	177, 181, or 274

## 2.4 STRUCTURAL ATTACHMENTS

Structural attachments shall be concrete insert channels or individual inserts for new concrete, surface-mounted channel or individual inserts for existing concrete or where applicable, steel, roof plate supported attachments in the control building, complete with all accessories required. All structural attachments including all accessories shall be galvanized steel for indoor use and stainless steel for outdoor use, and shall be provided by a single manufacturer. Structural attachments shall be as measured by Unistrut Corporation or approved equal.

## 2.5 PIPE SUPPORT ATTACHMENTS TO CONCRETE

All pipe support attachment to concrete shall be in adhesive anchors unless noted otherwise.

Products which may be incorporated in the work include, but are not limited to, the following:

- A. HIT RE 500 Injection Adhesive Anchor, Hilti, Inc.

- B. HIT HY 150 Injection adhesive Anchor, Hilti, Inc.
- C. Power-Fast, Powers Fasteners, Inc.

**2.6 PROTECTION SADDLES**

Protection saddles shall be used for protecting pipe insulation against damage at pipe supports or as shown on the Plans. The nominal thickness of covering shall be the same as that of pipe insulation. The protection saddles shall be curved carbon steel plate and shall be Anvil Figure 160 through Figure 166 or approved equal.

**2.7 SPACING**

Maximum support spacing shall conform to the following table:

Pipe Size Inches	Pipe Material	Maximum Spacing Feet
1" & Smaller	Iron or Steel	6
	Copper Plastic Tubing	4-1/2 continuous continuous
1-1/4 to 2"	Iron or Steel	8
	Copper or Plastic	5
2-1/2 to 4"	Iron or Steel	10
	Copper or Plastic	6
6 to 8"	Iron or Steel	12
	Plastic	8

**PART 3 EXECUTION**

**3.1 DESIGN**

Pipe and conduit support systems shall be designed in accordance with applicable reference standards specified in paragraph 1.3. Pipe and conduit supports shall be designed and selected to withstand seismic loads for IBC 2018 Seismic Design Category D with  $S_s=1.269g$  and  $S_1=0.445g$  and shall adhere to the following conditions:

- A. Weight balance calculations shall be made to determine the required supporting force at each pipe support location and the pipe weight at each equipment location. Design loads for inserts, clamps, and other support items shall not exceed the manufacturer’s recommended loads.
- B. Pipe supports shall be able to support the pipe in all conditions of operation. They shall allow free expansion and contraction of the piping,



and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment. Allow clearances for pipe expansion and contraction.

- C. Wherever possible, pipe attachments for horizontal piping shall be pipe clamps, or as shown on the pipe support detail sheet. Horizontal or vertical pipes should be supported preferably at locations of least vertical movement.
- D. All pipe supports shall provide a means of vertical adjustment after erection.
- E. Where practical, riser pipe shall be supported independently of the connected horizontal piping. Pipe support attachments to the riser piping shall be riser clamps.

### **3.2 INSTALLATION**

Pipe support system shall be installed strictly in accordance with standards and codes referenced in paragraph 1.3 of this Section and piping support system manufacturer and piping manufacturer's recommendations.

In addition, all piping shall be rigidly supported and anchored so that there is no movement or visible sagging between supports.

Contact between dissimilar metals, including contact between stainless steel and carbon steel, shall be prevented. Supports for brass or copper pipe or tubing shall be copper-plated. Those portions of pipe supports, which contact other dissimilar metals, shall be rubber or vinyl coated.

Anchorage shall be provided to resist thrust due to temperature changes, changes in diameter or direction, or dead-ending. Anchors shall be located as required to force expansion and contraction movement to occur at expansion joints, loops, or elbows, and as required to prevent excessive bending stresses and opening of mechanical couplings. Anchorage for temperature changes shall be centered between elbows and mechanical joints used as expansion joints. Anchorage for bellows type expansion joints may be located adjacent to the joint.

Pipe supports and expansion joints are not required in buried piping, but concrete thrust blocking or other approved anchorage shall be provided as indicated on the Plans or specified in other sections.

**\*\*\*END OF SECTION \*\*\***

## SECTION 15100

### VALVES

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section consist of valves and accessories as shown on the Plans, described in these Specifications, and as required inside of buildings and vaults.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01300	Submittals
01800	Testing, Commissioning and Training
02510	Water Distribution
Division 11	Equipment
Division 15	Mechanical

##### 1.3 SUBMITTALS

Submit Catalog cuts and shop drawings in accordance with Section 01300 to demonstrate that the valves and appurtenances conform to the Specifications requirements.

The Contractor shall furnish manufacturer's installation and operation manuals, bulletins, and spare parts lists for all valves.

##### 1.4 QUALITY ASSURANCE

All materials and equipment furnished under this Section shall be by the manufacturer specified.

All materials in contact with potable water shall be NSF 61 and NSF 372 certified for potable water use.

See Section 15400 for Plumbing specifications and requirements.

## **PART 2 PRODUCTS**

### **2.1 GATE VALVES**

Gate valves shall be ductile iron body valves with resilient wedge conforming to the latest revision of AWWA Standard C515 and shall be NSF 61 approved. Valves shall have epoxy coating fusion bonded to all internal and external surfaces of the valve body and bonnet in compliance with AWWA C550. The wedge shall be fully encapsulated in rubber. The valves shall be non-rising stem, open to the left, equipped with standard 2-inch square operating nuts and O-ring seals at all joints. Minimum working pressure shall be 350 psi. Resilient wedge gate valves shall be American Flow Control Series 3500, Mueller 2360 series, Kennedy, or approved equal.

Above ground gate valves shall be provided with handwheels.

### **2.2 CHECK VALVES**

Check valves for liquid service 2 inches and smaller shall be swing check, bronze body, composition disc, 125 pound service, NSF61 compliant/lead-free.

Check valves for liquid service 2 inches and larger shall be swing check, outside lever with weight or spring, ductile iron body and cover, stainless steel seats and shaft, and EPDM gaskets/coverings. Valve shall be provided with fusion bonded epoxy coating and shall provide up to the full pipe flow opening. Minimum valve working pressure shall be 250 psi. Valves shall be AWWA C508 compliant, NSF61 compliant, suitable for 125 pound service, and shall be as manufactured by DeZurik, Val-Matic, or equal.

### **2.3 BALL VALVES**

Ball valves shall be brass, NSF 61 approved, with a minimum working pressure of 250 psi.

### **2.4 COMBINATION AIR VALVES**

Per Plans.

### **2.5 CONTROL VALVES**

Control valves shall be globe type, stainless steel trim, ductile iron body, epoxy lined and coated with 150 pound flanged ends and rated for 250 psi. Seat shall be stainless steel.

Schedule A – Site 46 – 112<sup>th</sup> Avenue NE FCV

Valve No.	Function	Size	Cla-Val Model	Adjustment Range
01 FCV 01	Flow Control & Pressure Reducing	10"	131G-18BCSYKCX	Max Flow: 4,600 gpm 30 – 300 psi
01 PRV 02	Pressure Reducing	10"	90G-01BCSYKC	30 – 300 psi
01 PRV 03	Pressure Reducing	6"	90G-01BCSYKC	30 – 300 psi
01 PRV 04	Pressure Reducing	2"	90G-01BCSYKC	30 – 300 psi
01 PRV 05	Pressure Relief & Sustaining	3"	50G-01BKC	20 – 200 psi

Schedule B – Site 69 – 451/446 Zone Separation Valve

Valve No.	Function	Size	Cla-Val Model	Adjustment Range
02 PRV 01	Check Valve with Solenoid Operated Return Flow	12"	81G-08BYKC	N/A

All of the above listed valves, for Schedule A and Schedule B, shall be supplied with a limit switch, model X105LCW.

Setpoints shall be determined by Northshore Utility District staff.

## 2.6 STRAINER

Schedule A – Site 46 – 112<sup>th</sup> Avenue NE FCV

Strainer shall be a 12-inch Cla-Val X43H, H-style, epoxy coated, ductile iron body, stainless steel screen, 150 lb. flange, or approved equal.

## 2.7 VALVE IDENTIFICATION TAGS

Each shut-off or control valve, shall be provided with a 1-1/2-inch minimum diameter heavy brass tag. Tags shall bear the identifying number of the valve and one or more identifying letter symbols of the service line.

Numbers and letters shall be block type with 1/2-inch-high numbers and 1/4-inch-high letters stamped on the tags and filled with black enamel.

Attach tags to the valves by split-key rings soldered so that the ring and tag cannot be removed.

Furnish a drawing and a neatly typed valve directory listing each valve number, type of valve and its location. Submit the directory and drawing to the Owner for approval.

## **PART 3 EXECUTION**

### **3.1 GENERAL**

All valves and accessories shall be installed in a manner and location as shown on the Plans or as required for the application and in accordance with manufacturer's instructions. Valve size is fully equal to line piping in which the valve is installed unless otherwise noted on the Plans. Support all valves where necessary. In case on conflict between these Specifications and a governing code, the more stringent standard shall prevail.

All valves of the same style or type shall be furnished by a single manufacturer.

Provide all accessories necessary for proper valve operation as specified or required for the application. Buried valves shall be installed with square operating nuts and adjustable cast iron valve boxes with covers. Valve boxes shall be set such that the slots in the boxes are in line with the run of pipe the valves are in. Provide two sets of T wrenches for buried valve operation.

Buried valves shall be provided with 1-inch solid steel extension stems with rock guards if the operating nut will be 18 inches or more below the ground surface.

Valves shall be installed with the operator in a position for convenient operation. Particular care shall be taken to insure that space is available for operation of lever or handwheel operated valves without interference to walls, piping or equipment. Any valve which is installed, in the opinion of the Engineer, in a manner that operation is inconvenient shall be modified or removed and reinstalled in a manner suitable to the Engineer at the expense of the Contractor. Operations for manual valves shall be lever or handwheel as is standard with the manufacturer unless another type of operator is specified or required by the manufacturer.

For submerged valves, provide stem guides as recommended by the valve manufacturer on a spacing of 6'-0". As an alternate, provide valves with extended bonnets where practical. Provide supports for extended bonnets as required. Stem guides and supports shall be 316 stainless steel. All installation fasteners for submerged valves, guides, and supports (nuts, bolts and washers) shall be 316 stainless steel.

### **3.2 CONTROL VALVE**

The services of a factory trained representative of the control valve manufacturer shall be provided. Services shall include a half day onsite and one additional half day for the supervision of equipment startup, testing and instruction of the Owner's personnel in the operation and maintenance of the equipment. The cost

of these services shall be included in the bid price. Instruction and training shall not take place until valve startup is completed and the valves are fully operational.

Contractor shall supply upstream and downstream pressure for testing of control valve including gauges to supply the pressure required.

**\*\*\* END OF SECTION \*\*\***

## SECTION 15400

### PLUMBING

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section shall consist of plumbing to include interior water systems, drain and waste systems, and fixtures and trim as shown on the Plans and specified herein.

All permits shall be obtained in accordance with Section 01160 of these Specifications.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01200	Measurement and Payment
01160	Regulatory Requirements
01300	Submittals
15050	Piping Systems

##### 1.3 REFERENCES

ASTM B62	Specification for Composition Bronze or Ounce Metal Castings
ASTM B88	Specification for Seamless Copper Water Tube
ASTM B371	Specification for Copper-Zinc Silicon Alloy Rod
AWWA C502	American Water Works Association Standard for Dry-Barrel Fire Hydrants

##### 1.4 MANUFACTURERS

Use products of a single manufacturer where two or more units of the same class of equipment are required.

##### 1.5 QUALITY ASSURANCE

All plumbing shall be performed in accordance with the current edition of the Uniform Plumbing Code. The Plans do not detail all items such as complete venting, etc.; however, it is understood that this work shall be included as part of this Project.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

Material shall be delivered to the project site in its original unopened containers with labels informing manufacturer and product name. Material shall be stored and handled in compliance with manufacturer's recommendation to prevent damage.

## **1.7 NAMEPLATES**

Provide major components of equipment with manufacturer's name, address, catalog number, capacity, and equipment designation securely affixed in a conspicuous place.

## **PART 2 PRODUCTS**

### **2.1 PIPE AND FITTINGS - WATER SYSTEM**

#### **A. ABOVE GROUND PIPING**

##### **1. Pipe**

- a. Type "K" copper, ASTM B88, silver solder.
- b. Brass

All brass pipe 3 inches and smaller shall be Schedule 40 red brass pipe as indicated on the Drawings, pressure rated for a minimum of 150 psi, which meets or exceeds ASTM B43.

Provisions for pipe expansion shall be as recommended by the Pipe manufacturer.

##### **2. Fittings**

- a. Wrought copper; ANSI B16.22, silver solder.
- b. Brass plumbing fittings shall be brass fittings rated to a minimum of 150 psi. Fittings shall be threaded.



## **2.2 PIPE AND FITTINGS - DRAIN AND WASTE SYSTEM**

### **A. BURIED AND ABOVE GROUND PIPE**

All drain, waste and vent pipe and fittings shall be SDR 35 PVC in accordance with Section 02535.

## **2.3 VALVES**

### **A. PRESSURE REDUCING VALVE (DOMESTIC WATER)**

Adjustable self operated type, bronze body, stainless steel integral strainer, and cast iron spring case, 20- to 70-psig outlet pressure range and inlet pressures to 250 psig. Shall have a minimum working pressure of 250 psi. Watts, B&G, Fisher, Leslie.

### **B. BACKFLOW PREVENTER**

Backflow preventers shall be of the reduced pressure type, double check valve assembly, or double check detector assembly as indicated on the Plans by Febco, Beeco, Watts or equal. Sizes to be as indicated on the Plans. Shall have a minimum working pressure of 250 psi.

### **C. VALVE COMPONENTS**

Material used capable of operating within services required, e.g., hot water heating valve components designed for continued operation at 240 degrees F.

## **2.4 FLOOR DRAINS**

### **A. GENERAL**

J.R. Smith, Zurn, Josam or Wade equal to J.R. Smith models listed.

1. Floor Drain – FD – 2320, galvanized with a nickel bronze top.

## **2.5 CLEANOUTS**

### **A. GENERAL**

J.R. Smith, Zurn, Josam or Wade equal to J.R. Smith models listed.

1. Grade Cleanout - GCO - 4283 - brass tapered thread plug.

2. Floor Cleanout - FCO - 4023 - brass tapered thread plug.

## **2.6 PIPING SPECIALTIES**

### **A. STRAINERS**

0.045 of an inch perforated 304 stainless steel screen, Armstrong AISC or equal by Yarway, Sarco.

### **B. UNIONS**

2 inches and smaller; ground joint, malleable iron type. Crane, Walworth, Syspac.

### **C. INSULATING UNION**

Epcos, Capitol.

### **D. ACCESS PANELS**

Milcor, Type "DW" with screwdriver operated lock. Stainless steel access panels in tile walls.

### **E. ESCUTCHEON**

Grinnell Fig. 2 or 13, nickel plated.

### **F. TRAP PRIMERS**

J.R. Smith, Josam, Zurn or Wade, equal to J.R. Smith model S-2699.

### **G. PIPE MARKING**

See Section 15050.

## **2.7 MECHANICAL SUPPORTING DEVICES**

### **A. PIPE HANGERS**

Adjustable threaded rod type in accord with MSS SP-58, MSS SP-69, and ANSI B31.1

### **B. CONCRETE INSERTS**

Malleable iron body and nut, Grinnell CB or equal.

C. EXPANSION JOINTS

Stainless steel bellows type, Keflex model 308 or equal by Flexonics.

D. ALIGNMENT GUIDES

Keflex series P or equal by Flexonics.

**2.8 FIXTURES AND TRIM**

A. TOILET

Furnish and install toilets as shown on the Plans. The toilet shall meet the American Disabilities Act guidelines and ANSI A117.1 requirements for people with disabilities.

The toilet shall be Vitreous China with an 18-inch rim height. The toilet shall be American Standard Products Elongated Water-Saver Cadet Toilet, Model No. 2108.408, or equal.

B. LAVATORY AND FIXTURES

A lavatory with fixtures shall be provided for installation as shown on the Plans. The lavatory shall meet the American Disabilities Act guidelines and ANSI 117.1 requirements for people with disabilities.

The lavatory unit shall be Vitreous China, with front overflow and nominal dimensions of 20" W x 18" L. Faucet holes shall be 4 inches on center. The lavatory shall be American Standard, Decorum, Model No. 9024 Series, or equal.

The lavatory fixtures shall include aquaseal valves with renewable seats, 4-inch centers and 4-inch brass wrist handles; an aerator with 2-1/2-gpm flow restrictor; and a pop-up drain with a 1-1/4-inch tailpiece. The fixtures shall be American Standard, Heritage Centerset Faucet, Model No. 2103.786, or equal.

C. INSTANTANEOUS WATER HEATER

Instantaneous water heaters shall be wall mounted, electric, commercial, on demand water heaters. Enclosure shall be 18 gauge stainless steel and be NEMA 4X rated. Electric heating element shall be heavy duty, low watt density Incoloy 800 sheathed electric resistance element. Heat exchanger shall be copper tubing with brazed brass fittings, include large

internal passageways for minimal pressure, and be constructed of NSF 61 barrier materials for potable water. Temperature control shall be by internal microprocessor with PID logic and dual display of setpoint and actual water outlet temperatures. Safety controls shall include surface mounted bi-metal thermostat with manual reset. Connections shall be 3/4" inlet and outlet. Design flow, temperature rise, and electrical requirements are per the Water Heater Schedule. Instantaneous water heaters shall be Keltech HL series, or equal.

### **PART 3 EXECUTION**

#### **3.1 PIPE AND PIPE FITTINGS – WATER SYSTEM**

**A. BURIED WATER PIPE**

Install with not less than 1 foot of cover, measured from top of pipe to approved finish floor. Install pipe in accordance with the manufacturer's recommendations. Construct water lines under other utilities where necessary to meet the minimum cover requirements.

**B. PIPES**

Remove burrs by reaming. Use Teflon tape on male threads only.

**C. OPENINGS IN PIPES**

Keep closed during progress of work.

**D. COORDINATION**

Install so as not to interfere with light fixtures or other trade components.

**E. CLOSE NIPPLES**

Not permitted on any part of work. Use standard short nipples for short pipe connections. Use of bushings not permitted.

**F. PIPING OF COPPER TUBING**

Continuous. Copper tubing inserts in runs of steel pipe not permitted. Solder joints in copper piping. Do not lay copper tubing on rocks or gravel.

G. CONNECTIONS BETWEEN PIPES OF DISSIMILAR METALS

Make with insulating union (Dielectric). Include cast iron valve connections to adapters for copper pipe.

H. CUTTING OF COPPER PIPE

Use a cutter. Smooth sharp edges with emery cloth.

I. SADDLES ON PIPE IN LIEU OF TEES AND BENDING PIPE

Not permitted.

J. EQUIPMENT ISOLATION

Provide isolation valves (gate or ball valve) and unions at piping connections to all equipment.

K. CONCEALED PIPING

Conceal all piping in finished areas unless otherwise noted.

**3.2 PIPE AND PIPE FITTINGS - DRAIN AND WASTE SYSTEM**

A. BURIED DRAIN PIPE

Install with not less than 1 foot of cover, measured from top of pipe to approved finish floor. Install pipe in accordance with the manufacturer's recommendations. Construct drain lines under other utilities where necessary to meet the minimum cover requirements.

B. HORIZONTAL SOIL AND WASTE PIPE GRADING

Provide a grade of 1/4 inch per foot where possible, but in no case less than 1/8 of an inch per foot. Install main vertical soil and waste stacks with provisions for expansion and extend full size to roof line as vents.

C. PIPES

Remove burrs by reaming. Use Teflon tape on male threads only.

D. OPENINGS IN PIPES

Keep closed during progress of work.

E. COORDINATION

Install so as not to interfere with light fixtures or other trade components.

F. CONCEALED PIPING

Conceal all piping in finished areas unless otherwise noted.

### 3.3 VALVES

A. PRESSURE REDUCING VALVE ASSEMBLY

Install with a strainer on inlet side and relief valve on low pressure side. Make connections to pressure reducing valve through a gate valve and a union on each side and a full-size globe valve bypass around reducing valve. Install valves so that they are easily accessible for maintenance and removal. Provide pressure gauges on both high and low pressure sides.

B. BACKFLOW PREVENTER

Provide for boilers and chillers, and to comply with “Cross-Connection Control Regulation in Washington State.” Install relief valve on downstream side. After being installed, all backflow preventers shall be inspected and tested by a certified Backflow Assembly Tester and/or a Cross-connection Control Specialist to ensure that protection is provided commensurate with the assessed degree of hazard according to the standards listed in the current edition of the International Plumbing Code.

C. AIR GAPS

Distance between inlet pipe and flood level rim twice the diameter of supply pipe.

D. VACUUM BREAKERS

Use atmospheric type where vacuum breaker is not upstream of shut-off. Install 12 inches above highest downstream pipe elevation. Use pressure type otherwise. Provide for lawn sprinkling, hose bibs, and faucets with hose end connections.

E. BALL AND BUTTERFLY VALVES

May be used in lieu of gate valves on all services except steam systems.

### **3.4 CLEANOUTS**

Provide every 50 feet and install at all locations required by code and to permit cleaning of all sewer piping. Provide cleanouts full size of pipe, but not larger than 4 inches. Close cleanout openings with brass screw plugs. Where cleanouts occur in floor, install a brass ferrule complete with a screwed brass cover, flush with floor. Install cleanout threads with graphite. Locate cleanouts to clear cabinet work and make them easily accessible.

### **3.5 VENTS**

#### **A. FLASH AND COUNTERFLASH**

Install vents passing through roof with roof flashing and counterflashing assemblies.

### **3.6 AIR CHAMBERS**

Provide at each water connection to a plumbing fixture, same size as connection. Minimum length 16 inches, except 24-inches length at flush valves.

### **3.7 PIPING SPECIALTIES**

#### **A. GAUGES**

Mount so gauges can be easily read from the floor. Provide ball valves to isolate pressure gauges. Cocks or petcocks are not acceptable.

#### **B. THERMOMETERS**

Mount to be easily read from the floor. Provide swivel at neck.

#### **C. UNIONS**

Install at final connections to all equipment items and on control side of all valves in mains, branches and risers.

#### **D. ESCUTCHEONS**

Install at all places where exposed piping passes through walls, floors or ceilings.

E. ACCESS PANELS

When not specifically shown on the Plans, provide in walls, ceilings, etc., to provide adequate access for service and maintenance of concealed valves, dampers, motors, air vents or any other concealed equipment or accessories. Minimum size 12" x 12".

F. TRAP PRIMERS

Install automatic trap primers at all locations as shown on the Plans.

G. EQUIPMENT, VALVES, AND PIPING

Tag for identification, indicating equipment, zone and area served. Provide nameplates for access doors and removable ceiling panels to areas containing mechanical equipment, valves, etc. Submit to Engineer for approval proposed list of nameplates. Run all drips and drains for pumps, pans, reliefs, etc., to the drain. Discharge onto floor not permitted.

H. GALVANIZED IRON SLEEVES

Not less than 20 gauge, cast in concrete, and installed wherever piping passes through floors, footings or walls of concrete or masonry construction. Sleeves for insulated pipe shall be of sufficient size to allow the covering to pass through sleeve. Use steel pipe extended 1 inch above finished floor for sleeves in floors of rooms exposed to water. Watch and protect all sleeves and inserts while concrete is poured. For penetration of floors and walls from buried pipe, caulk annular space between pipe and sleeve with first quality oakum and fill with pitch.

I. EXPOSED PIPING, VALVES, HANGERS, ETC., AT FIXTURE

Chromium-plated finish.

J. SINK SIZE

Coordinate and verify each sink size with cabinet manufacturer prior to ordering.

K. ROUGH-IN AND CONNECTION FOR FIXTURES AND EQUIPMENT

Connect fixtures and equipment furnished and installed by General Contractor, Owner, or others. It is the Contractor's responsibility to obtain from supplier sufficient information to rough-in properly and connect all



fixtures in accordance with manufacturer's recommendation. Furnish all traps, valves tailpieces and other trim not furnished with equipment.

L. SHUT-OFF VALVES

Provide shut-off valves on all water lines to fixture groups.

M. LOCATION OF FIXTURES

Locate in accordance with details and dimensions on Plans.

N. INSTALLATION OF FIXTURES AND EQUIPMENT

Support and fasten wall hung fixtures with concealed floor support type carriers. Align fixtures and equipment installed in batteries in accord with architectural drawings. Fit fixtures on finished walls without noticeable warpage on either the wall or fixture and grout with G.E. silicone or similar approved material.

O. VACUUM BREAKERS

Locate and install on water supply to all fixtures which have water connection located below rim. Install on all hose bibs.

P. WATER CONNECTION STOPS

Install individual loose key stops on all fixtures. If water connections are concealed, install valves in lieu of stops.

### **3.8 MECHANICAL SUPPORTING DEVICES**

A. GENERAL

Mechanical equipment and materials are not to be suspended or supported from pipe, electrical conduit, ceiling systems or any non-structural member.

B. CONCRETE ANCHORING

Use cast inserts in new construction; stamped metal inserts not acceptable. Expansion shells may be used in existing construction; powder actuated inserts are not acceptable.

C. PIPE HANGERS AND SUPPORTS

Item selections, hanger spacings, rod diameters, and protection shields in accord with MSS SP-69 and MSS SP-58, unless otherwise indicated. Pipes shall not be hung or supported from each other. Isolate copper water pipes from dissimilar metals, hangers, steel or aluminum studs, etc.

D. STRUCTURAL ATTACHMENTS

Beam clamps where possible.

E. VERTICAL ADJUSTING DEVICES

Provide on all rigid hangers.

F. PROTECTION SHIELD/PROTECTION SADDLE

Use on insulated pipe.

**3.9 EXISTING UTILITIES**

Locate well enough in advance of the excavation to prevent damage during construction. The Contractor is responsible for any damage whatsoever resulting from his operations on the project.

**3.10 CONTAMINATION**

Prevent contamination of the pipeline during construction from any operation or source.

**3.11 HOT WATER**

Generate at 120 degrees F unless indicated otherwise on the Plans.

**3.12 SYSTEM DRAINING**

Grade domestic water piping so that it can be drained from low points. Provide a valved drain run to nearest floor drain or approved terminus.

**3.13 HEAD PROTECTION**

Where duct angles, pipe hangers, equipment support angles, etc., are exposed in walkways or in access ways to equipment for maintenance purposes, cover all such potentially injurious protrusions less than 6'-8" above the floor with padding. Secure padding permanently and finish comparable to adjacent surfaces.

### **3.14 TESTING AND STERILIZATION**

#### **A. WATER SYSTEM (POTABLE AND NON-POTABLE)**

Clean piping prior to testing by thoroughly flushing with water until all dirt and foreign materials have been removed. Maintain flushing operations for not less than 1 hour and until piping is clean. Not less than 80-psi flushing pressure.

Conduct for a period of not less than 8 hours at 150-percent operating pressure, 125 psig minimum.

Potable water piping shall be sterilized with calcium hypochlorite at 50 mg/L chlorine for 24 hours prior to line acceptance. Contractor shall furnish hypochlorite. The cost of disposal of water used for sterilization shall be borne by the Contractor.

#### **B. DRAIN AND WASTE SYSTEM**

Subject all work to hydrostatic test of 10-feet head of water or as directed by local plumbing inspection authority. Obtain approval for all work or portions of work as tested, in writing, prior to covering or concealment in any manner. Notify Engineer at least two normal working days prior to testing any portion of work and do not conceal any work until so directed by the Engineer.

### **3.15 INSPECTION**

It shall be the Contractor's responsibility to contact the Owner and arrange for final inspection.

**\*\*\* END OF SECTION \*\*\***

## SECTION 15700

### HEATING, VENTILATION, AND AIR CONDITIONING

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section shall consist of the heating, ventilation, and air conditioning equipment and other associated items as shown on the Plans, and as further specified herein.

All permits shall be obtained in accordance with Section 01160.

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
Division 16	Electrical

##### 1.3 QUALITY ASSURANCE

Submittals shall be in accordance with Section 01300.

All equipment supplied in this Section shall be provided to produce complete, operable systems with all elements properly interconnected as shown in schematic diagrams or to provide specified operations. If a specific dimensioned location is not shown for interconnections or smaller system elements, the Contractor shall select appropriate locations and show them on shop drawing submittal for review.

Equipment and material shall be new and without imperfections and shall be erected in a neat and workmanlike manner; aligned, leveled, cleaned and adjusted for satisfactory operation; installed in accordance with the recommendations of the manufacturers and the best standard practices for this type of work to ensure connecting and disconnecting accessories can be readily made and so that all parts are easily accessible for inspection, operation, maintenance and repair. Oil and lubrication fittings shall be located clear of and away from guards, base, and equipment and within reach from the operating floor whenever possible. In order to meet these requirements with equipment as furnished, minor deviation from the Plans may be made as approved by the Owner.

The manufacturer's recommendations and instructions of products used in the work are hereby made part of these Specifications, except as they may be superseded by other requirements of these Specifications.

## **1.4 PROJECT MEETINGS**

Attend a minimum of two site meetings, each up to 2 hours in duration. The first site meeting will be held after 95 percent of the HVAC equipment and controls have been installed. Any required training should be scheduled and performed at this first site meeting. A follow up site meeting shall be scheduled 6 months after the complete installation of the HVAC and controls to ensure proper operation. Any additional training required should be scheduled and performed at the follow up site meeting.

## **1.5 EQUIPMENT LIST**

Refer to Heating, Ventilation and Air Conditioning Schedules shown on the Plans.

## **1.6 SUBMITTALS**

Submit manufacturer product data on HVAC equipment, as listed in this Section, under the provisions of Section 01300.

## **PART 2 PRODUCTS**

### **2.1 APPROVED MANUFACTURERS**

Equipment manufacturers and model numbers shall be as shown on the Plans except where indicated herein.

### **2.2 LOUVERS**

Louver performance data shall be licensed under the AMCA Certified Ratings Program and shall bear the AMCA Certified Ratings Seal. Certified performance data shall include airflow pressure loss and water penetration.

#### **A. DRAINABLE BLADE**

Louvers shall be stationary type with drainable blades in a 6-inch louver frame. Each stationary blade shall incorporate an integral drain gutter and each jamb shall incorporate an integral downspout so water drains to blade end, then down the downspouts and out at the louver sill. The louver construction shall consist of a frame and blades from aluminum extrusions of minimum 0.081-inch nominal wall thickness. The blades shall be positioned at 37 degree angles. Each louver shall be equipped with a framed, removable, 0.125 x 3/4 flattened aluminum rear-mounted bird screen or 16 x 18 mesh aluminum insect screen. Louvers shall be supplied with a Kynar finish which meets AAMA 2605. Each factory-assembled

louver section shall be designed to withstand wind loadings of 25 psf. Drainable blade louvers shall be Greenheck ESD series, or equal.

**B. COLOR SELECTION**

Louver color to be selected by Owner from the manufacturer's standard palette of at least 24 colors.

**2.3 DAMPERS**

Damper air performance data shall be developed in accordance with the latest edition of AMCA Standard 500-D.

**A. GRAVITY BACKDRAFT DAMPERS**

Gravity backdraft dampers shall be suitable for pressures up to 1-inch w.g., velocities to 2,500 ft/min and temperatures to 180 degrees F. Gravity-operated back draft dampers shall rotate to the fully open position in the direction of the airflow when subjected to a differential pressure of 0.2 of an inch w.g. or less. Gravity damper construction shall consist of minimum 18-gauge galvanized steel frame with 2.5-inch to 3.5-inch depth; aluminum blades; 304 stainless steel axles turning in acetal bearings. The damper shall be equipped with extruded vinyl blade seals; and internal aluminum tie bar with spring assist. Finish shall be as shown on equipment schedule. Gravity backdraft dampers shall be Greenheck WD series, or equal.

**B. INSULATED FRAME AND BLADE DAMPERS**

Dampers shall be suitable for pressures up to 8-inch w.g., velocities to 4,000 ft/min, standard air leakage less than 3 CFM/square foot at 1-inch w.g. and temperatures to 200 degrees F. Dampers shall consist of: 0.125-inch aluminum channel frame; aluminum airfoil blade internally insulated with polyurethane foam and with polystyrene on four sides and thermally broken with dual polyurethane resin gaps; aluminum airfoil blade internally insulated polyurethane foam and thermally broken. The airfoil blades shall be completely symmetrical relative to their axle pivot point, presenting identical resistance to airflow in either direction or pressure on either side of the damper. The axle shall be 304 stainless steel with dual bearings in an acetal inner sleeve. The airfoil blade and jamb seal shall be silicone rubber. Blade-to-blade linkage shall be 304 stainless steel. Insulated frame and blade dampers shall be Greenheck ICD-45, or equal.

## **2.4 DAMPER ACTUATORS**

Actuators shall have spring return operation and open in the direction of the airflow. Actuators shall fail in the open position. Actuators shall be sized by the damper manufacturer for the torque requirements of the damper. The mounting location, voltage, and NEMA enclosure rating shall be as shown on the schedules. Damper actuators shall be Belimo or equal.

## **2.5 FANS**

Fans shall bear the AMCA Certified Ratings Seal for both sound and air performance and be UL tested and approved.

### **A. RESTROOM CEILING EXHAUST FANS/LIGHTS**

Ceiling Fans/Lights shall be ceiling mount with multi-speed control (0, 30-100 CFM) that shall be built-in with a high/low adjustable delay timer and activated by a wall switch. Select from 50/80/110 CFM. The motor shall be enclosed with brushless ECM motor engineered to run continuously. ECM motor speed shall automatically increase when the fan senses static pressure to maintain selected CFM. A High/Low delay timer shall return the fan to the preset CFM after a definable period of time. Power rating shall be 120v/60Hz. Duct diameter shall 4" or 6". Fan shall be UL and cUL listed. Lamps shall be of the LED panel type utilizing no less than one 10 watt LED lamp. Ceiling exhaust fans shall be Panasonic FV series, or equal.

### **B. INLINE DIRECT DRIVE FANS**

Inline direct drive fans shall be of the centrifugal, direct drive inline type. The fan, fan housing, and accessories described below and in the Plans shall be one unit supplied by the same manufacturer. The housing shall be of square design constructed of heavy-gauge aluminum and include square duct mounting collars. Fan construction shall include two removable access panels. The fan wheel shall be centrifugal backward inclined, constructed of aluminum. The wheel shall be statically and dynamically balanced. Motor shall be a DC electronic commutation type motor (ECM) specifically designed for fan applications. Internal motor circuitry shall convert AC power supplied to the fan to DC power to operate the motor. Motor shall be speed controllable down to 20 percent of full speed (80 percent turndown). Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal. Fan motor shall be of the high-efficiency type running at a minimum of 85 percent efficient at all speeds. Motors shall be heavy-duty ball bearing type carefully matched to the fan load and furnished at the specified voltage, phase, and

enclosure as indicated on the Fan Schedules. Motor and drives shall be readily accessible for maintenance. The accessories, controls, and finish shall be as indicated on the Fan Schedule. Inline direct drive fans shall be Greenheck SQ series, or equal.

## **2.6 ELECTRIC HEATERS**

Heaters shall be UL Listed, CSA Certified and meet requirements of the National Electrical Code.

### **A. UNIT HEATERS**

Heaters shall be horizontal or vertical mount type. Heater housing shall be constructed of heavy gauge steel. Heaters shall be fan-forced air unit with aluminum finned, copper clad heating elements. The fan shall be completely enclosed and dynamically balanced. The unit shall be complete with pivotal wall or ceiling mounting kit as specified on Plans, control transformer, automatic reset thermal overheat protector, adjustable louvered outlet grille and enamel finished steel housing; all shall be one unit supplied by the same manufacturer. Unit heaters shall be Qmark MUH series, or equal.

### **B. WALL MOUNTED HEATERS**

Provide and install fan forced electric wall mounted electric heaters. Heater shall be designed for wall recessed or surface mounting. Construction shall be galvanized steel housing with steel grille. The heating elements shall be resistance wire enclosed in a steel sheath with steel plate fins. Heater shall include thermal cutout switch and built-in thermostat. Wall mounted heaters shall be QMark AWH series, or equal.

## **2.7 AIR QUALITY SENSORS**

Air quality sensors shall consist of a controller with the capability to sense two gases and have two sets of relays for fan/alarm activation. Unit shall also have LED indication of power, fault, and two threshold indicators for each gas channel. Enclosure shall be NEMA 4X rated.

### **A. CO SENSOR**

1. Sensing range: 0-400 PPM
2. Low threshold point: 35 PPM
3. High threshold point: 100 PPM



**B. NO<sub>2</sub> SENSOR**

1. Sensing range: 0-10 PPM
2. Low threshold point: 0.5 PPM
3. High threshold point: 2 PPM

Air quality sensor units shall be AirTest CT2100 series, or equal. Provide Manufacturer's services for startup and testing of unit including the use of Manufacturer's standard Calibration Kit.

**2.8 FLEXIBLE DUCT CONNECTORS**

At the inlet and discharge of all air handling equipment provide flexible duct connectors. The metal to fabric connection shall consist of fabric material a minimum of 3 inches wide with 3 inch metal on either side of the flex material. Metal shall match the duct material for which it is installed. The fabric and metal shall be joined by means of a double lock seam.

**A. INDOOR**

Flexible fabric shall be Neoprene material with woven fiberglass as base fabric Neoprene coating and shall be UL listed. Material specification at a minimum shall be Weight: 30 oz./sq. yd, Tensile Strength of 500 psi, Tear Strength: 12 psi, Low Temperature: -40 °F, High Temp: 200 °F. Indoor flexible duct connectors shall be Duro Dyne or equal.

**2.9 ELBOWS**

Standard radius or vaned square, as per SMACNA Standards.

**2.10 TAPE**

Non-combustible, three inches in size, foil backing, pressure-sensitive lap of facing material. NASHUA 322, NASHUA FSK (High Pressure) or equal.

**2.11 DUCT SEALANT**

Duct sealant shall be Foster 32-19 Duct-Fas, or equal.

**2.12 ADHESIVE**

Adhesive shall be Foster 85-60 Quick-Tack, or equal.

## **2.13 METAL DUCTWORK**

Metal ductwork for air supply and return air shall be fabricated in accordance with ASTM A527 (galvanized sheet metal) or ASTM A167, ANSI Type 302/304 (stainless steel sheets) if S.S. ductwork is shown on the Plans. Metal ductwork shall be rigidly constructed and installed. Slip joints shall be in the direction of air flow. All joints shall be sealed tight. Bonding materials for sealing duct system and attaching insulation shall be supplied by manufacture. Ducting shall be United McGill, SMACNA or equal.

Hangers shall be secured to the ceiling or walls and shall be adequate to support ductwork. Where ducts go through walls, there shall be 1/4-inch clearance left and this area shall be sealed tight with compatible mastic and foam rubber and the penetration area covered over with flanges that are secured to the ductwork only. Volume dampers shall be located as shown on the Plans, and at a minimum of one damper for each branch duct installed. Dampers are to be of the same material as the ducts they are installed in. Fire dampers shall be installed in ductwork as directed by the Building Permit or required by the Owner.

Ductwork shall be installed and supported to comply with the requirements and recommendations of Sheet Metal and Air Conditioning Contractors National Association (SMCACNA) HVAC Duct Construction Standards. Sheet metal plenum shall be constructed of not lighter than 18-gauge galvanized steel and reinforced with 1-1/2-inch by 1-1/2-inch by 1/8-inch angles as required to prevent drumming or breathing. Access openings and covers shall be provided for cleaning, wiring and servicing motors, filters, fans and dampers located within or blocked by sheet metal work.

## **2.14 DUCT HANGERS AND SUPPORTS**

Comply with requirements and recommendations of Sheetmetal and Air Conditioning Contractors National Association (SMACNA) HVAC Duct Construction Standards.

Conform to requirements of SMACNA “Seismic Restraint Manual Guidelines for Mechanical Systems.”

Furnish standard and fabricated hangers and supports complete with necessary inserts, bolts, nuts, rods, washers and other accessories.

Hanger straps and rods shall be in accord with SMACNA Duct Construction Standards.

Fasten bracing to ductwork, including riveting, bolting, and tack welding per SMACNA.

Provide galvanized steel band or fabricated angle iron brackets for wall supports, except in wet well area where stainless steel components are required.

A. HANGER RODS

Carbon Steel, with hex nuts and flat washers.

B. CONCRETE INSERTS

1. Continuous channel - Unistrut.
2. Universal, malleable iron - Type 18, FS WW-H-171.

Beam Clamps and Attachments as required.

## **2.15 SEISMIC SUPPORTS**

All HVAC supports, tie rods, bracing, brackets or other types of supports shall be designed in accordance with the current edition of the International Building Code (IBC) and ASCE 7-10. Evaluate the seismic loads in accordance with IBC and Chapter 13 of ASCE 7-10 for the seismic design parameters shown on the Plans.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

All materials shall be installed as shown on the Plans and according to manufacturer's recommendations. Adjust all dampers and louvers to provide tight seal when closed and unobstructed flow when open. Provide all necessary controls, and coordinate all control wiring with Division 16. All installed equipment shall function in manner intended.

The heating/cooling system shall be installed as shown on the Plans and shall be connected to any ductwork with flexible connections. The Contractor shall be responsible for the installation of any condensate drain piping and conduit/wire runs for controllers/thermostats.

## **3.2 TESTING, ADJUSTING AND BALANCING**

### **A. QUALIFICATIONS**

All work shall be performed under the direct supervision of an AABC Certified Test and Balance Engineer. Resumes including education, experience, and certification of each person on the project shall be submitted for review and approval by the Owner. Notify the Owner 10 days prior to testing. The Owner shall witness the testing and balancing.

### **B. INSTRUMENTATION**

All instruments used will be currently calibrated and listed in the TAB report showing instrument description, serial number, and date of calibration.

### **C. AIR BALANCE**

When systems are complete and ready for operation, the TAB Agency will perform a final air balance for all air systems and record the results. The volume of air for the supply, return, exhaust, and outside air equipment and terminals will be tested and balanced within the tolerances of the AABC Standard. The general scope of balancing by the TAB Agency will include, but is not limited to, the following:

#### **1. Fan Speed**

Measure and record RPM at each fan speed.

#### **2. Voltage and Amperage Readings**

Measure and record the final operating amperages and voltage for each motor.

#### **3. Static Pressure Profile**

Static pressure profiles shall be measured and recorded across each supply fan, cooling coil, heating coil, return air fan, air handling unit filter, and exhaust fan, and at the furthest air device or terminal unit from the air handler supplying that device. Static pressure profiles shall also be provided for systems, which do not perform as designed.

4. Equipment Air Flow

Adjust and record exhaust, return, outside, and supply air CFM and temperatures, as applicable, at each fan and coil.

5. Outlet Air Flow

Adjust each exhaust inlet and supply diffuser, register and grille to within the tolerances shown in the AABC Standard. Include all terminal points of air supply and all points of exhaust.

D. REPORTS

The report will contain all required information as described within this specification, including the information formatted and shown in the AABC Standard. Include with the data the date tested, personnel present, records of test instruments used, and a list of all measurements taken. All measurements and recorded readings (of air, water, electricity, etc.) that appear in the reports shall be certified by the Agency's Test and Balance Engineer. Six copies of the final report shall be submitted to the Owner indicating a summary of actual operating data and any abnormal operating conditions.

E. EXECUTION

1. Provide additional dampers, and clean filters as specified herein and shown on the Plans.
2. Put all systems and equipment into operation and continue operation until all adjusting, balancing, testing, demonstrations, instructions, and cleaning of systems have been completed.
3. Do not begin testing and balancing until systems are completed and in good working order.
4. Check motors for proper rotation, coupling and drive alignment, belt tension, and freedom from vibration, etc.
5. Make all changes to drives and dampers as necessary to accomplish specified airflows.

**\*\*\*END OF SECTION\*\*\***

**DIVISION 16**  
**ELECTRICAL**

## SECTION 16050

### BASIC ELECTRICAL MATERIALS AND METHODS

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the requirements and methods for furnishing and installing the basic electrical materials, and other associated items as shown on the Plans, and as further specified herein.

##### 1.2 RELATED WORKS SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
01800	Testing, Commissioning, and Training
02300	Site Earthwork
Division 3	Concrete
09900	Painting
11000	Equipment General Provisions
Division 15	Mechanical
Division 16	Electrical

##### 1.3 DEFINITIONS

###### A. ADJUSTABLE SPEED DRIVE CONTROLLERS

Adjustable speed drives are variable frequency AC drives used to power AC squirrel-cage induction motors at variable frequencies, which relate directly to variable speed. These drives are also commonly known as Variable Frequency Drives (VFDs).

Basic design typically consists of AC to DC conversion followed by AC output wave simulation using pulse-width modulation (PWM). This simulated output power signal will appear to the motor as a representation of an adjustable frequency sine wave. This output may be electrically noisy.

###### B. ANALOG I/O

Analog I/O are PLC input/output electronic signals that are contiguous over time. Analog signals represent a large number of values within a specific range.

C. ATTICS

Attics shall be considered those closed environments between ceilings and roofing that allow full entry of personnel by use of ladders, pull-down stairs, or other special means.

ATTICS are considered dry crawl spaces (see CRAWL SPACES).

Tight spaces between ceilings and roofs that do not allow full entry of personnel are considered concealed areas (see CONCEALED AREAS).

D. CHEMICAL AREAS

Locations where process chemicals are stored or used within a process in either a confined or open manner. Chemical areas may be exposed to chemical solids, liquids, or gases as a result of normal operation, system maintenance, or spills/leaks.

E. CONCEALED AREAS

Locations that are underground, within walls, or within other areas that do not allow full entry of personnel are considered concealed. Concealed areas are not exposed (see EXPOSED AREAS) or accessible (see ATTICS and CRAWL SPACES).

F. CONTROL PANELS

Control Panels shall be defined as enclosures that contain electrical devices capable of controlling, altering, indicating or displaying the function or conditions of electrical circuits. Unlike junction boxes, Control Panels are not just used for the redirection or reconnection of electrical circuits.

G. CONVENIENCE RECEPTACLES

120 Vac general-purpose receptacles that are not dedicated to a specific function or piece of equipment. Receptacles dedicated to computers, heat tracing, fans, louvers, and etc., are not considered convenience receptacles.

H. CRAWL SPACES

Crawl spaces shall be considered those closed environments that are not normally accessible to personnel, but that allow full entry of personnel by special means.



Crawl spaces are considered exposed areas and may be dry or wet (see ATTICS).

I. DAMP AREAS

Damp areas are considered wet (see WET AREAS).

J. DEDICATED RECEPTACLES

Dedicated receptacles are provided for a specific receptacle load such as computers, heat tracing, fans, louvers, metering pumps, sump pumps, and etc. Dedicated receptacles are not intended for general use.

K. DIGITAL I/O

A digital I/O point consists of a single input or output binary bit at one of two possible states, which may be represented as 1's or 0's, ON or OFF, YES or NO, TRUE or FALSE, etc. Digital I/O may also be called "discrete" I/O. Within these specifications, both terms are synonymous.

L. DRY AREAS

Locations not normally subject to dampness or wetness. A location classified as dry may be temporarily subjected to dampness or wetness, as in the case of a building under construction (see FINISHED AREAS).

Rooms containing process water, chemical piping, or related equipment are not considered DRY. Areas that are not considered DRY are considered WET.

M. EXPOSED AREAS

Locations that are visible, outdoors, or exposed to a process or room environment. Exposed areas are not concealed (see CONCEALED AREAS).

N. FINISHED AREAS

Indoor confined areas that are not directly exposed to a process or process chemicals. They typically include closed offices, bathrooms, laboratories, lunch/break rooms, etc. Finished areas are considered DRY.

O. HAZARDOUS AREAS

Class I, Divisions 1, and 2; Class II, Divisions 1 and 2; Class III, Divisions 1 and 2 locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings (reference National Electrical Code, Article 500).

P. HIM

Human Interface Module – A programmable operator interface directly associated with, or integral to, an electrical control device (such as a VFD or Soft Start drive). This interface displays device setpoints and status with a keypad for data entry.

Q. HMI

Human Machine Interface – The way a person interacts with a computer or electronic device. It comprises the screen menus and icons, keyboard shortcuts, command language, and help functions. Peripheral support devices, such as a mouse, keyboard, touch screen, and remote controls are also included. The HMI system is typically PC based, located in an office or lab environment.

R. HOT SPARE

A “Hot Spare” is a PLC analog or digital channel in a PLC card that is powered but the channel is unassigned. Hot spares are connected to fused field I/O terminal block groups per Specification 16940.

S. INDOOR AREAS

Confined locations where the equipment is normally protected from wind, dust, rain, snow, and other natural elements. INDOOR areas are not the same as DRY areas.

T. I/O

Inputs/Outputs – Input and output signals into and out of a PLC or RTU.

U. LEGALLY REQUIRED STANDBY SYSTEMS

Those systems required and so classed as legally required to have standby power by Government requirements.

V. OIU

Operator Interface Unit – A graphical display of industrial plant system variables and status. It may also allow for process control adjustments. Navigation of its programming may be via keypad, touch screen, or a combination of both. An OIU is typically located on a field control panel or control panel in an electrical equipment room.

An Operator Interface Unit is considered a possible extension of a PLC, like an I/O or network card. PLC installations may or may not include an OIU.

W. OUTDOOR AREAS

Locations where the equipment is normally exposed, or partially exposed, to weather in the form of wind, dust, rain, snow, and other natural elements.

X. PROCESS AREAS

Process areas are those areas that are directly exposed to process moisture, or that may be subjected to moisture in the event of a process leak or failure. They typically include pump rooms, chemical rooms, and direct process-exposure areas such as clearwells, open filters, and reservoirs. Process areas are considered WET.

Y. PLC

Programmable Logic Controller – A device used to monitor and control system process. It can be used stand-alone or in conjunction with other systems such as SCADA. It may provide telemetric functions or interface with telemetric equipment.

Z. RTU

Remote Telemetry Unit/Remote Terminal Unit – A device that reads the status of process devices and transmits them to another telemetric unit. RTUs may transmit a command from another source but will not alter or interpret the command. RTUs differ from PLCs in that they do not control a process.

AA. SCADA

Supervisory Control and Data Acquisition (SCADA) systems are data monitoring and control stations that allow operators to visualize and adjust

live process conditions at a centralized HMI. These systems often include process historical data tracking and alarming capabilities. SCADA systems can be used for data monitoring locally, remotely, or both.

BB. SHOP FABRICATED

Manufactured or assembled equipment for which a UL test procedure has not been established.

CC. SOFT START MOTOR CONTROLLERS

See SOLID STATE MOTOR CONTROLLERS in this Section.

DD. SOLID STATE MOTOR CONTROLLERS

Solid State motor controllers provide an electronically controlled acceleration and deceleration of AC squirrel-cage induction motors. Once the motor has reached full speed, the electronics are switched off and replaced with a motor drive contactor that connects the motor directly to line power, thus assuring continuous full voltage to the motor. Solid State motor controllers are also referred to Soft Start motor controllers.

Unlike VFD drives, Solid State motor controllers do not alter the sine wave *frequency* to the motor; instead they alter the portion of the sine wave that reaches the motor. This controls the amount of power sent to the motor and affects the motor's ability to create torque. The electronic Solid State control is only used during acceleration and deceleration. During acceleration the controller switches the waveform from 0 up to 100 percent (full voltage) and during deceleration switches the waveform from 100 down to 0 percent (no voltage).

EE. TELEMETRY

Telemetry is the transfer of data between remote sites. Typical methods of data transfer are utility phone lines, radio transmission, and fiber optics.

FF. VARIABLE FREQUENCY DRIVES (VFDs)

See ADJUSTABLE SPEED CONTROLLERS in this Section.

GG. VIBRATING EQUIPMENT

Equipment that is subject to vibration under normal operating conditions, such as motors, transformers, electrically operated valves, etc.

## HH. WET AREAS

Locations outdoors, underground, directly or indirectly exposed to the process, in concrete slabs or masonry in direct contact with the earth, or in any other way subject to saturation with water or other liquids.

## 1.4 REFERENCES

Unless otherwise noted, the requirements of the following code-making authorities and standard organizations apply:

<u>References</u>	<u>Title</u>
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society of North America
ISA	Instrument Society of America
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NRTL	National Recognized Testing Laboratory
OSHA	Occupational, Health, and Safety Administration
UL	Underwriters Laboratories, Inc.
UL 508	Safety Industrial Control Equipment
UL 698	Industrial Control Equipment for Use in Hazardous Locations
WAC 296-46B	Washington Administrative Code, Electrical Safety Standards, Administration, and Installation

In case of conflict or disagreement between codes, standards, laws, ordinances, rules, regulations, plans, and specifications, the more stringent condition shall govern.

## 1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Prior to submittal of shop plans, coordinate all electrical equipment, particularly motor control equipment, process and control panels, and instrumentation, with related manufacturers and with other applicable equipment and systems specified in other divisions of the Specifications.
- C. Provide submittals in the following manner:
  1. Organize the submittals by CSI code type.

2. Clearly show the Tag Number associated with each submittal within each CSI grouping.
  3. Include non-tagged devices such as grounding systems, conduits, wireway, ductbank details, wire, cable, boxes, fittings, switches and receptacles.
  4. Clearly show the specific part, part number, order code, etc. associated with the device. Use pointers, highlights, circles, etc. to clearly identify the specific part.
  5. Submit on distribution equipment, including but not limited to: Unit substations, Medium voltage switching equipment, motor control centers and control equipment, low voltage switchboards, safety switches, dry-type (specialty) transformers, panelboards, and grounding.
  6. Submit on generators and automatic transfer switches.
  7. Submit on lamps, lighting, site lighting, and wiring devices.
- D. Provide manufacturer's product technical data including, but not limited to:
1. Manufacturer's name, address, and contact number.
  2. Manufacturer's product descriptive bulletin.
  3. Nameplate data, current, voltage, load, impedance, and other electrical data pertinent to the Project and necessary to assure compliance with the Specifications and Plans.
- E. Provide elementary wiring diagrams for the electrical control systems showing the wiring of electrical control items, such as starters, control systems, interlocks, switches, and relays as they apply to this Contract.
- F. Provide schematic interconnection diagrams and/or PID diagrams for each control system and each control panel. Each control diagram shall show a schematic representation of the process equipment and the locations of the switches, meters, automatic valves, indicators, controllers, and recorders. Show correct operating settings and ranges for each control instrument on the diagrams.

- G. Use diagrams and symbols in shop plans, which conform to JIC Electrical Standards for Industrial Equipment and/or NEMA, ICS, ANSI, and IEEE standards, latest revisions. Prepare plans on 22" x 34", or ANSI size A, B, or D in a format similar to the Contract Documents or other nationally recognized drawing standard.
- H. Clearly, indicate on submittals that the equipment or material is NRTL listed or is constructed of listed or recognized components. Where a NRTL standard has not been established, clearly identify that no NRTL standard exists for that equipment.
- I. OPERATION AND MAINTENANCE MANUALS

Reference base requirements in specification 01300.

Manuals for the electrical system shall also include:

1. Manuals for Motor Control Centers. MCC wiring diagrams shall include updated title block showing the date redline field changes were incorporated into the documentation.
2. Manuals for fabricated control panels. Wiring diagrams shall include updated title block showing the date redline field changes were incorporated into the documentation.
3. In each section, compile a spare parts list and supplier index.
4. Assemble records of all tests, measurements, and calibration settings made for each device.
5. The Contractor shall supply three USB copies of the final equipment manuals in a tabbed, searchable, .pdf format, with a table of contents bookmarked to provide a navigation link to each section of the manual(s).

## **1.6 SYSTEM DESCRIPTION**

- A. Provide the labor, materials, and equipment necessary to furnish, install, and place into operation complete power, lighting, control, alarm, communications, and instrumentation electrical system of this Contract as shown on the Plans or Specifications herein.
- B. Provide a functioning system(s) in compliance with manufacturer's instructions, performance requirements as specified or indicated, and

modifications resulting from reviewed shop plans and field coordinated plans.

- C. Provide complete wiring and controls for all equipment specified under other divisions and that comply with Division 16.
  - 1. Connect motors, controls, meters, and any other electrical device installed or provided as part of the project.
- D. Pay and make arrangements for necessary permits, licenses, and inspections.

## **1.7 QUALITY ASSURANCE**

### **A. TESTING AGENCY QUALIFICATIONS**

A “Nationally Recognized Testing Laboratory” (NRTL) recognized and approved by the State of Washington.

- 1. Testing Agency Field Supervision: Use persons currently certified by NETA or the National Institute for Certification in Engineering Technologies, or equal, to supervise onsite testing specified in Part 3.

- B. Comply with NFPA 70 (NEC) for components and installation.

### **C. LISTING AND LABELING**

Provide products specified in this Section that are listed and labeled.

- 1. The Terms “Listed and Labeled:” As defined in the National Electrical Code, Article 100.
- 2. Listing and Labeling Agency Qualifications
  - a. A NRTL recognized and approved by the State of Washington.

## **1.8 DELIVERY, STORAGE AND HANDLING**

Ensure that equipment is not used as steps, ladders, scaffolds, platforms, or for storage – either inside or on top of enclosures. Protect nameplates on electrical equipment from being defaced. Repair or replace damaged, corroded, and rejected items at no additional cost to the Owner.



## **PART 2 PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Refer to individual Division 16 sections.
  - 1. Similar equipment shall be provided by only one manufacturer throughout the project unless otherwise noted in the Specifications.
- B. Submit requests for substitution in accordance with Section 01300.
- C. Trade names and catalog numbers may be used in the Plans or Specifications to establish quality standards and basis of design:
  - 1. Other listed manufacturers in the applicable specification sections with equal equipment may be acceptable.

### **2.2 GENERAL PRODUCT REQUIREMENTS**

- A. Except as otherwise indicated, provide new materials and equipment, which are standard products of manufacturers, regularly engaged in production of such equipment. Provide material or equipment approved and labeled for the purpose for which it is to be used by NRTL or other organizations acceptable to the State of Washington Department of Labor and Industries.
- B. Where voltage, current, power, temperature or other ratings are specified that do not correspond to standard ratings of the manufacturer selected by the Contractor, furnish the next rating level which is more conservative or increases the capacity of the device or material in question.
- C. Furnish materials, devices, and equipment that are non-corrosive or coat them in a manner that renders them non-corrosive and acceptable to the Engineer. Do not provide materials, which contain polychlorinated biphenyls, asbestos, or other hazardous or detrimental materials. Do not install materials in a location or construction manner that produces galvanic action or do not install material combinations with corroding or eroding action.
- D. Where changes in the work, or substitutions in material are proposed, ensure that sizes, weights, openings, etc., are provided that do not require changes in the work outside this Division.
- E. All terminals shall be suitable for 75 degrees C rated copper conductors.

## **2.3 FABRICATION**

- A. When equipment is shop fabricated specifically for this Project, use electrical devices and enclosures, which are NRTL, listed and labeled or recognized.
- B. **SHOP OR FACTORY FINISHES**
  - 1. See Division 11 and Section 09900.
  - 2. Interiors of other painted electrical equipment shall be either white or light gray.
- C. Fabricate equipment or devices in the field equivalent in every respect to manufactured items used for the same purpose. Where cutting, drilling, grinding, etc., is done to galvanize or painted metal, regalvanize, or paint to match original finish.

## **2.4 SUPPORTING DEVICES**

- A. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components.
  - 1. **Material**

Steel, except as otherwise indicated, protected from corrosion with zinc coating, or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.
  - 2. **Metal Items for Use Outdoors or in Damp Locations**

Hot-dip galvanized steel, or stainless steel, except as otherwise indicated.
- B. **ANCHORS**

Galvanized steel in dry areas; stainless steel or hot dipped galvanized steel in wet areas.

  - 1. Lag screws or Type A tapping screws for wood.
  - 2. Rockwell “well-nut” for light loads in masonry.

3. Thru-bolt with fender washers for heavy loads in masonry.
4. Toggle bolts with springhead for hollow partitions.
5. Self-drilling anchors with threaded studs for concrete.
6. Clamps or U-bolts for structural steel.
7. Self-drilling anchors with extension rods for hollow tile over concrete.

C. SHEET-METAL SLEEVES

0.0276 of an inch or heavier galvanized sheet steel, round tube, closed with welded longitudinal joint.

D. PIPE SLEEVES

ASTM A53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

## 2.5 ELECTRICAL IDENTIFICATION

A. MANUFACTURER'S STANDARD PRODUCTS

Where more than one type is listed for a specified application, selection is Installer's option but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and Specifications.

B. COLORED ADHESIVE MARKING TAPE FOR RACEWAYS, WIRES, AND CABLES

Self-adhesive vinyl tape, not less than 3 mils thick by 1 inch wide.

C. UNDERGROUND LINE WARNING TAPE

Provide bright-colored, vinyl tape not less than 3-mils thick by 6-inches wide compounded for direct-burial service with permanent and continuous print.

D. TAPE MARKERS

Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

E. COLOR-CODING CABLE TIES

Type 6/6 nylon, self-locking type. Colors to suit coding scheme.

F. FASTENERS FOR PLASTIC-LAMINATED AND METAL SIGNS

Self-tapping stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

G. FLASH PROTECTION WARNING

Provide Arc Flash Warning Label on all equipment as required by 110.16 NEC (2020). The label is to contain the following text:

WARNING or DANGER  
Arc Flash Hazard!  
Follow requirements in NFPA 70E  
for safe work practices and  
appropriate PPE. Failure to comply  
can result in death or injury.

## 2.6 TOUCHUP PAINT

Use touchup paint on equipment provided by equipment manufacturer and select color to match existing equipment finish.

A. FOR NON-EQUIPMENT SURFACES

Matching type and color of undamaged, existing adjacent finish.

B. FOR GALVANIZED SURFACES

Zinc-rich paint recommended by equipment manufacturer.

## PART 3 EXECUTION

### 3.1 ELECTRICAL SUPPORTING METHODS

A. WET AREAS

1. For pullboxes and equipment vaults, reference Specification Section 16130.
2. For wet areas which are not pullboxes or equipment vaults, hot-dip galvanized materials, stainless steel materials, or nonmetallic,

U-channel system components unless otherwise noted on the Plans.

**B. DRY AREAS**

Hot-dip galvanized materials unless otherwise noted on the Plans.

**C. METHODS**

Support raceway, equipment, and devices from framing members or building structure with sufficient clearance for maintaining and servicing. Provide backing plates, and/or framing material to support equipment, devices, and materials, which are located between the building or facility structure-framing members.

**3.2 RECORDS**

- A. Maintain and annotate on the job at all times a separate set of Record Drawings in accordance with the General Conditions. Show changes from the Contract Documents, routing of hidden raceways, actual fixture and equipment locations, equipment sizes and dimensions and building outline changes. At the end of the Project, provide the Engineer a complete set of Plans marked in red pencil in a manner consistent with the Contract Plans, indicating the changes made on the job.
- B. Record voltage, current, and megohmmeter and ground ohmic resistance test measurements made on the electrical work, the trip units, fuses, and overload relay elements installed in the equipment and the setting of all pressure, flow, level, etc., control devices. When the Project is completed and operating, turn over these records to the Owner.
- C. Equipment and raceways installed under this contract for future work shall be dimensioned on the Record Drawings.

**3.3 COORDINATION**

- A. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations. Obtain approval from structural Engineer for penetration of structural components prior to penetrating the component.
- B. Coordinate installation of supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

- C. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the work. Coordinate installation of large equipment requiring positioning prior to closing in the building.
- D. Coordinate the location of motors, switches, panel connections, and other points of connection with the equipment manufacturers or vendors prior to conduit installation. Route circuits to the actual connection point. Even if removal and reinstallation of building materials is necessary, remove and reinstall conduit, outlet boxes, and other electrical connections, if initial electrical connections are not made to the appropriate equipment location.
- E. Coordinate and schedule connecting electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- F. Coordinate and verify work under Division 16 with work under other Divisions, cooperate in locating equipment to avoid interference with work of others, and plan work to harmonize with the work of other trades so that all work may proceed as expeditiously as possible. Coordinate the installing of built-in work, attaching items to buildings, and cutting and patching. Coordinate connecting electrical circuits to components furnished under other Divisions. (Portions of the electrical design are based upon the equipment specified in other Divisions.) No extras are allowed because of moving work required to avoid interference with work of other Contractors.
- G. Coordinate the interruption of electrical systems to any part of the facility in use by the Owner at least 2 working days before interruption of the system.
- H. Coordinate installing electrical identification after completion of finishing work where identification is applied to field-finished surfaces.
- I. Where changes in the work, or substitutions in material are proposed, ensure that sizes, weights, openings, etc., are provided that do not require changes in the work outside this Division.
- J. Legally required standby system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent devices per NEC 701.18. Do an engineering coordination study of all overcurrent devices and provide copies for review by the Engineer and retention by Owner.

### 3.4 INSTALLATION

#### A. ENCLOSURES FOR USE WITH ELECTRICAL EQUIPMENT

Unless specifically called out otherwise on the Plans, electrical enclosures shall meet the following specification:

1. Dry Areas

NEMA 1.

2. Wet Areas

a. Indoors

NEMA 3R with HVAC equipment.

NEMA 4 where the enclosure will be subjected to splashing water or hose-directed water.

NEMA 12 where the enclosure will not be subjected to splashing water or hose-directed water.

b. Outdoors

NEMA 3R where the enclosure will not be subjected to splashing water, hose-directed water, or windblown dust.

NEMA 4 where the equipment is not HVAC and where the enclosure will be subjected to splashing water, hose-directed water, or windblown dust.

3. Corrosive Locations

NEMA 4X.

4. Exceptions

a. As otherwise indicated on the Plans.

b. As modified in other Division 16 sections.

5. Standards

- a. NEMA ICS-6, Enclosures for Industrial Controls and Systems.
- b. UL 508A, Standard for Industrial Control Panels.
- c. UL 698, Industrial Control Equipment for use in Hazardous Locations.

B. WORKMANSHIP

Install the equipment and materials in a neat and workmanlike manner employing workers skilled in the particular trade and in accordance with the manufacturer's instructions, the National Electric Code, National Electric Safety Code, applicable local regulations, ordinances, and industry standards. A person in charge at the site shall maintain adequate supervision of the work under this division when necessary for coordination with other work.

C. SELF-SUPPORTED EQUIPMENT

Install self-supporting equipment in a level and plumb manner, shimming with full width stainless steel shims, as necessary. Bolt units to the floor with stainless steel expansion anchors and bolts, or weld units to embedded steel channels. Floor or pad shall be level within plus or minus 1/8 of an inch in a square yard before installing equipment. Grout or caulk enclosure to floor or pad. Provide bushings on conduits entering from above or at the side. For conduits entering from below, install grounded insulating bushings bonded to the ground bus or pad.

Install concrete pads and bases according to requirements of Section 03300.

Provide concrete foundations or pads required for electrical equipment as indicated or specified:

1. Floor-mounted equipment shall be mounted on a 4-inch-high concrete housekeeping pad. Pad shall be poured on top of the finished floor or slab.

D. MOUNTING HEIGHT

Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not



indicated. Mount enclosures for individual units at 54 inches above floors to centerline of controls unless otherwise indicated in the Plans.

E. ACCESSIBILITY

Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, while minimizing interference with other installations.

F. EQUIPMENT ORIENTATION

Install items parallel and/or perpendicular to other building systems and components, except where otherwise indicated.

G. EQUIPMENT MOUNTED ENCLOSURES

Attach enclosures mounted on equipment with machine screws or clamps as required. Do not drill equipment frames or sheets without permission of supplier/manufacturer or the Engineer.

Do not mount safety switches and external equipment to other equipment enclosures, unless enclosure mounting surface is properly braced to accept mounting of external equipment.

H. COORDINATION

Give right of way to raceways and piping systems installed at a required slope.

I. WALL MOUNTED ENCLOSURES

Stand equipment off wall surfaces a minimum of 1/4 of an inch where enclosures are mounted on walls in WET AREAS with neoprene or plastic shim washers.

J. MISCELLANEOUS SUPPORTS

Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices, except where components are mounted directly to a structural member of adequate strength.

K. SLEEVES

Install for cable and raceway penetrations of concrete slabs and walls, except where core-drilled holes are used. Install for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

L. FASTENING

Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building structure.

1. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or any other items.
2. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof-test load.

M. FIREPROOFING

1. Do not remove or damage fireproofing materials.
2. Install hangers, inserts, supports, and anchors prior to installation of fireproofing.
3. Repair or replace fireproofing removed or damaged.

N. PENETRATIONS

Make all penetrations of electrical work through walls and roofs water and weather-tight.

O. MISCELLANEOUS REQUIREMENTS

1. Screen or seal all openings into outdoor equipment to prevent the entrance of rodents and insects.
2. Equipment fabricated from aluminum shall not be placed in direct contact with earth or concrete.
3. Do not exceed the dimensions indicated for equipment except as approved in writing by the Engineer.

4. Do not use equipment or arrangements for equipment that reduce the required clearance or exceed the space allocations.

P. DIMENSIONS

Dimensions indicated for electrical equipment and dimensions indicated for the installation of electrical equipment are restrictive dimensions.

1. Field measurements take precedence over dimensioned plans.

### 3.5 IDENTIFICATION

A. LABELS

Install labels where indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment. Conduit labeling is further described in section 16130. The labeling of conductors is further described in section 16120.

B. NOMENCLATURE

Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated on the Contract Documents or required by codes and standards. Use consistent designations throughout the Project.

C. SELF-ADHESIVE IDENTIFICATION PRODUCTS

Clean surfaces of dust, loose material, and oily films before applying.

D. IDENTIFY PATHS OF UNDERGROUND ELECTRICAL LINES

During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above power and communication lines. Where multiple lines installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches, use a single line marker.

E. ENGRAVED, PLASTIC-LAMINATED LABELS, SIGNS, AND INSTRUCTION PLATES

Engraving stock shall be melamine plastic laminate punched for mechanical fasteners with a minimum thickness of 1/16 of an inch for signs up to 20 square inches, and 1/8 of an inch thick for larger sizes. Engraved legend in white letters on black face. Provide nameplates on

equipment enclosures giving the name and circuit identification of the enclosed device/equipment in 1/4 of an inch lettering.

**F. PANELBOARD SCHEDULES**

For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

**G. ARC FLASH HAZARD**

Provide and install warning labels for arc flash hazard on all switchboards, panelboards, control panels, motor control centers, and other equipment per the requirements of the NEC and Washington State Administrative Code (WAC).

**3.6 DEMOLITION**

**A. EQUIPMENT TO BE DEMOLISHED**

Demolish all existing electrical devices and circuits, which are noted for demolition. Demolition includes, but is not limited to:

1. Removing all conduit, conductors, fittings, device boxes, hangers, panels, devices, etc., which are not concealed in the building structure or below grade/slab.

**B. TEMPORARY POWER**

Provide temporary power to existing branch circuit panels, branch circuits, and/or directly to electrical devices as required to keep all portions of the existing facility, which are occupied by the Owner, or required for operation, in operation at all times. Obtain approval by all appropriate code authorities, including the Department of Labor & Industries Electrical Inspection Department, or the local jurisdiction having authority, for any temporary connections required.

**C. DAMAGED ELECTRICAL EQUIPMENT**

Where remaining electrical work is damaged or disturbed in the course of the work, remove damaged portions, and install new products of equal capacity, quality, and functionality.

**D. ABANDONED WORK**

Remove existing conductors from conduits, unless otherwise indicated. Cut and cap buried raceway indicated to be abandoned in place 2 inches below the surface. Cap and patch surface to match existing surface finish.

**E. REMOVAL**

See section 01900.

**F. TEMPORARY DISCONNECTION**

Remove, disconnect, store, clean, reinstall, reconnect, and make operational those components that are indicated for relocation and/or reconnection. Coordinate the process, mechanical, HVAC, and other equipment scheduled to be relocated and/or reused with other Divisions.

**3.7 CUTTING AND PATCHING**

Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for electrical installations. Perform cutting by skilled mechanics of the trades involved.

Repair disturbed surfaces to match adjacent undisturbed surfaces.

**3.8 TOUCHUP PAINTING**

Thoroughly clean damaged areas and provide primer, intermediate, and finish coats to suit the degree of damage at each location.

Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

**3.9 EXTRA MATERIALS**

Extra materials in this Section cover all spare parts for electrical devices under this contract and are centrally listed here for clarification and completeness. Spares shall match products installed, and shall be packaged with protective covering for storage and identified with labels describing the contents within.

A. PANELBOARDS (ASSOCIATED CSI SECTION – 16440)

1. Cabinet Keys

Provide three spares of each type of key for panelboard cabinet locks.

2. Provide a latching plastic container with a printed label adhered to the lid stating “PANELBOARD SPARE KEYS.”

B. CONTROL PANELS (ASSOCIATED CSI SECTION – 16940)

The following quantities cover all control panels fabricated by the fabrication shop (quantities are not per panel).

1. DIN-rail Fused Terminals

Provide five spare DIN-rail fused terminals of each type and rating.

2. DIN-rail Feed-Through Terminals

Provide five spare DIN-rail feed-through terminals of each type, color, and rating.

3. Power Fuses (line power)

Provide three spare power fuses of each type and rating.

4. Control Power Fuses

Provide 10 percent (minimum of two) spare control power fuses of each type and rating.

Provide one control fuse puller.

5. PLC I/O Fuses

Provide 10 percent (minimum of two packets of five fuses each) spare control fuses of each type, voltage, and rating. Fuse ampacity should be clearly shown or marked.

6. PLC Buffer Relays

Provide 10 percent (minimum of four) spare PLC buffer relays of each type, style, and rating.

7. Control and Timing Relays

Provide 10 percent (minimum of four) spare control and timing relays of each type, style, and rating.

8. Control and Timing Relay Sockets

Provide two spare control and timing relay sockets of each type, style, and rating.

9. Intrinsically Safe Barriers

Provide one spare intrinsically safe barrier each type, style, and rating.

10. Ethernet Switches

Provide one spare Ethernet switch of each type.

11. Relay/Solenoid Surge Protective Devices

Provide two spare Metal Oxide Varistors (MOVs) for AC relays and solenoids and two spare diodes for DC relays and solenoids.

12. Provide a single latching plastic container with a printed label adhered to the lid stating "CONTROL PANEL SPARE PARTS."

C. PLC PROCUREMENT (ASSOCIATED CSI SECTION – 16910)

1. Provide 10 percent (minimum of one) boxed spares of each PLC I/O module, communications module, power supply, and CPU module used in this contract.

2. Provide a single latching plastic container with a printed label adhered to the lid stating "PLC SPARE PARTS."

### **3.10 TESTING, THIRD PARTY**

Test electrical equipment before energization and placing into service. Report all test results in writing. Where tests disclose a defect in the work, rework, or repair the work at no additional expense to the Owner and retest to confirm the rework or repair until testing confirms that the defect has been corrected. Test in accordance with the manufacturer's installation and testing instructions and the applicable electrical standards (i.e., NEMA, NFPA, IEEE, ISA, ANSI) for the class of equipment

### **3.11 TESTING NOT REQUIRING THIRD PARTY**

Test electrical equipment before energization and placing into service. Report all test results in writing. Where tests disclose a defect in the work, rework, or repair the work at no additional expense to the Owner and retest to confirm the rework or repair until testing confirms that the defect has been corrected. Test in accordance with the manufacturer's installation and testing instructions and the applicable electrical standards (i.e., NEMA, NFPA, IEEE, ISA, ANSI) for the class of equipment

#### **A. CONDUCTOR MEGGER TEST**

##### **1. Power Conductor Testing**

After pulling and prior to connection perform a Megger test between all power conductors (including the equipment ground) and between each power conductor and earth ground in the following manner:

- a. Perform megger tests at 600 V.
- b. Record ambient temperature and humidity during testing.
- c. Cables or conductors with a steady-state value less than 100 megohms shall be considered "failed".
- d. Failed cables and conductors shall be removed and replaced with new and retested per these specifications.
- e. Provide a Power Conductor Megger Testing Report. A blank copy of this report, specifically associated with this contract, is available from Engineering on request. A copy of these signed test results shall be submitted to the Engineer for approval prior to startup and shall be included in the O&M Manual.



2. Control Conductor Testing
  - a. Control conductor insulation testing is not required.
3. Instrumentation Conductor Testing
  - b. Instrumentation conductor insulation testing is not required.

#### B. CONDUCTOR INSPECTION

On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures
  - a. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.2. Certify compliance with test parameters.
  - b. Remove and replace conductors with visible insulation damage on conductor ends due to installation in an incomplete or damaged conduit system such as, but not limited to, missing bushings or burrs on conduit ends.

#### C. GROUND TEST

Engage an independent electrical testing organization to perform the test below.

1. Subject the completed GROUNDING ELECTRODE SYSTEM to a 3-point fail-of-potential ground test according to IEEE 81. Perform the test not less than 2 full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage, and without chemical treatment or other artificial means of reducing natural ground resistance.

Maximum grounding resistance values shall be as listed below:

- a. Equipment Grounding System: 25 ohms.
- b. Main Service, Grounding Electrode System: 5 ohms.

2. Provide ground test documents signed by the tester and the contractor and issued and approved by the Engineer prior to energizing the power distribution system.

These documents shall clearly show and describe the methods and equipment used in the test and all relevant readings and findings including ground resistance at each test location and observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

These documents shall clearly state whether the system has passed or not passed and show the point(s) where failure occurred. A copy of these signed test results shall be included in the O&M Manual.

3. Where resistance to ground exceeds specified values, notify the Engineer. Check connections of affected equipment and conductors. Replace or repair defective connections or conductors. Provide additional ground rods where the grounding electrode resistance is greater than specified. Revise and repeat testing until resistance is within specifications.
4. These specifications apply to the following Section if it is included in this contract: 16060.

### **3.12 GENERAL TESTING AND INSPECTION**

#### **A. PRIOR TO ENERGIZATION**

1. After installing disconnect switches and circuit breakers, perform visual and mechanical inspection of enclosures and devices.
2. Test the equipment and electrical circuits for proper connection, tightness, and absence of undesirable shorts and grounds.
3. Check for continuity, visual damage, marking, and proper phase sequence.
4. Remove any burrs, filings, or other foreign materials from all enclosures; completely wipe down and vacuum.
5. Run a magnet around the bottom of each enclosure and around surfaces that may have collected metal shavings during manufacturing or construction.

## B. AFTER ENERGIZATION

1. After electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
2. Correct malfunctioning units on site where possible and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.
3. Test operation, calibration, and settings of the meters, relays, and indicating devices.
4. Test all operating controls for proper operation.
5. Test all auxiliary equipment, i.e., heaters, thermostats, lights, all illuminated indicating devices and lamps, and all audible alarm devices which are an integral part of transformers and panels to verify that they function properly.
6. Check fuses with an ohmmeter. Ring out wiring and busing. Check operation of control and safety interlocks. Check grounding of potential transformers, current transformers, and surge protective devices. Check control connections and tightness at terminal blocks, relays, meters, switches, etc. Tug on each connection to verify a tight connection.
7. Check field connections to field devices, PLCs, and motor starters..
8. Verify proper communication reliability and data transfer speed on local networks.
9. Rework or repair equipment, which performs unsatisfactorily during, or as a result of, testing at no additional expense to the Owner.
10. Additional testing requirements specific to other sections are specified in those sections.

### 3.13 TEST DOCUMENTS

Test documents, as described above, shall be signed and submitted to Engineering for review prior to energizing associated electrical circuits.

### **3.14 DEMONSTRATION**

Demonstrate to the Owner that the electrical installation is working by operating all electrical systems and equipment. Simulate control and emergency conditions, artificially where necessary, for complete system tests. Demonstrate equipment in accordance with each section in Division 16.

### **3.15 CLEANING**

Clean dirt and debris from all internal and external surfaces. Vacuum out the interior of electrical panels.

Apply touchup paint as required to repair scratches, etc.

Replace nameplates damaged during installation. Thoroughly vacuum the interior of all enclosures to remove dirt and debris.

**\*\*\* END OF SECTION \*\*\***

## SECTION 16060

### GROUNDING AND BONDING

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes grounding of electrical systems, equipment, and basic requirements for grounding, and protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.

##### 1.2 RELATED WORKS SPECIFIED ELSEWHERE

<u>Sections</u>	<u>Items</u>
01300	Submittals
16050	Basic Electrical Materials and Methods
16120	Conductors and Cables
16130	Raceway and Boxes
WAC 296-46B-250	Grounding and Bonding

##### 1.3 DEFINITIONS

- A. **BONDING JUMPER** (from NEC 2017, Article 100 - Definitions, Bonding Jumper, Main)

The connection between the GROUNDED CIRCUIT CONDUCTOR and the EQUIPMENT GROUNDING CONDUCTOR at the service.

- B. **EQUIPMENT GROUNDING CONDUCTOR** (from NEC 2017, Article 100 - Definitions)

The conductive path installed to connect normally non-current-carrying metal parts of equipment together and to the SYSTEM GROUNDED CONDUCTOR or to the GROUNDING ELECTRODE CONDUCTOR, or both. Code requirements associated with equipment grounding is referenced to NEC 250, Section VI – Equipment Grounding and Equipment Grounding Conductors.

- C. **GROUNDED SERVICE CONDUCTOR**

Also called “utility neutral.” A conductor used to connect the neutral point of the utility transformer to the neutral point of the service entrance.

See SUSE, SYSTEM GROUNDING.

D. GROUNDING ELECTRODE (from NEC 2017, Article 100 - Definitions)

A conducting object through which a direct connection to earth is established.

E. GROUNDING ELECTRODE CONDUCTOR (from NEC 2017, Article 100 - Definitions)

A conductor used to connect the SYSTEM GROUNDED CONDUCTOR or the equipment to a GROUNDING ELECTRODE or to a point on the grounding electrode system.

F. GROUNDING ELECTRODE SYSTEM

See SYSTEM GROUNDING.

G. SUSE

The term SUSE is an acronym for “SUITABLE FOR USE AS SERVICE EQUIPMENT.” It is the point in the electrical grounding system where the SYSTEM GROUNDING CONDUCTORS connect to the EQUIPMENT GROUNDING CONDUCTORS, or the GROUNDED SERVICE CONDUCTOR, or both. For each separately-derived source, this shall occur at the SUSE point. These two points are connected by a BONDING JUMPER.

H. SYSTEM GROUND GRID

The SYSTEM GROUND GRID refers to all portions of SYSTEM GROUNDING. It may be as simple as a pair of ground rods and their associated GROUNDING ELECTRODE CONDUCTORS or a complex ground system with multiple types of GROUNDING ELECTRODES.

I. SYSTEM GROUNDED CONDUCTOR

See GROUNDING ELECTRODE CONDUCTOR.

J. SYSTEM GROUNDING

System Grounding (also referred to as a GROUNDING ELECTRODE SYSTEM) consists of all GROUNDING ELECTRODES, GROUNDING ELECTRODE CONDUCTORS, and associated connecting devices. The GROUNDED SERVICE CONDUCTOR, typically referred to as the

“utility neutral”, is also associated with the system ground. Code requirements associated with system grounding is referenced to NEC 250.50 – Grounding Electrode System.

#### **1.4 SUBMITTALS**

Submit under provisions of Section 01300, and Section 16050.

#### **1.5 QUALITY ASSURANCE**

See Section 16050.

### **PART 2 PRODUCTS**

#### **2.1 GROUNDING AND BONDING PRODUCTS**

Where types, sizes, ratings, and quantities indicated are in excess of National Electrical Code (NEC) requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

#### **2.2 WIRE AND CABLE GROUNDING CONDUCTORS**

Comply with Section 16120.

##### **A. EQUIPMENT GROUNDING CONDUCTORS**

###### **1. Insulated Conductors**

Color coded green, per section 16120.

###### **2. Sized in compliance with NEC Table 250.122 or as shown on the Plans, whichever is larger.**

##### **B. GROUNDING-ELECTRODE CONDUCTORS**

###### **1. Bare Conductors**

Soft drawn stranded copper meeting ASTM B8.

###### **2. Sized in compliance with NEC Table 250.66 or as shown on the Plans, whichever is larger.**

C. **GROUNDING BRAIDS**

1. Copper, manufactured, sized at 26,240 circular mils minimum (#6 AWG equivalent).
2. Certified C22.2, No. 41, Grounding and Bonding Equipment.
3. UL Listings: UL-467 and UL486A.

**2.3 GROUND RODS**

A. **SIZE AND TYPE**

1. Ground rods shall be 3/4-inch diameter by 10-feet long unless otherwise stated on the Plans.
2. Ground rods shall be copperclad steel rods as follows:
  - a. Heavy uniform coating of electrolytic copper molecularly bonded to a rigid steel core.
  - b. Corrosion resistant bonding between the copper and steel.
  - c. Hard drawn for a scar-resistant surface.

**2.4 GROUND ROD BOX**

A. **GROUND ROD BOXES**

1. Ground rod boxes shall be “Fogtite Ground Rod Box” or equal.

B. **GROUND ROD BOX LIDS**

1. Ground rods associated with vaults, pullboxes, or handholes that may be subjected to road traffic or heavy loads shall have their ground box lids match the road rating load value of the associated vaults, pullboxes, or handholes.
2. The minimum ground rod box lid shall be rated H20.



## **2.5 CONNECTOR PRODUCTS**

### **A. COMPRESSION CONNECTORS**

1. Compression type for interior locations:
  - a. Standards: UL 467.
  - b. High copper alloy content.
  - c. Non-reversible.
  - d. Terminals for connections to bus bars shall have two bolt holes.
2. Compression type suitable for direct burial in earth or concrete:
  - a. Standards: UL 467, IEEE 837.
  - b. High copper alloy content.
  - c. Non-reversible.

### **B. BOLTED CLAMPS**

1. Standards: UL 467.
2. High copper alloy content.
3. Heavy-duty type.

## **PART 3 APPLICATION**

There are two types of grounding systems covered in this specification;  
(1) Grounding Electrode Systems and (2) Equipment Grounding Circuits.

1. Grounding Electrode Systems shall comply, as a minimum, to the requirements of NEC Sections 250.50 through 250.104, including Table 250.66, "Grounding Electrode Conductor for Alternating-Current Systems."
2. Equipment Grounding Circuits shall comply, as a minimum, to the requirements of NEC Sections 250.110 through 250.148, including Table 250.122, "Minimum Size Equipment Grounding Conductors for Grounding Raceway and Equipment."

### 3.1 GROUND ROD BOX

The connection of Grounding Electrode Conductors to each ground rod shall be accessible through a ground rod box as described herein.

- A. Each ground rod shall be provided with a separate ground rod box which shall provide access to the ground rod, its Grounding Electrode Conductor, and its associated ground clamp.

**Exceptions:**

- *Unless specifically stated or detailed otherwise on the Plans.*
- *Ground rod boxes shall not be required if the ground rod is exposed in a manhole, handhole, or seal-off vault as described in this specification.*

- B. Each ground rod box shall be mounted flush to grade.

**Exceptions:**

- *Unless specifically stated or detailed otherwise on the Plans.*

### 3.2 GROUNDING ELECTRODE SYSTEMS

Comply with NEC Article 250, Section III for types, sizes, and quantities of Grounding Electrode Conductors, except where specific types, larger sizes, or more conductors than required by NEC are shown on the Plans.

Provide grounding system as shown on the Grounding One Line Diagram of the Plans if provided.

A. GROUNDING ELECTRODE SYSTEM

A GROUNDING ELECTRODE SYSTEM shall have a minimum of two ground rods spaced a minimum of 6 feet apart and connected with Grounding Electrode Conductors as described in this Section.

B. SYSTEM GROUND GRIDS AROUND STRUCTURES WITH CONCRETE FLOORS OR STEM WALLS

A ground grid shall consist of a ring of Grounding Electrode Conductors around a building or structure placed a maximum of 3 feet away from the structure at a minimum depth of 30 inches below grade with its ground

connection established in one of the three following ways: (1) with ground rods; (2) with “concrete-encased electrodes;” or (3) with a combination of both (1) and (2).

When the Plans specifically show, state, or define the method of establishing the SYSTEM GROUND GRID and show the distribution and sizes of the Grounding Electrode Conductors, then these methods shall be followed unless required to be larger by NEC Table 250.66.

When the Plans state that the Contractor may define the method of grounding, then it is left to the Contractor to provide one of the three grounding methods in compliance to NEC and with the approval of the Electrical Engineer and the Electrical L&I Inspector. Regardless of the method used, the Contractor is responsible to provide and meet the testing requirements in QUALITY CONTROL in this Section.

1. Establishing a SYSTEM GROUND GRID with Ground Rod Electrodes
  - a. Ground rods shall be placed at each of the major corners of the structure. If a structure has an irregular shape with corners spaced more than 10 feet apart, than a ground rod shall be placed at that corner.

2. Establishing Ground with “Concrete-Encased Electrodes”

A “concrete-encased electrode” ground system shall be allowed only if the building or structure is provided with a new concrete floor in direct contact with the earth and meets or exceeds the requirements of NEC Section 250.52.

- a. Attach a separate Grounding Electrode Conductor from the SYSTEM GROUND GRID to the foundation rebar in each of the four corners of the building or structure minimum.

#### C. VAULT AND PULLBOX GROUNDING

1. Provide a SYSTEM GROUND GRID around Pullboxes and Equipment Vaults in compliance with ground conductors sized per NEC Table 250.66 unless shown larger on the Plans. The minimum grounding electrode conductor size shall be #6 AWG.
2. Install grounding around and inside the vaults as described in Part 4 herein.

3. Magnetic Flow Meters
  - a. Provide and connect a Grounding Electrode Conductor to the flow meter manufacturer's ground rings as per the manufacturer's recommendations. Provide a #6 AWG ground conductor unless shown otherwise on the Plans.

**Exceptions:**

- *Unless manufacturer provides documentation verifying that ground rings are not required.*

4. Separately Derived Sources
  - a. Ground step-down power transformer secondary neutral "XO" terminals to Grounding Electrode Conductors.
    - i. System Ground Grid
  - b. Ground step-down power transformer secondary neutral "XO" terminals to Grounding Electrode Conductors.

### **3.3 EQUIPMENT GROUNDING**

Comply with NEC Article 250, Section VI for sizes of Equipment Grounding Conductors, except where specific larger sizes are shown on the Cable and Conduit Schedule in the Plans.

#### **A. EQUIPMENT GROUNDING CIRCUITS**

Install insulated Equipment Grounding Conductors with circuit conductors in the manner listed below and in compliance with Code.

1. Service and Feeders.

Bond the Equipment Grounding Conductor to the equipment to which the circuit connects and to the raceway if it is metallic.
2. Single-phase motor or appliance branch circuits.
3. Three-phase motor or appliance branch circuits.
4. Flexible raceway runs.

**B. EQUIPMENT GROUNDING CONDUCTORS**

Equipment Grounding Conductors shall be insulated and color-coded green.

**C. ISOLATED GROUNDING-RECEPTACLE CIRCUITS**

Install a separate insulated Equipment Grounding Conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at the Equipment Grounding Conductor terminal of the applicable derived system or service, except as otherwise indicated.

**D. NONMETALLIC RACEWAYS**

Install an Equipment Grounding Conductor in nonmetallic raceways unless they are designated for telephone or data cables. Bond the conductor at each end to grounded metallic raceway or equipment.

**E. METALLIC RACEWAYS**

Install grounding bushings at the end of each conduit and connect to the equipment ground or GROUNDING ELECTRODE SYSTEM.

**F. WATER HEATER, HEAT-TRACING, AND ANTIFROST HEATER CIRCUITS**

Install a separate Equipment Grounding Conductor to each electric water heater, heat-tracing assembly, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

**G. CONTROL PANELS WITH A PLC**

Provide an insulated Equipment Grounding Conductor from the panelboard ground bus directly to a block of isolated ground terminals in the control panel. These terminals shall not be connected to the control panel's chassis ground. This ground shall be considered "Clean Ground" and shall be dedicated to the termination of instrument cable shields. This "clean" ground shall be #10 AWG minimum.

**3.4 FREE-STANDING ELECTRICAL SUPPORT STRUCTURES**

Metal support structures used to support electrical equipment, devices, cabinets, panels, or enclosures shall be connected to the GROUNDING ELECTRODE SYSTEM by Grounding Electrode Conductors sized as shown on the Plans or per

NEC Table 250.66, whichever is larger. Provide a ground conductor to each vertical support member within 6 inches after rising out of the concrete pad.

### **3.5 METAL FRAME BUILDING AND SIMILAR STRUCTURES**

The metal frame of a building, metal roofs, and other large metal surfaces on buildings shall be bonded to the grounding electrode conductor sized in accordance with NEC Table 250-66. Use a heavy-duty clamp or lug bolted to the metal. Welded metal frame members will be considered to be bonded together. Bolted metal frame members will be considered bonded together under all of the following conditions:

- A. Members are cleaned and a conductive corrosion inhibitor is applied between the mating surfaces.
- B. Bolts are fully torque.
- C. It is proved that from no point on the framework there is more than 5-ohms measured from it to the attachment point of the grounding electrode.

## **PART 4 EXECUTION**

### **4.1 INSTALLATION**

#### **A. GROUNDING ELECTRODE CONDUCTORS IN RACEWAYS**

- 1. **GROUNDING ELECTRODE CONDUCTORS** shall not be installed in metallic raceway. Where required to be in raceway, use PVC-Schedule 80 unless shown otherwise on the Plans. Reference Specification Section 16130.

Ground electrical systems and equipment according to NEC requirements, except where Plans or Specifications exceed NEC requirements.

Coordinate grounding connections made to the water system with the mechanical work and install bonding jumpers wherever deemed necessary.

#### **B. VAULT AND PULLBOX SYSTEM GROUNDING**

- 1. Grounding Outside the Structure
  - a. Provide a minimum of two ground rods, one at each opposite corner, spaced at least 6 feet apart, on the outside of the structure.

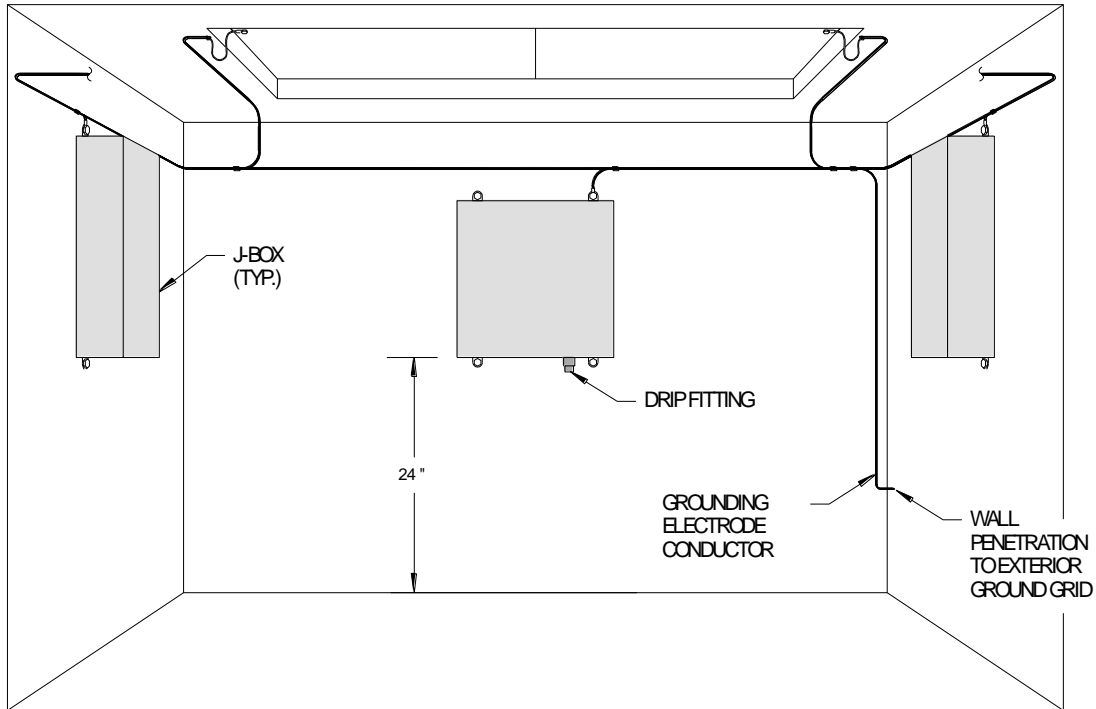
- b. Provide a ground rod box over each ground rod with the same road rating of the pullbox/vault lid.
- c. Space the SYSTEM GROUND GRID a minimum of 12 inches from the edge of the vault.
- d. Connect the vault/pullbox SYSTEM GROUND GRID to the main SYSTEM GROUND GRID with Grounding Electrode Conductor sized per NEC Table 250.66 unless shown larger on the Plans. The minimum conductor size shall be #6 AWG.

## 2. Grounding Inside the Structure

Reference Figure 4.1.B. In this section, the term “vault” shall apply to both pullboxes and equipment vaults.

- a. Provide a Grounding Electrode Conductor into the vault at one of the four corners. Seal the penetration with non-shrink grout.
- b. Continue the Grounding Electrode Conductor up one corner to 3 - 6 inches below the vault ceiling. Loop the Grounding Electrode Conductor around the vault at this height, on all walls containing a junction box, cable tray, ladder, or other metallic equipment, securing to the vault walls each 24 inches with 316L stainless steel clamps, lag bolts, and fasteners.
- c. Extend a Grounding Electrode Conductor to one of the top mounting bolts of each junction box, cable tray, permanent ladder, or other metallic equipment.
- d. For vaults with metallic hatch lids, provide a grounding braid from the Grounding Electrode Conductor to the hatch lid, sized per NEC Table 250.122 minimum. Provide the braid on the hinged side, sufficiently long to allow a complete 180 degree opening of the hatch lid without tension on the braid. For vaults with dual lids, connect grounding braids to both hinged sides.
- e. Ground hydraulic piping near its points of entry into, and exit out of, the vault.

- f. Ground manufacturer's instrumentation devices inside the vault per the manufacturer's recommendations.



**Figure 4.1.B**

### **Vault and Pullbox Internal Grounding**

## **4.2 CONNECTIONS**

### **A. GENERAL**

Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to assure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to the contact surfaces.



**B. EQUIPMENT GROUNDING-WIRE TERMINATIONS**

Make the grounding conductor connections to motors or equipment 10 hp and above or 20 amperes and above, with conductor termination and a 5/16 of an inch minimum bolt tapped to the motor frame or equipment housing. Ground connection to smaller motors and equipment may be made by fastening the conductor termination to a connection box.

**C. METAL RACEWAY TERMINATIONS**

Where metallic raceways terminate at metallic or non-metallic enclosures, panels, or housings, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors, except as otherwise indicated.

**D. CONNECTION TORQUE**

Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486A and UL 486B.

**E. COMPRESSION-TYPE CONNECTIONS**

Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

**4.3 QUALITY CONTROL**

**A. TESTS**

1. Provide ground testing per Specification 16050, Section 3.

**\*\*\* END OF SECTION \*\*\***

## SECTION 16120

### CONDUCTORS AND CABLES

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes building wires, cables, and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

##### 1.2 RELATED WORKS SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
16050	Basic Electrical Materials and Methods
RCW 19.28.261	Revised Code of Washington, Exemptions from RCW 19.28.161 through RCW 19.28.271
16940	Control Panels

##### 1.3 SUBMITTALS

See Section 01300.

Indicate Field Test Reports and interpret their results for compliance with performance requirements.

##### 1.4 QUALITY ASSURANCE

See Section 16050.

#### PART 2 PRODUCTS

##### 2.1 BUILDING WIRES AND CABLES

###### A. STRANDING

1. All power, control, and instrumentation conductors larger than #20 AWG shall be stranded.
2. All equipment ground conductors larger than #16 AWG shall be stranded.
3. All grounding electrode conductors larger than #10 AWG shall be stranded.

B. POWER AND CONTROL WIRE

All power and control wire and conductors in raceways shall be rated 600 VAC.

1. XHHW, XHHW-2

a. Conductor

Class B, stranded, annealed, uncoated copper. Conductors shall comply with:

- i. UL Standard 44.
- ii. ASTM-B3, ASTM-B8, and ASTM-B7B8.

b. Insulation

Cross-Linked Polyethylene (XLP) High Heat Water Resistant. Insulation shall comply with:

- i. UL-83 Thermoplastic-Insulated Wires and Cables.
- ii. UL-1063 Machine-Tool Wires and Cables.

c. The cable shall meet the following Standards and Agency approvals:

- i. NEMA WC70/ICEA S-95-658.
- ii. ASTM Stranding Class B3, B8, B7B8
- iii. Federal Specification A-A-59544

2. THHN, THWN, THHN/THWN-2

a. Conductor

Copper, annealed, uncoated. Conductors shall comply with:

- i. ASTM-B3, ASTM-B8, and ASTM-B7B8.

- b. Insulation  
  
Polyvinyl Chloride (PVC), Nylon jacket. Insulation shall comply with:
    - i. UL-83 Thermoplastic-Insulated Wires and Cables.
    - ii. UL-1063 Machine-Tool Wires and Cables.
  - c. The cable shall meet the following Standards and Agency approvals:
    - i. NEMA WC70/ICEA S-95-658.
3. MTW (Machine Tool Wiring)
- a. Conductor  
  
Copper, annealed, uncoated. Conductors shall comply with:
    - i. ASTM-B3, ASTM-B8, and ASTM-B7B8.
  - b. Insulation  
  
Polyvinyl Chloride (PVC). Insulation shall comply with:
    - i. UL-83 Thermoplastic-Insulated Wires and Cables.
    - ii. UL-1063 Machine-Tool Wires and Cables.
  - c. The cable shall meet the following Standards and Agency approvals:
    - i. NEMA WC70/ICEA S-95-658.
    - ii. UL Standard UL 83, UL 1063, UL 758 cUL file: E156879 and E123744
    - iii. AWM Specification 1316, 1317, 1318, 1319, 1320, 1321
    - iv. ASTM Stranding Class B3, B8, B7B8
    - v. Federal Specification A-A-59544

- vi. CSA 22.2 No. 75, UL E156879 and E123744

#### 4. VFD CABLES

The VFD cables shall be 3-conductor with 3 bare copper symmetrical ground wires in XLPE insulation, dual 100 percent copper tape shielding, UL rated at 1,000 V, direct burial, 90C, wet/dry rated, in a sunlight- and oil-resistant PVC jacket (Beldon Series 295xx, or equivalent).

- a. Conductor: Copper, tinned.
- b. Insulation: XHHW-2 or RHW-2 rated.
- c. The cable shall meet the following certifications:
  - i. Mine Safety & Health Administration (MSHA) standards.
  - ii. Suitable for use in Class I & II; Division 2 hazardous locations.
- d. The cable shall meet the following Standards and Agency approvals:
  - i. 1000 V UL 1277, Type TC-ER
  - ii. 1000 V CSA AWM I/II, A/B FT4

#### C. INSTRUMENTATION, COMMUNICATION, AND NETWORKING CABLES

All instrumentation, communication, and networking cables and conductors in raceway shall be rated 600 VAC.

##### **Exceptions:**

- *Telephone cables.*
- *Antenna cables.*
- *Fiber optic cables.*

1. Analog Instrument Cables

Paired and triad analog instrument cables shall be #18 AWG stranded tinned copper 600 V tray cable, rated for wet applications at 75 degrees C in a sunlight resistant PVC jacket. Cables shall be plenum and direct burial rated, and shall be provided with individual pair/triad isolated 100 percent foil shields with independent drain wires and an overall isolated shield with drain wire.

These cables shall also be used for totalizing pulse signals from flow meters.

The following cables shall be used for multiple conductor applications:

- a. 2-Conductor, 1 twisted pair, 100 percent overall shield. Belden #9341 or #1120A or equivalent.
- b. 3-Conductor, 1 twisted triad, 100 percent overall shield. Belden #1121A or equivalent.
- c. 4-Conductor, 2 twisted pairs, 100 percent individual shields plus 100 percent overall shield. Belden #1048A or equivalent.

2. Ethernet Copper Cables

Ethernet cables shall be 600 V, bonded pair, shielded.

- a. Enhanced Category 6 (6e).
  - i. 600 V, polypropylene insulation, with inner PVC jacket and Industrial Grade, Sunlight and Oil Resistant, Black, PVC outer jacket.
  - ii. 8-Conductor, 4 twisted bonded pairs, #23 AWG, solid bare copper, 100% overall foil shield.
  - iii. 19.8 dB attenuation per 100 meters at 100 MHz.
  - iv. Belden #7953A or equivalent.

- b. Enhanced Category 5 (5e).
  - i. 600 V, polyolefin insulation, with inner PVC jacket and Industrial Grade, Sunlight and Oil Resistant, Black, PVC outer jacket.
  - ii. 8-Conductor, 4 twisted bonded pairs, #24 AWG, solid bare copper, 100 percent overall foil shield plus 70 percent overall braided tinned copper shield.
  - iii. 22.0 dB attenuation per 100 meters at 100 MHz.
  - iv. Beldon #7957A or equivalent.

3. Enhanced Category 5 (5e) and 6 (6e) RJ45 cable plugs

RJ45 cable plug connectors shall be 8-wire, 10 – 10000 Mbit/sec with metal housing and FC connection technology.



Siemens P/N 6GK1901-1BB12-2AA0 or equal.

4. DeviceNet Cables

DeviceNet cables shall be 2x #16 AWG Power Pair plus 2x #18 AWG data pair, stranded copper, 600 V, 75 C, 100 percent individual shield plus 65 percent overall braided shield.

- a. 600 V, 75 C, Gray Sunlight/Oil-Resistant PVC jacket.

- b. 2-Conductor, 1 twisted pair, #16 AWG, PVC-Nylon insulated, stranded copper power conductors with 100% foil shield with common foil drain wire.
- c. 2-Conductor, 1 twisted pair, #18 AWG, F-R Polypropylene insulated, stranded copper data conductors with 100% foil shield with common foil drain wire.
- d. 65 percent tinned copper overall braided shield.
- e. Beldon #7896A or equivalent.

5. Profibus Cables

Profibus cables shall be #22 AWG, solid bare copper, 600 V, FHDPE insulation, 100 percent foil shield plus a 65 percent tinned copper braid shield, in a sunlight resistant PVC jacket.

Profibus cables shall comply with:

EU Directive 2000/53/EC (ELV),  
 EU Directive 2002/95/EC (RoHS),  
 EU Directive 2002/96/EC (WEEC),  
 EU Directive 2003/11/EC (BFR),  
 CA Prop 65

- a. 600 V, 75 C, Cellular Polyolefin Insulation, Violet jacket.
- b. 100 percent overall foil shield with drain wire plus 65 percent tinned copper braided shield.
- c. 2-Conductor, 1 twisted pair, #22 AWG, solid bare copper.
- d. Beldon #3079A or equivalent.

6. Fiber Optic Cables

Fiber cables shall comply with:

EU Directive 2000/53/EC (ELV),  
 EU Directive 2002/95/EC (RoHS),  
 EU Directive 2002/96/EC (WEEC),  
 EU Directive 2003/11/EC (BFR),  
 CA Prop 65



a. Single Mode Cables

Single mode fiber optic cables shall be loose tube, buffered, outside and riser rated, suitable for underground conduit, maximum attenuation at 1310 nm = 0.5 dB/km, maximum attenuation at 1550 nm = 0.5 dB/km.

6-Strand: Belden #B9W510T or equivalent.

12-Strand: Belden #B9W511T or equivalent.

b. Multi-Mode Cables

Multi-mode fiber optic cables shall be loose tube, buffered, outside and riser rated, suitable for underground conduit. Maximum attenuation at 850 nm = 3.5 dB/km, maximum attenuation at 1310 nm = 1.2 dB/km.

i. 62.5  $\mu\text{m}$  (OM1):

6-Strand: Belden #B9B510T or equivalent.

12-Strand: Belden #B9B511T or equivalent.

ii. 50  $\mu\text{m}$  (OM2):

6-Strand: Belden #B9A510T or equivalent.

12-Strand: Belden #B9A511T or equivalent.

D. CONTROL AND POWER CABLE/CORDS

1. HVAC Cables

HVAC cables shall only be used as control cables between HVAC equipment and thermostats or other controlling devices.

a. 4-Conductor, #16 AWG, stranded, 600V, tinned copper, cabled, PVC insulation, and PVC jacket. Belden #8620 or equivalent.

b. 5-Conductor, #16 AWG, stranded, 600V, tinned copper, cabled, PVC insulation, and PVC jacket. Belden #9620 or equivalent.

- c. 9-Conductor, #16 AWG, stranded, 600V, tinned copper, cabled, PVC insulation, and PVC jacket. Beldon #9621 or equivalent.
  - d. 12-Conductor, #16 AWG, stranded, 600V, tinned copper, cabled, PVC insulation, and PVC jacket. Beldon #8622 or equivalent.
- 2. Power Cords
    - a. Type SO, 600 Vac, size #14 or larger.
  - 3. Specialty Wire

As shown specifically on the Plans.

#### E. CONTROL AND INSTRUMENTATION CABLE CONNECTORS

##### 1. Open Cable to Enclosure Connectors

Open cable to enclosure connectors for interior and exterior applications shall be 316 stainless steel control receptacle cord connector sets: Panel Receptacle = Turck #P-RKV series; field cable termination plug = Turck #P-RSV series. Provide separate pins for each cable shield.

## 2.2 SPLICES, TAPS AND TERMINAL BLOCKS

Splices are only allowed under the conditions of Section 4.2.E.

#### A. SPLICES TO POWER CONDUCTORS

- 1. Splices in Outdoor Areas, Handholes, Vaults, or Direct Buried
  - a. For inline butt splices, use inline resin splice kits for non-shielded cables, 600 V; 3M Scotchcast 82-A series or equal. UL listed 486D.
  - b. For odd-shaped and odd sized splices, use multi-mold resin splice kits for non-shielded cables, 600 V; 3M Scotchcast 85-14CP or equal. UL listed 486D

2. Indoor Splices and Taps for Receptacles and Lighting
  - a. Use quick spin, wing torque Electrical Spring and Grounding Connectors; 3M 312, 412, 512, and 512G or equal.
3. Motor Lead Connectors
  - a. Motor terminal connectors shall be insulated multiple tap connectors rated for 600 Vac; N.S.I. Polaris or equal.
4. Power Terminal Blocks
  - a. All power terminals shall be 600 Vac, suitable for 75 degrees C rated copper conductor.
  - b. Power terminal blocks may be copper or aluminum and shall have a short circuit current withstand rating following the guidelines described in UL 1059 and shall meet or exceed the available bolted fault current at the point of application.

## B. SPLICES TO CONTROL CONDUCTORS

### 1. In Junction Boxes and Handholes

Splices to control conductors in junction boxes and handholes shall be made with 600 V, UL486D certified, water-proof direct bury connectors with strain relief, pre-filled with waterproof and corrosion-proof, non-hardening, silicone dielectric sealant; DRYCONN DBSR Series or equal.

### 2. In Pull Boxes

- a. For inline butt splices, use inline resin splice kits for non-shielded cables, 600 V; 3M Scotchcast 82-A series or equal. UL listed 486D.
- b. For odd-shaped and odd sized splices, use multi-mold resin splice kits for non-shielded cables, 600 V; 3M Scotchcast 85-14CP or equal. UL listed 486D.

### 3. Terminal Blocks in Panels

Reference Specification 16940 for terminations in Control Panels.

**C. SPLICES TO INSTRUMENTATION CABLES AND CONDUCTORS**

**1. In Junction Boxes**

Strip back the cable outer sheath exposing cable conductors and shield lengths to 1-inch or less. Twist the wires together and solder. Insert and engage into 600 V, UL486D certified, water-proof connectors, pre-filled with waterproof and corrosion-proof, non-hardening, silicone dielectric sealant; DRYCONN Aqua Series or equal.

**2. In Pull Boxes and Handholes**

Instrument cables and conductors are always passed through a junction box inside pull boxes and handholes. Reference “In Junction Boxes” (above) and Specification 16130, Section 4.

**3. Terminal Blocks in Panels**

Reference Specification 16940 for terminations in Control Panels.

**2.3 INSULATING MATERIALS**

**A. ELECTRICAL INSULATION PUTTY**

Scotchfill, or equal.

**B. INSULATING ELECTRICAL TAPE**

7 Mil/0.18 mm Plasticized PVC, rubber-based adhesive, 200 percent elongation, 26 N/cm tensile strength, 8 kV breakdown voltage, meeting CE, CSA, UL certifications.

**C. CONDUCTOR COLOR-MARKING TAPE**

7 Mil/0.18 mm Plasticized PVC, rubber-based adhesive, 200 percent elongation, 26 N/cm tensile strength, 8 kV breakdown voltage, meeting CE, CSA, UL certifications, in required color.

**D. ELECTRICAL HEAT SHRINK TUBING**

Heat shrink tubing shall be dual-wall polyolefin, 3-1 shrink ratio, 600 Vac, -55 to 110 degrees C operating range meeting UL 224 600V, 125 degrees C.

## PART 3 APPLICATIONS

### 3.1 WIRE APPLICATIONS

#### A. CABLE AND CONDUIT SCHEDULE

The Cable and Conduit Schedule shall be considered absolute. No changes to wire sizes, wire count, insulation type, or circuit type shall be allowed without approval from the Engineer.

#### B. WIRES IN RACEWAYS

Wires installed in raceways shall be considered "FIELD" wiring and shall be installed and terminated by qualified and licensed electrical contractors.

##### **Exceptions:**

- *Installation and termination may be by the owner under the provisions of "RCW 19.28.261, Exemptions from RCW 19.28.161 through RCW 19.28.271."*
- *If the raceway is installed inside a control panel fabricated by a certified UL 508 shop, then these wires may be installed and terminated per the provisions of WIRES IN CONTROL PANELS as listed below.*

##### 1. Power Wire

###### a. Insulation

All service, feeder, and branch circuit conductors shall be XHHW-2.

##### **Exceptions:**

- *Unless called out otherwise in the Cable and Conduit Schedule.*
- *Unless approved in writing by the Electrical Engineer.*
- *Unless both ends of wire are installed in the same control panel.*

2. Class 1 and 2 Control Wire

a. Insulation

All control circuits in raceways shall be XHHW-2.

**Exceptions:**

- *Unless called out otherwise in the Cable and Conduit Schedule.*
- *Unless approved in writing by the Electrical Engineer.*

b. Minimum control wire size in conduits and raceways

The minimum control wire size in conduits and raceways shall be #14 AWG.

C. WIRES IN CONTROL PANELS

Wires in control panels are those that are terminated within a control panel, and do not extend beyond the control panel enclosure. Wires that extend beyond the control panel enclosure shall be installed and terminated per the provisions of “WIRES IN RACEWAYS,” above.

1. Control Panel Power and Control Wire

a. Insulation

Power and control conductors in control panels shall be MTW or THHN/THHN-2.

b. Wires shall have the following minimum sizes and colors:

<b>Circuit Type</b>	<b>Wire Size<sup>(1)</sup></b>	<b>Wire Color</b>
<b>120 VAC Power Circuits</b>		
120 VAC, Line	#14 AWG	Black
120 VAC, Neutral	#14 AWG	White
120 VAC, Equipment Ground	#14 AWG	Green
<b>120 VAC Control Circuits</b>		
120 VAC, Line	#18 AWG	Black
120 VAC, Neutral	#18 AWG	White

<b>Circuit Type</b>	<b>Wire Size<sup>(1)</sup></b>	<b>Wire Color</b>
<b>Low-Voltage AC Control Circuits</b>		
Low-Voltage, Line	#18 AWG	Red
Low-Voltage, Neutral	#18 AWG	White
<b>24 VDC Power Circuits</b>		
+24 VDC Power	#14 AWG	Blue
24 VDC Common	#14 AWG	White with Blue stripe
24 VDC Equipment Ground	#14 AWG	Green
Isolated (Shield) Ground	#12 AWG	Yellow with Green stripe <sup>(2)</sup>
<b>24 VDC Control Circuits</b>		
+24 VDC Control	#18 AWG	Blue
24 VDC Common	#18 AWG	White with Blue stripe
<b>PLC I/O Circuits</b>		
DC I/O	#18 AWG <sup>(3)</sup>	Yellow
DC I/O Common	#18 AWG	White with Yellow stripe
Analog Inputs	#18 AWG	Analog Instrument Cable <sup>(4)</sup>
Analog Outputs	#18 AWG	Analog Instrument Cable

Notes:

- (1) Wire sizes are minimums; size wires to comply with NEC and UL 508.
- (2) Isolated (Shield) ground wires shall be of a color scheme that is approved for ground wires but distinct from equipment grounds.
- (3) For PLC digital outputs, conductors may be #18 AWG between the PLC output terminal and the buffer relay coil when fused at not more than 5A. Wiring from the buffer relay output contacts to field terminals shall be #14 AWG minimum. For retrofit panels without buffer relays, digital output wiring shall be #14 AWG.
- (4) Contractor shall provide one of the Analog Instrument Cables described in the "PRODUCTS" section of this specification.

2. Where panels are required to be manufactured and certified to a particular standard (such as UL 508A), the contractor shall substitute wire colors where required to meet the standard.

**D. CONDUCTORS DIRECT BURIED**

Refer to the Plans for specifications regarding directly buried conductors and cables.

E. POWER CORDS

SO power cords shall be allowed in control panels for circuits not greater than 120 Vac or 48 Vdc. Such applications require installation by a UL 508 shop.

F. SPECIALTY WIRE

Refer to the Plans for specifications regarding “Specialty Wire”.

## **PART 4 EXECUTION**

### **4.1 EXAMINATION**

Examine raceways and surfaces receiving wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **4.2 INSTALLATION**

A. GENERAL INSTALLATION METHODS

1. Install wires and cables in raceway system, according to manufacturer’s written instructions and NECA’s “Standard of Installation,” after raceway system is complete.
2. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A and UL 486B.
3. Install cables and conductors neatly in all enclosures. Bend or form wires in neat runs from conduits to terminals. Arrange wires so that they may be grouped by conduit or function in the enclosure. Install cable ties and straps to support and bundle wires in enclosures. Arrange wires to allow wire tags and numbers to be easily read without bending or flexing wiring.
4. Leave 6 inches or more of free conductor at each connected device or equipment terminal and 9 inches of free conductor at each unconnected outlet. Tape free ends of conductors at unconnected outlets and coil neatly in outlet box.



5. Install wiring to equipment neutral and grounding blocks on the bottom or furthest back row first. Leave unconnected blocks accessible for future neutral or grounding connections.
6. Provide individual neutral conductors for each associated circuit. Common neutral conductors for multi branch circuits are not permitted.
7. All power distribution raceways shall contain at least one continuous copper grounding conductor with a minimum size as per NEC 250.122. Larger sizes shall be used if identified in the Cable and Conduit Schedule on the Plans.

#### B. CONDUCTORS SHARING RACEWAYS

1. Power conductors shall not be run in the same raceway with control conductors.

**Exception:**

- *Unless specifically shown otherwise in the Cable and Conduit Schedule.*

2. Power conductors shall not be run in the same conduit or raceway with instrumentation cables/conductors.
3. Control conductors shall not be run in the same conduit or raceway with instrumentation cables/conductors.

**Exception:**

- *Unless specifically shown otherwise in the Cable and Conduit Schedule.*

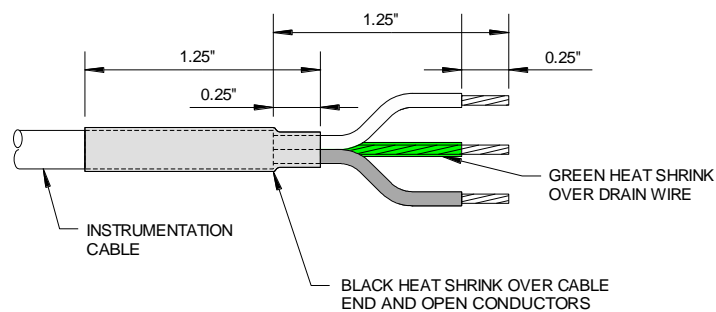
#### C. CONDUCTORS IN CONTROL PANELS

1. Control Panel Instrumentation (Signal) Wiring
  - a. Signal cables between analog input and output field terminals and a PLC shall be connected to the field terminals as shown in Specification 16940.
  - b. All cables shields shall be terminated at the field terminal end. Connections to the PLC analog input and output terminals shall not land the shield.

- c. Signal cable conductors and their shields/drains shall not be separated greater than as described below.
2. Control Panel Communication and Networking Wiring
- a. All communication and networking cables inside control panels shall have their ends made up with terminal connectors. No cables shall be left open-ended.
  - b. Cables shall be routed inside Panduit™ or neatly tied to other conductor bundles.

D. INSTRUMENTATION (SIGNAL) CABLES

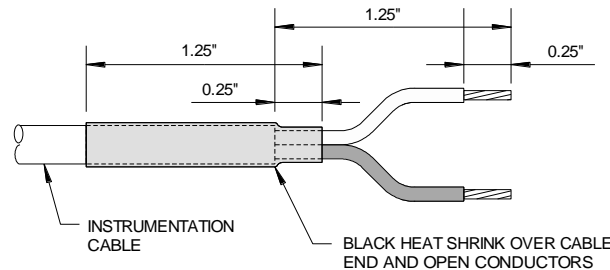
1. Preparing the Shielded End



- a. Neatly trim the end of the cable.
- b. Strip back 1.25 inch of the outer jacket taking care not to cut into the conductor insulation.
- c. Neatly trim the foil back to the edge of the outer jacket taking care not to damage the drain wire.
- d. For signal cables with a braided shield over a foil shield, carefully cut the braid back to the edge of the outer jacket.
- e. Provide a green heat shrink tube over the drain wire, leaving 0.25 inch of exposed conductor.
- f. Provide a 1.25-inch black heat shrink over the jacket, covering 0.25 inch of the exposed conductors. This properly insulates and protects the ends of the shields and the outer jacket.

- g. Strip the signal conductors exposing 0.25 inch of conductor.

## 2. Preparing the Unshielded End



- a. Neatly trim the end of the cable.
- b. Strip back 1.25 inch of the outer jacket taking care not to cut into the signal conductor insulation.
- c. Neatly trim the foil back to the edge of the outer jacket.
- d. Cut the drain wire at the edge of the outer jacket taking care not to damage the signal conductor insulation.
- e. For signal cables with a braided shield over a foil shield, carefully cut the braid back to the edge of the outer jacket.
- f. Provide a 1.25-inch black heat shrink over the jacket, covering 0.25 inch of the exposed conductors. This properly insulates and protects the ends of the shields and the outer jacket.
- g. Strip the signal conductors exposing 0.25 inch of conductor.

## E. SPLICING CONDUCTORS

1. Install service, feeder, and motor circuits continuous without splices from equipment terminal to equipment terminal or motor lead.

### Exceptions:

- *Service entry feeders at weatherheads.*

- *Branch circuits at taps for convenience receptacles and lighting.*
  - *As specifically called out.*
  - *With written permission from the Engineer.*
2. Install instrumentation and control circuits continuous without splices or terminations from source equipment terminal to destination equipment terminal.

**Exceptions:**

- *On terminal strips in control panels.*
  - *On terminal strips in termination panels.*
  - *As specifically called out.*
  - *With written permission from the Engineer.*
3. Where splicing is allowed, or specifically called out, install in the following manner:

- a. Splicing Inside Vaults, Handholes, Outdoor J-Boxes, or J-Boxes in Wet Areas

Power and control conductors shall be spliced per Section 2.2.A. Provide a minimum of 24 inches of length on both wires for future re-splicing.

- b. Splicing Inside Motor J-Boxes

Power connections inside motor j-boxes shall be made using insulated multiple tap connectors rated for 600 Vac; N.I.S. Polaris or equal. Cover the splice with a minimum of three layers of black insulating electrical tape. Provide a single band with a minimum of two wraps of the appropriate phase color tape to the entry T-lead. Bend the connections away from the sides of the j-box and motor frame to prevent abrasion from motor vibration.

Control connections inside motor j-boxes shall be made with crimped butt-splices with heat shrink covers. The heat shrink shall overlap the butt barrel ends by a minimum of

1/2 inch on each side. Cover the splice with a minimum of three layers of black insulating electrical tape.

c. Splicing in J-Boxes and Control Panels Mounted Indoors in Dry Rooms

i. Conductors size #12 AWG through #6 AWG:

For conductors less than #6 AWG, provide crimped butt-splice with heat shrink cover. The heat shrink shall overlap the butt barrel ends by a minimum of 1/2 inch. Cover the splice with a minimum of three layers of black electrical tape. Provide a 2-wrap (minimum) single band of the appropriate phase color tape.

**Exception:**

- *For receptacles and lighting, reference Section 2.2.B.*

ii. Conductors size #4 AWG and larger:

(1) Terminal Connectors

For conductors larger than #6 AWG, connections shall be made using insulated multiple tap connectors rated for 600 Vac; N.S.I. Polaris or equal.

Cover the splice with a minimum of three (3) layers of black electrical tape. Provide a 2-wrap (minimum) single band of the appropriate conductor color tape.

(2) Terminal Blocks

All power terminals shall be 600 Vac, suitable for 75 degrees C rated copper conductor.

Connect using properly sized terminal blocks.

**Exception:**

- *If splices are allowed by the Engineer, then use plated copper alloy compression splicing sleeves installed by high-pressure compression tools and insulated with heat shrink Raychem sleeves.*

F. REPLACING FAULTY CONDUCTORS

When replacing a faulty conductor or cable that shares a raceway with other conductors or cables, all conductors and cables must be removed and replaced with new.

**Exceptions:**

- *If the raceway is straight and without bends or offsets and its length is less than 30 feet, and the conductors are not bound together in the raceway, then only the faulty cable must be pulled and replaced with new. A manufacturer-approved pulling compound or lubricant must be used to minimize degradation to the remaining conductors. The contractor is responsible for the integrity of the remaining conductors.*
- *With specific approval by the Engineer.*

G. CONDUCTOR LABELLING

All conductors shall be labeled in the following manner.

**Exceptions:**

- *Conductors supplying power to lighting and convenience receptacles.*
- *Non-insulated ground conductors.*
- *At each motor tag for winding lead numbers. Make all phase rotation changes for motor direction changes at the motor to maintain correct color phase sequence in equipment.*
- *In each enclosure or box where more than one ungrounded power conductor is spliced or connected, tag for panelboard identification and pole number (reference Section 3.3C.).*



2. Do not use white, gray, green, or green with yellow stripes color for any power, lighting, or control conductor not intended for neutral or equipment grounding purposes.

**Exception:**

- *Instrumentation and control multi-conductor cables may use white, gray, or green singly or as part of a trace color in addition to the base color.*

3. Equipment grounding conductors: Green or green with yellow stripes.

4. 480/277 volt, 3-phase systems:

Phase A	Phase B	Phase C	Neutral
Brown	Orange	Yellow	Gray

5. 208/120 or 240/120 volt, 3-phase systems:

Phase A	Phase B	Phase C	Neutral
Black	Red	Blue	White

6. 240/120 volt, single phase systems:

Phase A	Phase B	Neutral
Black	Red	White

7. Use wire with insulation of required color for conductors of #6 AWG and smaller. For wire larger than #6 AWG, where not available in specified colors, use conductor color marking tape per Section 2.3.C. When conductors are marked in this manner, mark each conductor at all accessible locations such as panelboards, junction boxes, pullboxes, auxiliary gutters, outlets, switches, and control centers.
8. Connect power conductors of the same color to the same phase throughout the installation. Viewing all equipment from the front, make connections so phase color sequence is in the same order as that for panelboards, switchboards, motor control centers, etc.



## I. PULLING CONDUCTORS

### 1. Instrumentation, Communication, Networking, and Fiber Cables

Make all cable pulls by hand using a manufacturer-approved pulling compound or lubricant where necessary.

### 2. Power and Control Conductors

- a. Make all cable pulls by hand where possible. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, or wrapping extra conductor into an eye, that will not damage cables or raceway.
- b. On mechanically-assisted pulls use a manufacturer-approved pulling compound or lubricant where necessary. The compound used must not deteriorate the conductors or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values. Install pullboxes where necessary to prevent exceeding manufacturer's recommendations.

### 3. Cut cable or conductor ends off after pulling and clean all pulling compound from exposed conductors before terminating.

## J. CABLE SUPPORTS

Support cables according to Section 16050.

Provide vertical conductor support per NEC Table 300.19(A).

## K. WIRING AT OUTLETS

1. Install conductor at each outlet, with at least 6 inches of slack. Connect only to receptacle screw terminals using insulated spade-type lugs.
2. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer, and in compliance with other Sections of Division 16.

### **4.3 FIELD QUALITY CONTROL**

#### **A. TESTING**

1. Provide conductor megger testing per Specification 16050, Section 3.

**\*\*\* END OF SECTION \*\*\***

## SECTION 16130

### RACEWAY AND BOXES

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

##### 1.2 RELATED SECTIONS SPECIFIED ELSEWHERE

<u>Sections</u>	<u>Items</u>
01300	Submittals
02530	Utility Structures
16050	Basic Electrical Materials and Methods
16060	Grounding and Bonding
16120	Conductors and Cables
16140	Wiring Devices

##### 1.3 DEFINITIONS

###### A. 100 PERCENT CONTINUOUS

100 percent continuous means that electrical continuity shall be maintained over a conduit's entire length and that such conduits shall consist of only RGS (whether PVC-coated or not), LFMC, or combinations of these types. There can be no break in the electrical continuity by non-metallic components.

EMT conduits are not considered 100 percent continuous.

###### B. CONDUIT BODIES

A separate portion of a conduit system that provides access through a removable cover to the interior of the system at a junction of two or more sections of the system.

###### C. CONTROL CONDUITS

Control conduits typically contain cables or conductors in the range of 12 Vdc to 120 Vac. These cables/conductors are used to provide discreet field inputs and outputs to motor drives, PLC controllers, operator stations, etc. They typically connect to discreet I/O field devices like local

panel pushbuttons, indicating lights, selector switches, field limit switches, relay circuits, etc.

D. CONTROL PANELS

Control panels are enclosures in which one or more circuits are changed, unlike junction boxes where circuits are simply routed through the panel. Control panels may be as simple as an enclosure with a pilot light or they may be very complicated with hundreds of I/O terminations. For Control Panel considerations, reference Specification 16940.

E. CONVENIENCE RECEPTACLES

Reference Section 16140, Definitions.

F. DEVICE BOXES

Device boxes are electrical boxes used for receptacles, light switches, dimmers, and other similar devices. Selector switches, indicating lights, displays, etc., are mounted in control panels and equipment enclosures, not in device boxes.

G. DRIP FITTINGS

Drip fittings are used to drain water from conduit entry points, junction boxes, or other enclosures where accumulation of moisture must be removed. They are also intended to disable the entry of foreign materials, including tools and fingers, through the drain.

H. DRY LOCATIONS

Reference Section 16050, Definitions.

I. EMT

Electrical Metallic Tubing (a type of RMC).

J. EQUIPMENT VAULT

An Equipment Vault is a VAULT that contains one or more electrical devices that are terminated within the vault; such as flow meters, control valves, control or power panels, lighting, and etc.

SEE VAULTS

K. FINISHED AREAS

Reference Section 16050, Definitions.

L. FMC

Flexible Metal Conduit (a type of RMC).

M. FRP

Fiberglass Reinforced Plastic (a type of RNC).

N. HANDHOLES

A handhole is a pullbox that is not sufficiently sized for entrance of personnel (reference PULLBOXES).

O. INSTRUMENTATION CONDUITS

Instrumentation conduits contain cables and conductors that carry low-power modulated or communication signals. They may include 4-20 mA current loops, 0–10 volt analog signals, 5 to 12 Vdc digital (TLL) data, analog or digital communications signals, etc. They may also include low-voltage compliance power to instruments such as 5 Vdc,  $\pm 15$  Vdc, or 24 Vdc.

P. INTRINSICALLY SAFE CIRCUIT

A circuit in which any spark or thermal effect, produced either normally or in specified fault conditions, is incapable of releasing sufficient electrical or thermal energy to cause ignition of a specific hazardous atmospheric mixture in its most easily ignitable concentration.

Q. JUNCTION BOXES

Junction boxes are electrical enclosures used for combining, splitting, pulling, or redirecting electrical circuits. Junction boxes may terminate one conduit or join multiple conduits. Circuits are not *altered* inside a junction box. Enclosures where circuits are altered are called CONTROL PANELS. With the exception of terminal strips, junction boxes do not contain electrical devices.

1. Junction Boxes, Type J1

Junction boxes identified as TYPE J1 can contain only non-linear power circuits.

2. Junction Boxes, Type J2

Junction boxes identified as TYPE J2 can contain only intrinsically safe circuits.

3. Junction Boxes, Type J3

Junction boxes identified as TYPE J3 can contain only instrumentation circuits that are not intrinsically safe.

Junction boxes not containing circuits of the types identified for TYPE J1, TYPE J2, or TYPE J3 are simply called “junction boxes” (without a TYPE identifier).

R. LFMC

Liquidtight Flexible Metal Conduit (a type of RMC).

S. LINEAR POWER LOADS

Linear power loads are those that are not VFD circuits (both line or load), and are not UV ballast circuits. Although actually non-linear, fluorescent lighting circuits shall be considered linear power loads.

T. NON-LINEAR POWER LOADS

Non-linear power loads shall include all VFD circuits (both line or load) and all UV ballast circuits. Although actually non-linear, fluorescent lighting circuits shall be considered linear.

U. POWER CONDUITS

Power conduits contain branch and feeder conductors with voltages 120 Vac and above. These conductors provide operating power to MCCs, panels, motors, lighting, receptacles, HVAC, etc. Conductors can be of #12 AWG wire gauge and larger, either separate or in power cables.

V. PROCESS AREAS

Reference Section 16050, Definitions.

W. PULLBOXES

Pullboxes are underground electrical enclosures, sufficiently sized to allow the entrance of personnel, used for combining, splitting, pulling, or redirecting electrical circuits. Pullboxes may terminate one conduit or join multiple conduits. A pullbox can be considered an underground junction box.

Circuits are not altered or terminated inside a pullbox. Pullboxes do not contain electrical equipment or devices.

**Exception:**

- *Pull boxes may include a sump pump.*

Handholes are types of pull boxes but are not sufficiently sized to allow the entrance of personnel (reference HANDHOLES).

X. PVC

Polyvinyl Chloride Conduit (a type of RNC).

Y. PVC-RGS

Polyvinyl chloride, externally coated RGS (a type of RMC).

Alias: May be called or shown on Plans and elsewhere in specifications as PVC-Coated RGS or PVC-RMC.

Z. PVC-RMC

Reference PVC-RGS.

AA. RGS

Rigid Galvanized Steel (a type of RMC).

BB. RMC

Rigid Metal Conduit (General NEC Category).

CC. RNC

Rigid Nonmetallic Conduit (General NEC Category).

DD. SURFACE RACEWAYS

A metallic raceway that is intended to be mounted to the surface of a structure, with associated couplings, connectors, boxes, and fittings for the installation of electrical conductors.

EE. VAULTS

A vault is an underground structure, serviceable or accessible only from the top. Handholes, Equipment Vaults, and Pullboxes are considered vaults.

FF. WET LOCATIONS

Reference Section 16050, Definitions.

GG. WIREWAYS

Sheet metal troughs with hinged or removable covers for housing and protecting electric wires and cable in which conductors are laid in place after the wireway has been installed as a complete system.

**1.4 SUBMITTALS**

- A. Submit under provisions of Section 01300.
- B. Provide data for surface raceways, wireways and fittings, hinged-cover enclosures, and cabinets.

**1.5 QUALITY ASSURANCE**

See Section 16050.

**1.6 COORDINATION**

Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

Coordinate electrical work with outside utilities associated with the project.



Non electrical piping and structural has priority over underground conduit routing.

**Exception:**

- *Unless specifically coordinated otherwise with the General Contractor.*

**PART 2 PRODUCTS**

**2.1 METALLIC CONDUIT TYPES**

**A. EMT**

1. Conduit

Galvanized steel tubing meeting ANSI C80.3.

2. Conduit bodies shall be galvanized, or epoxy coated cast iron or aluminum one piece with galvanized, or epoxy coated cast cover, gasket, and threaded hubs. Use stainless steel screws or other approved non-corroding screws to hold cover in place.

3. EMT connectors shall be compression type only. Set screw connectors shall not be allowed.

4. Conduit clamps for EMT shall be stamped galvanized steel.

**B. FMC**

1. Conduit

Flexible, galvanized steel convolutions forming a continuous raceway.

2. Connectors

Galvanized steel, screw in, approved for grounding.

**C. LFMC**

1. Conduit

Flexible, galvanized steel convolutions forming a continuous raceway, covered by a liquid tight PVC layer. Electri-Flex Type LA or American Sealtite, Type UA

2. Connectors

Galvanized steel, screw in, grounding type with a ferrule, which covers the end of the inside and outside of the conduit.

D. RGS

1. Conduit

Hot dipped galvanized with threaded ends meeting ANSI C80.1.

2. Couplings

Steel, cast iron, or malleable iron compression type employing a split, corrugated ring and tightening nut, with integral bushings and locknuts. No indent or set screw type.

a. Couplings

Unsplit, NPT threaded steel cylinders with galvanizing equal to the conduit.

b. Nipples

Factory made through 8 inches, no running threads.

c. Conduit bodies shall be galvanized, or epoxy coated cast iron or aluminum one piece with galvanized, or epoxy coated cast cover, gasket, and threaded hubs. Use stainless steel screws or other approved non-corroding screws to hold cover in place.

3. Conduit Clamps

Conduit clamps for RGS shall be cast iron.

E. PVC-COATED RGS, PVC-RMC

1. General

a. A proprietary colored urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil

thickness. Conduit or fittings having areas with thin or no coating shall be unacceptable.

- b. The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30 degrees F (-1 degrees C).
- c. All male and female threads on conduit, elbows, and nipples shall be protected by application of an electronically conducting corrosion resistant compound.
- d. Installation of the PVC coated conduit system shall be performed in accordance with the manufacturer's installation manual.
- e. Conduits and fittings shall meet the following standards:
  - i. ASTM D870
  - ii. ASTM D1151
  - iii. ASTM D3359
  - iv. ASTM D1308
  - v. NEMA RN1

## 2. Conduit

- a. The PVC coated rigid metal conduit must be UL listed. The PVC coating must have been investigated by UL as providing the primary corrosion protection for the rigid metal conduit. Ferrous fittings for general service locations must be UL listed with PVC as the primary corrosion protection. Hazardous location fittings, prior to plastic coating must be UL listed. All conduit and fittings must be new, unused material. Applicable UL standards may include: UL 6 Standard for Safety, Rigid Metal Conduit, UL 514B Standard for Safety, Fittings for Conduit and Outlet Boxes.
- b. The conduit shall be hot dip galvanized inside and out with hot dipped galvanized threads.

3. Fittings and Accessories

The design shall be equipped with a positive placement feature to ease and assure proper installation. Certified results confirming seal performance at 15 psig (positive) and 25 inches of mercury (vacuum for 72 hours shall be available).

- a. A PVC sleeve extending one pipe diameter or 2 inches, whichever is less, shall be formed at every female fitting opening except unions. The inside sleeve diameter shall be matched to the outside diameter of the conduit.
- b. The PVC coating on the outside of conduit couplings shall have a series of longitudinal ribs 40 mils in thickness to protect the coating from tool damage during installation.
- c. Conduit Form 8 Bodies shall be 1/2 inch through 2-inch diameter, shall have a tongue-in-groove “V-Seal” gasket to effectively seal against the elements. Conduit bodies shall be Form 8 and shall be supplied with plastic encapsulated stainless steel cover screws.
- d. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameter of the coated conduit. All U bolts will be supplied with plastic encapsulated nuts that cover the exposed portions of the threads.
- e. Conduit clamps and fittings for PVC-Coated RGS conduits shall be 316L stainless steel.

4. Approved Material

- a. Plasti-Bond REDH2OT, Perma-Cote, or KorKap manufactured by Robroy Industries.
- b. Ocal-Blue Steel conduit and fittings as manufactured by Ocal, Inc.
- c. Any deviation from the above approved materials must be approved by the Engineer.

## 2.2 NONMETALLIC CONDUIT TYPES

### A. PVC

#### 1. Conduits

NEMA TC 2, Schedule 40 or 80 PVC.

#### 2. Fittings and Accessories

NEMA TC 3; match to conduit type and material, but elbows shall be RMC.

#### 3. Conduit bodies

Where allowed, shall match type, material, and gauge of conduit.

### B. FIBERGLASS/REINFORCED THERMOSETTING RESIN (RTR) ELBOWS

#### 1. General

a. Listed by UL to the UL 2420 Below Ground standard. The resin system shall be epoxy based, with no fillers. The fiberglass shall consist of continuous E-glass Grade "A" roving.

b. Carbon black shall be used as ultra violet inhibitor to protect the elbows and fittings during storage and exposure to the outdoors. Elbows shall be black in color.

c. The internal elbow walls shall be smooth with all fibers embedded in the epoxy.

d. All shall meet the nominal radius of + or - 2°. The wall thickness shall meet the tolerances as shown in NEMA TC 14.

e. Elbows shall meet the following standards

i. Volume and Surface Resistivity: ASTM D257

ii. Dielectric Constant and  
Dissipation Factor: ASTM D150

iii.	Dielectric Strength:	ASTM D149
iv.	Tensile Strength, Axial:	ASTM D2105
v.	Compressive Strength:	ASTM D695
vi.	Modulus of Elasticity and Thermal Conductivity:	ASTM D2105
vii.	Thermal Conductivity:	ASTM D5930-1
viii.	Specific Gravity:	ASTM D792
ix.	Glass Content:	AP1 15LR
x.	Water Absorption:	ASTM D570
xi.	Barcol Hardness:	ASTM D2583
xii.	Coefficient of Thermal Expansion:	ASTM D696
xiii.	Impact Resistance:	ASTM D2444
xiv.	Stiffness at 5 Percent Deflection:	ASTM D2412

## 2.3 OUTLET AND DEVICE BOXES

### A. STANDARD METAL BOXES

Assembled from stamped steel hot dipped zinc galvanized coated flat pieces, welded or mechanical assembled into a device box, with knockouts for conduit or connector entrance, meeting NEMA OS 1, with plaster or extension rings and necessary mounting appurtenances to suite construction and application.

### B. CAST BOXES

#### 1. Cast Aluminum

Epoxy coated cast aluminum box, one piece, with mounting lugs, with threaded holes or hubs, with internal green ground screw and with neoprene gaskets.

2. Cast Iron

Cast iron with electro-galvanized and aluminum acrylic paint finish, one piece, with mounting lugs, with threaded holes or hubs, with internal green ground screw and with neoprene gaskets.

C. DEVICE COVERS

1. Plastic: Thermoplastic nylon, device-mount, ivory.
2. Aluminum: Sheet Aluminum.
3. Cast Iron: Iron alloy.

D. SWITCH ACTUATORS

1. Aluminum: Lever-arm type, raintight, cast aluminum matching the metallurgy of the device box.
2. Cast Iron: Lever-arm type, raintight, cast iron alloy matching the metallurgy of the device box.

E. WEATHERPROOF COVERS AND PLATES

Weather proof, self-closing, die-cast aluminum, UL listed.

F. IN-SERVICE COVERS

Shall be weather proof and hinged from top with removable cord slots.

**2.4 JUNCTION BOXES, HANDHOLES, AND VAULTS**

A. JUNCTION BOXES

1. Standard

Stamped steel, deep drawn one piece (without welds or tab connections), galvanized, with knockouts for conduit or connector entrance, meeting NEMA OS 1. Boxes 6" x 6" x 4" or larger may be code gauge fabricated steel continuously welded at seams and painted after fabrication.

2. Cast

Cast iron with electrogalvanized and aluminum acrylic paint finish, one piece, with threaded cover of the same metallurgy and finish, with mounting lugs, with threaded holes or hubs, with internal green ground screw and with neoprene gaskets; explosion-proof, dust-ignition-proof, raintight, rated for Class I, Division 1 and 2, Groups C, D.

3. Stainless Steel

NEMA 4X 316L stainless steel with gasketed screw down cover.

4. Explosion Proof for Internal Wire Termination

Explosion proof junction boxes shall be 18"H x 12"W x 6"D (minimum inside dimension) cast aluminum; explosion-proof, dust-ignition-proof, raintight, rated for Class I, Division 1 and 2, Groups C, D; Killark #EXB-12186-N34 or equal.

**Exception:**

- *Unless specifically stated otherwise on the Plans.*

5. Explosion Proof, No Terminations

Cast iron with electrogalvanized and aluminum acrylic paint finish, one piece, with threaded cover of the same metallurgy and finish, with mounting lugs, with threaded holes or hubs, with internal green ground screw and with neoprene gaskets; explosion-proof, dust-ignition-proof, raintight, rated for Class I, Division 1 and 2, Groups C, D.

**Exception:**

- *Unless specifically stated otherwise on the Plans.*

B. HANDHOLES

1. Material and Strength

Handholes shall be made from Concrete or Polymer Concrete. The boxes and covers are required to conform to all test provisions of ANSI/SCTE 77 2002 "Specification For Underground Enclosure Integrity" for Tier 15 applications (Design Load Vertical 22,500



lbs. and Lateral 800 lbs/sq. ft.) and to be Listed and Labeled. The boxes must physically accommodate and structurally support compatible covers, which possess the Tier rating. In no assembly can the cover design load exceed the design load of the box. All components in an assembly (box and cover) are to be manufactured by the same manufacturer. All covers are required to have a minimum coefficient of friction of 0.50 in accordance with ASTM C1028. Independent third-party verification or test reports stamped by a registered Professional Engineer certifying that all test provisions of this specification have been met are required with each submittal. The cover is to have an identifying function descriptor imprinted on it. The Descriptor shall be ELECTRICAL, CONTROL, SIGNAL, TELEPHONE, STREET LIGHT, or similar approved by the Engineer.

Handholes with metallic lids shall be grounded per Specification Section 16060.

Handhole lid assemblies comprised of steel shall have a factory-applied galvanized finish.

**Exception:**

- *Unless the assembly is fabricated from stainless steel.*

2. Manufacturers

Quazite (Strongwell Corp.)  
Carson Industries

C. PULLBOXES AND VAULTS

Precast concrete structures with preformed knockout holes for conduit entrance. Reference Section 02530, Utility Structures.

Pullboxes and vaults with metallic lids shall be grounded per Specification Section 16060.

Pullbox lid assemblies comprised of steel shall have a factory-applied galvanized finish.

**Exception:**

- *Unless the assembly is fabricated from stainless steel.*

## **PART 3 APPLICATION**

### **3.1 CONDUIT BODIES**

This section describes the types of raceways, junction boxes, and device boxes that can be used for different circuits and different environments. Reference Section 4.1 for methods and practices required for installation.

#### **A. CABLE AND CONDUIT SCHEDULE**

The Cable and Conduit Schedule shall be considered absolute. No changes to wire sizes, wire count, insulation type, circuit type, or conduit size shall be allowed without approval from the engineer.

The Cable and Conduit Schedule does not indicate conduit type (PVC, EMT, RGS, etc.) since, in many cases, a conduit's type may change between its source and destination. The rules stated in this specification define the necessary and allowed conduit type(s) for various applications and routes.

#### **B. RACEWAY REQUIREMENTS**

The term "RGS conduits" refers to a type of conduit body and does not imply whether the conduit is PVC-coated or not. Certain applications require RGS conduits with PVC coating, others do not. Reference Section 3.2, "RGS RACEWAY PROTECTIVE COATINGS" for these requirements.

##### **1. Circuit Types and Categories**

###### **a. Circuit Types**

Conduits are broken into three general circuit types; 1) Power, 2) Control, and 3) Instrumentation (see Definitions).

On the Cable and Conduit Schedule, Power conduits are those starting with the letter "P", Control conduits are those starting with the letter "C", and Instrumentation conduits are those starting with the letter "S".

###### **b. Circuit Categories**

Power circuits are broken into two categories, those that contain linear loads and those that contain non-linear loads (see Definitions).

Control and Instrumentation circuits are broken into two categories, those that contain intrinsically safe circuits and those that do not (see Definitions).

These types and categories are listed below in Table 3.1.B.1 below.

c. Relationships Between Circuit Categories and Conduit Types

Many electrical circuit types do not require special conduit routing considerations. However, Table 3.1.B.1 shows the circuit types where the conduit route must be 100 PERCENT CONTINUOUS (reference Definitions).

**Table 3.1.B.1**

<b>Circuit</b>		
<b>Type</b>	<b>Category</b>	<b>100% Continuous?</b>
Power	Linear	No
Power	Non-linear	Yes
Control	Non-intrinsic	No
Control	Intrinsic	Yes
Instrumentation	Non-intrinsic	Yes
Instrumentation	Intrinsic	Yes

2. Conduit Shape

Wiring shall be routed in pipe or tubular conduits, NOT in fabricated wireways or gutters.

**Exception:**

- *Unless specifically called out otherwise in the Plans.*

C. PVC SCHEDULE 40 RACEWAY APPLICATIONS

1. All straight portions of conduits completely concealed in walls, attics, concrete, or below ground (not exposed) shall be PVC Schedule 40.

**Exceptions:**

- *Power conduits containing non-linear loads shall be 100 percent continuous over their entire length.*
  - *Control conduits containing intrinsically safe circuits shall be 100 percent continuous over their entire length.*
  - *All Instrumentation conduits shall be 100 percent continuous over their entire length.*
  - *All conduits containing grounding electrode conductors shall be PVC Schedule 80 over their entire length.*
  - *PVC conduit areas under roads or heavy traffic areas shall be Schedule 80.*
  - *Where specifically called out otherwise in the Cable and Conduit Schedule.*
2. All portions of power and control conduits completely concealed inside a reservoir shall be PVC Schedule 40.

**D. PVC SCHEDULE 80 RACEWAY APPLICATIONS**

1. All portions of conduits which contain grounding electrode conductors shall be PVC Schedule 80 and shall contain no metal fittings, connectors, or devices. Such conduits containing grounding electrode conductors shall contain no other types of conductors.
2. PVC conduit areas under roads or heavy traffic areas.
3. As stated in the Cable and Conduit Schedule.

**E. RGS RACEWAY APPLICATIONS**

1. All conduits requiring 100 percent continuity per Section 3.1.B.1 shall be RGS over their entire length. For coating requirements, reference Section 3.2.

**Exception:**

- *LFMC conduit shall be allowed per the “LFMC Raceway Applications” section herein.*

2. Underground factory or bent elbows and offsets greater than or equal to 30 degrees shall be RGS.

**Exceptions:**

- *Where the radius of a conduit bend is greater than or equal to 15 feet per inch of trade size.*
- *Raceways used for the containment and protection of bare grounding electrode conductors shall be PVC Schedule 80. Reference PVC Schedule 80 raceway applications.*

3. All portions of conduits exposed outdoors shall be RGS.

**Exception:**

- *All conduits containing grounding electrode conductors shall be PVC Schedule 80 over their entire length.*

4. All portions of conduits under covered structures open on any side shall be RGS.

**Exception:**

- *All conduits containing grounding electrode conductors shall be PVC Schedule 80 over their entire length.*
- *LFMC conduit shall be allowed per the “LFMC Raceway Applications” section herein.*

5. All portions of conduits exposed on the inside of below-ground pullboxes, equipment vaults, wet wells, and dry wells (vaults) shall be RGS.

**Exceptions:**

- *All conduits immediately terminating after penetrating a vault wall, that are allowed to be PVC Schedule 40 underground, shall terminate as a PVC conduit bell-end.*

*If the conduit is connected inside the vault to any device, conduit body, junction box, control panel, or any other conduit, then all portions of the conduit inside the vault,*

*through the wall penetration, and 24 inches outside the vault shall be RGS and shall be grounded.*

- *All conduits containing grounding electrode conductors shall be PVC Schedule 80 over their entire length.*
6. All portions of conduits penetrating concrete floors, walls, or ceilings shall be RGS.

**Exception:**

- *In below ground vaults as described above.*
7. All conduit penetrations from grade shall be RGS.

**Exception:**

- *All conduits containing grounding electrode conductors shall be PVC Schedule 80 over their entire length.*
8. All portions of exposed conduits inside closed buildings shall be RGS.

**Exceptions:**

- *EMT conduit shall be allowed per the “EMT Raceway Applications” section herein.*
- *LFMC conduit shall be allowed per the “LFMC Raceway Applications” section herein.*
- *All conduits containing grounding electrode conductors shall be PVC Schedule 80 over their entire length.*
- *Unless otherwise specifically called out on a separate plan or detail.*

**F. LFMC RACEWAY APPLICATIONS (REFERENCE DEFINITIONS)**

1. LFMC conduit shall be used for the last 18 inches of connection to motors, transformers and other vibrating equipment.
2. LFMC conduit shall be used for the last 18 inches of connection to field instruments such as flow meters in vaults and ultrasonic level transducers.

3. LFMC conduit shall be used for the last 18 inches of connection to any device that may require minor movement during maintenance or repair or that may require physical adjustment.
4. LFMC conduit may be used in pull vaults for connections between conduit penetrations and junction boxes inside the vault where space is limited.

G. EMT RACEWAY APPLICATIONS (REFERENCE DEFINITIONS)

1. Exposed conduits may be EMT in completely enclosed dry (see Definitions) rooms.
2. EMT conduits may be used in attics and where concealed in walls.

**Exception to the use of EMT:**

- *Where conduit is required to 100 percent continuous.*

H. FIBERGLASS/RTR ELBOW APPLICATIONS

1. Fiberglass conduit shall not be used.
2. Fiberglass elbows may be used in underground applications with or without concrete encasement.

**Exception to the use of fiberglass elbows:**

- *Where raceway is required to 100 percent continuous.*

### 3.2 RGS RACEWAY PROTECTIVE COATINGS

Protected RGS conduits are used to minimize conduit degradation from moisture and chemicals.

Where called in the Plans or Specifications as “Protected RGS,” “PVC-Coated RGS,” “PVC-Coated,” “PVC-RGS,” or “PVC-RMC,” all such conduits, elbows, and fittings shall be factory coated PVC as defined in Section 2.1.

A. PVC-COATED RGS CONDUIT APPLICATIONS

1. All portions of RGS elbows, bends, straight pipes, couplings, and fittings buried underground shall be PVC-Coated.

2. All portions of RGS elbows, bends, straight pipes, couplings, and fittings encased in concrete shall be PVC-Coated.
3. All portions of RGS elbows, bends, straight pipes, couplings, and fittings exposed outdoors shall be PVC-Coated.
4. All portions of RGS elbows, bends, straight pipes, couplings, and fittings inside underground vaults, pullboxes, wet wells, and dry wells shall be PVC-Coated.
5. All portions of RGS elbows, bends, straight pipes, couplings, and fittings exposed in Chemical Rooms (reference Definitions) shall be PVC-Coated.
6. All portions of RGS conduits penetrating concrete floors and below-ground walls and ceilings shall be PVC-Coated at least 12" into the exposed area and extending at least 24" underground.

**Exceptions:**

- *Where specifically noted to be otherwise in the Plans.*
- *Non-metallic conduits that terminate at the wall of a pullbox.*

### **3.3 JUNCTION AND DEVICE BOX APPLICATIONS**

#### **A. JUNCTION BOXES**

1. Junction boxes for Instrumentation, Intrinsically Safe, and Non-Linear Power circuits (see Definitions) shall be hinged steel, 6" x 6" x 4" minimum.
2. Dry Areas (see Definitions).
  - a. Flush-mounted junction boxes may be the standard type.
  - b. Wall-mounted junction boxes shall be the NEMA 1 gasketed.
3. Wet Areas (see Definitions).
  - a. NEMA 4X 316L stainless steel.



**Exceptions:**

- *Except in pullboxes, cast junction boxes shall be allowed for applications where three conduits or less approach from three different directions and no terminations are made inside the junction box.*
- *Unless called out otherwise on the Plans*

4. Hazardous Areas (see Definitions).
  - a. Junction boxes shall be explosion-proof, dust and ignition-proof, raintight, rated for Class I, Division 1 & 2, Group C, d environments and shall conform to NEC Articles 500 through 517 (reference Section 2.5.A).

**B. DEVICE BOXES, ACTUATORS, AND COVERS**

All exposed boxes shall be of cast construction.

All aluminum and cast iron covers shall be provided with a weatherproof gasket.

**1. Outdoors, In Pullboxes, In Equipment Vaults**

**a. Receptacles**

Cast iron device box body with cast aluminum gasketed cover and top-opening “in-service” cover.

**Exception:**

- *Cast aluminum device box bodies may be used if specifically called out on the Plans or approved by the Engineer.*

**b. Light Switches**

Cast iron device box body with cast iron gasketed cover and lever-arm actuator.

**Exception:**

- *Cast aluminum device box bodies with gasketed die cast aluminum covers and lever arm actuators may*

*be used if specifically called out on the Plans or approved by the Engineer.*

2. Indoor, Wet Areas (see Definitions).

Flush-mounted (recessed) junction boxes may be the standard metal type.

These boxes will usually be mounted in wood or steel stud framed walls with gypsum plasterboard or similar surfacing cover. Boxes mounted in Concrete Masonry Unit (Block) walls shall be Masonry type boxes.

a. Receptacles

- i. Recessed (flush-mount) – standard device box body with gasketed die cast aluminum, snap-action, weatherproof cover.
- ii. Surface-mounted – cast aluminum device box body with gasketed die cast aluminum, snap-action, weatherproof cover.

b. Light Switches

- i. Recessed (flush-mount) – standard device box body with gasketed cast aluminum switch cover.
- ii. Surface-mounted – die cast aluminum device box body with gasketed cast aluminum switch cover.

3. Indoor, Dry Areas (See Definitions)

a. Receptacles

- i. Recessed (flush-mount) – standard device box body with plastic cover.
- ii. Surface-mounted – cast aluminum device box body with plastic cover.

- b. Light Switches
  - i. Recessed (flush-mount) – standard device box body with plastic switch cover.
  - ii. Surface-mounted – cast aluminum device box body with plastic switch cover.
- 4. Hazardous Areas (see Definitions).
  - a. Explosion proof.

### 3.4 PULLBOX AND HANDHOLE APPLICATIONS

#### A. PULLBOXES

Pullboxes shall be provided as shown on the Plans and as required by the Utility Companies.

- 1. Pullboxes shall be 6' x 6' x 4' deep minimum.

**Exceptions:**

- *Pullboxes with less than 2 TYPE J1, TYPE J2, or TYPE J3 junction boxes (reference Definitions) shall be allowed to be 4' x 4' x 4' minimum.*
- *Unless specifically called out otherwise on the Plans.*
- *Unless called out otherwise by a Utility Company.*

- 2. Pullboxes shall be provided with metal H30 hatch lids.

**Exceptions:**

- *If pullboxes are located where only light load vehicular traffic is present, then the hatch lids shall be rated at H25.*
- *If pullboxes are located where no vehicular load traffic is present, then the hatch lids shall be rated at H20.*

- 3. Pullbox lids shall be cast, engraved, or otherwise permanently marked with the legend "ELECTRICAL."

## B. HANDHOLES

Handholes are used as pull and splice points in underground installations and are typically installed in driveways, parking lots, and off-roadway applications subject to occasional non-deliberate heavy vehicular traffic.

1. Handholes shall be set adjacent to each pole light pedestal.

### **Exception:**

- *Unless specifically shown or called out otherwise on the Plans.*

## **PART 4 EXECUTION**

### **4.1 EXAMINATION**

Examine surfaces and spaces to receive raceways, boxes, for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **4.2 INSTALLATION, GENERAL**

#### **A. COORDINATION WITH OTHER WORK**

Wherever practical, route conduit with adjacent ductwork or piping.

1. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes or other heat sources operating at temperatures above 100 degrees F.
2. When installing utility conduits, comply with the spacing and depth requirements of the utilities.
3. Non-electrical buried piping has routing priority over electrical burials.

#### **B. MOUNTING PRACTICES**

1. All conduits in process areas shall be surface mounted unless specifically called out otherwise on the Plans.
2. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

3. Where several conduits follow a common route, stagger pull boxes, junction boxes, pulling sleeves, and fittings.

#### C. DEVICE BOX INSTALLATION

1. Coordinate box locations with building surfaces and finishes to avoid bridging wainscots, joints, finish changes, etc.
2. Recess boxes in the wall, floor, and ceiling surfaces in finished areas. Set boxes plumb, level, square and flush with finished building surfaces within 1/16 of an inch for each condition. Set boxes so that box openings in building surfaces are within 1/8 of an inch of edge of material cut-out and fill tight to box with building materials. Back boxes with structural material to prevent rotation on studs or joists. Use gang boxes wherever more than one device is used at one location.
3. Surface mount boxes to building structures with a minimum of 1/4-inch spacing and with a minimum of two fasteners. Provide attachments to withstand an additional force of 100 pounds applied vertically or horizontally.
4. Set recessed boxes at the following heights to the bottom of the box, except where noted otherwise in the Plan Set:
  - a. Convenience outlet receptacles in finished areas at 18 inches above floor.
  - b. Lighting switches, dimmers, etc., at 42 inches above floor.
  - c. Wall mounted telephones at 60 inches above floor.
  - d. Boxes for outlets on cabinets, countertops, shelves, and above countertops at 2 inches above the finished surface or 2 inches above the back splash. Verify size, style, and location with the supplier or installer of these items before installation.
5. Set surface-mounted receptacle and lighting boxes in wet areas 42 inches above the finished floor to the center of the box, unless called out otherwise in the Plan Set.

6. Set surface-mounted boxes for lighting switches within 12 inches of the door opening on the strike or lock side of the door or on the side closing last unless indicated otherwise in the Plan Set.
7. Arrange boxes used in wet areas to drain moisture away from devices or enclosures for equipment and make conduit connections from below.
8. Set floor boxes level and adjust to finished floor surface.

#### D. CONDUIT INSTALLATION

Install conduit as a complete and continuous system without wires. Mechanically secure to boxes, fittings, and equipment. Electrically connect conduits to all metal boxes, fittings, and equipment.

1. All field or manufactured ferrous metal threaded connections of conduits and fittings shall be installed with a coating of electrically conductive, corrosion resistant, copper colloidal compound such as “Shamrock Kopr-Shield™ Compound” or equivalent.
2. Keep conduits clean and dry. Close each exposed end.
3. Properly ground each metallic box, cover, lid, hatch, conduit, etc., in compliance with the National Electrical Code and Specification Section 16060.
4. When blowing through conduits, cover electrical components installed in enclosures to avoid blowing dirt, shavings, or moisture into equipment.
5. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel, monofilament plastic line, or woven polyester pull line with not less than 200-lb tensile strength. Leave at least 8 inches of slack at each end of the pull wire.
6. Install exposed raceways in lines parallel or perpendicular to the building or structural member’s lines except if structure is not level then follow the surface contours as much as practical. Do not crossover or use offsets if they can be avoided by installing the raceway in a different routing.
7. Run parallel or banked conduits together, on common supports where practical.

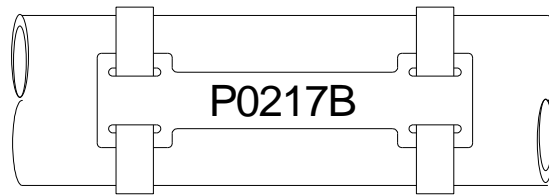
8. Make bends in parallel or banked runs concentric (common radius point, expanding radius). Use factory elbows only where elbows can be installed concentrically; otherwise, provide field bends for parallel raceways.
9. Select surface raceway outlet boxes to which lighting fixtures are attached of sufficient diameter to provide a seat for the fixture canopy.
10. Provide surface metal raceway outlet box and the backplate and canopy at the feed-in location of each end-stem suspension fluorescent lighting fixture.
11. Labeling

With the exception of conduits supplying power to lighting and convenience receptacles, all conduits shall be labeled in the following manner.

- a. Conduits shall be labeled at each entrance and exit of a raceway, box, and device. Labels shall be placed no more than 3 inches from the relevant entrance or exit and shall be positioned in a manner where they can best be read by technicians and maintenance personnel.

**Exception:**

- *Only one label shall be required for conduits less than 6 feet in length where the entire conduit can be seen from a single point.*
- b. The labels used shall be permanent items manufactured specifically for tagging conduits in direct sunlight and wet environments.
  - c. The conduit label shall be the full conduit number as listed on the Cable and Conduit Schedule.
  - d. The conduit label shall be attached near the ends of conduit stub ups through floors and penetrations into vaults even if equipment is set over the conduit.



**Figure 4.2.D.11**

**Example of a Conduit Label**

**E. RACEWAY TERMINATIONS AND CONNECTIONS**

1. Join raceways with fittings designed and approved for the purpose and make joints tight.
2. Make connections waterproof and rustproof by application of a watertight, conductive thread compound. Clean threads of cutting oil before applying thread compound.

3. **PVC–RMC Conduits**

Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

4. Apply PVC adhesive by brush.

5. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.

6. Cut ends of conduit square with hand or power saw or pipe cutter. Ream cut ends to remove burrs and sharp ends. Make conduit threads cut in the field with the same effective length and same thread dimensions and taper as specified for factory-cut threads.

7. **Flexible Connections**

Use maximum of 18 inches of flexible conduit for equipment subject to vibration, noise transmission, removal, or movement; and for all motors. Do not use flexible conduit in place of elbows, offsets, or fittings to attach to fixed equipment. Recessed and semi-recessed lighting fixtures may use up to 6 feet of flexible conduit, or 11 feet of premanufactured lighting “whips.” Use LFMC in wet or damp locations. Do not strap flexible conduit to structures or other equipment.



8. Provide double locknuts and insulating bushings at conduit connections to boxes and cabinets. Align raceways to enter squarely and install locknuts with dished part against the box. Use grounding type bushings where connecting to concentric or eccentric knockouts.

**Exception:**

- *In wet areas, conduit entries that are made into the side or top of an enclosure shall be made using Myers hubs.*

9. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

10. Support conduit connections to motors or other equipment independently of the motor or equipment. Raise or drop vertically to the nearest practicable point of connection to the unit. Run vertical drops to the floor and fasten with a floor flange. Unsupported drops are not permitted. Horizontal runs on the floor or on equipment are not permitted. Drop or raise at the appropriate closest location. Run conduit on equipment frames or supports to closely follow the contours of the equipment. Locate conduit to maintain access to all equipment services and adjustment points and so as not to interfere with operation of the equipment.

11. Connect conduit to hubless enclosures, cabinets, and boxes with double locknuts and with insulating type bushings. Use grounding type bushings where connecting to concentric or eccentric knockouts. Make conduit connections to enclosures at the closest point possible where the devices are located to which the circuits contained in the conduit will connect.

**Exception:**

- *In wet areas, connect to enclosures, boxes, and devices from the bottom side. In rare cases where bottom entry is not possible, side and top entries shall be made using Myer-type hubs.*

## F. EXPANSION FITTINGS

Where conduits cross building expansion joints, use suitable sliding or offsetting expansion fittings. Unless specifically approved for bonding, use a suitable bonding jumper.

### **Exception:**

- *For 100 percent continuous conduits, provide an LFMC loop to compensate for expansion. Include conduit outlet boxes for maximum bend compliance.*

## G. RACEWAY SUPPORT

Support raceways as specified in Section 16050.

1. Provide anchors, hangers, supports, clamps, etc., to support the raceways from the structures in or on which they are installed. Do not space supports further apart than 10 feet.
2. Provide sufficient clearance to allow conduit to be added to racks, hangers, etc., in the future.
3. Support raceway within 3 feet of every outlet box, junction box, panel, fitting, etc.
4. Support raceway and boxes in an approved manner by:
  - a. Expansion shields in concrete or solid masonry;
  - b. Toggle bolts on hollow masonry units;
  - c. Wood screws on wood;
  - d. Metal screws on metal.
5. Raceway in wet areas shall have clamp backs or other appropriate spacers to hold them a minimum of 1/2 inch off the surface. Horizontal runs on the roof surface shall be blocked at every 5 feet to hold them a minimum of 2 inches above roof surface.

## H. INSTALLING PVC-COATED RGS CONDUITS

1. Follow the manufacturer's requirements and recommendations when installing PVC-Coated RGS conduits.

2. Seal the connections to protect the conduit.
3. Provide manufacturer's PVC repair compound where the thickness of the conduit coating has been reduced or damaged (from bending, threading, nicking, etc.)

#### I. BENDS AND OFFSETS

1. Fabricated bends and offsets shall be made with manufacturer-approved bending tools, by manufacturer-certified personnel.
2. Where possible, use standard elbows, conduit fittings, or junction boxes to avoid fabricated bends.
3. Make bends and offsets uniform and symmetrical. Make bends and offsets so that the inner diameter is not reduced. Use expanding plugs for bends in PVC conduit of 2-inch trade size or larger. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

#### J. PENETRATIONS FOR RACEWAYS

1. Do not bore holes in floor and ceiling joists outside center third of member depth or within 2 feet of bearing points. Holes shall be 1-inch diameter maximum.

**Exception:**

- *Unless specifically approved by Structural Engineer.*
2. Penetrate through roofs with core drill hole 1/2 to 1 inch larger than conduit, flash with neoprene, caulk conduit in place and seal with silicone sealant under flashing. Sleeve roof opening where non-concrete roof construction occurs.

#### K. CONDUIT SEAL OFFS

Install raceway seal-off fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations as per NEC Article 500 and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

Install raceway seal-off fittings in compliance to NFPA 70 and NFPA 820.

**Exceptions:**

*Seal-off fittings filled with removable compound may be used in non-hazardous applications as listed below to eliminate the possibility of the passage of water or water vapor.*

- *Where conduits pass from warm to cold locations.*
- *Where conduits enter or exit buildings below grade.*
- *Where specifically called out on the Plans.*

**4.3 PULLBOXES**

**A. PULLBOX STRUCTURAL INSTALLATION**

Strict compliance must be followed regarding the installation of conduits, conductors, junction boxes, and grounding inside pullboxes.

1. Install pullboxes outside of classified areas. Field verify measurements to assure compliance.

**Exception:**

- *Unless specifically called out otherwise in the Plans.*

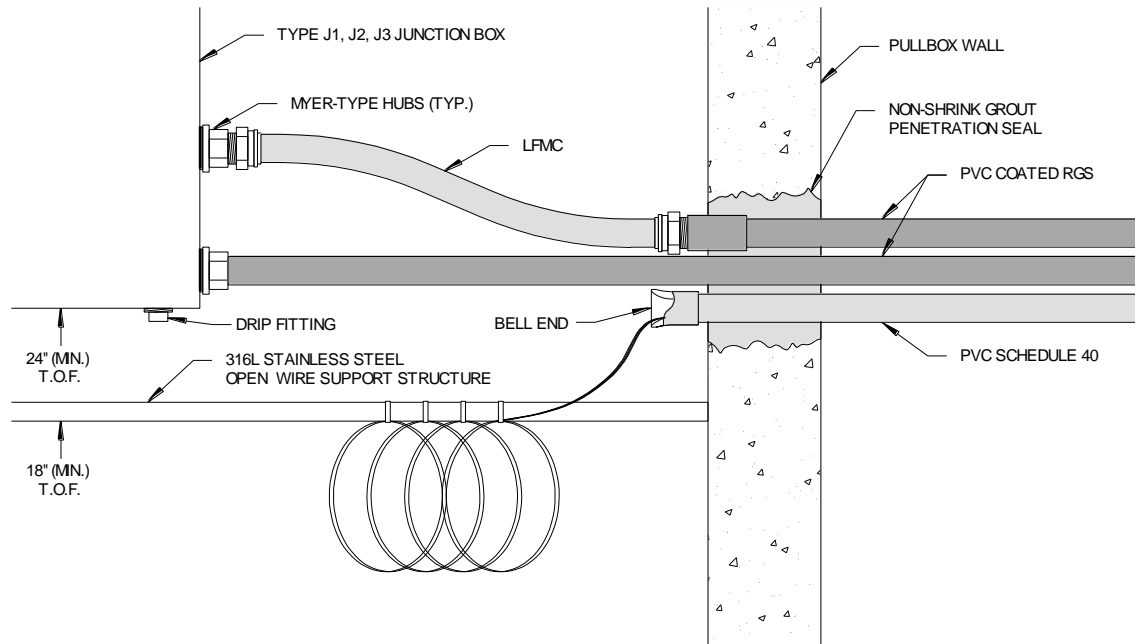
**B. PULLBOX CONDUIT, CONDUCTOR, JUNCTION BOX, AND GROUNDING INSTALLATION**

The six types/categories of electrical circuits as defined in Section 3.1.B.1 shall be installed as described herein (reference Figure 4.3.B).

1. Installing circuits in conduits NOT Identified As 100 percent Continuous in Pullboxes
  - a. Conduits NOT identified as 100 percent continuous shall terminate at the penetration into the pullbox with a PVC Schedule 40 bell-end.
  - b. Cables and conductors shall be open-wire within the pullbox.

- c. Coil 2 wraps at 24 inches per wrap of each open wire. Bind the wraps with Ty-Rap® cable fasteners.
  - d. Support open wires a minimum of 18 inches above the pullbox floor on 316L stainless supports mounted near the edges of the pullbox, leaving room in the center for safe entry, work, and exit. Secure wires with Ty-Rap® cable fasteners.
  - e. Physically separate power and control circuits as much as possible.
  - f. Plug the ends of all open conduits with a removable filler to minimize water entry into and out of the pullbox. Repair plugging after the movement of open wiring.
  - g. Seal around all conduit penetrations with non-shrink grout.
2. Installing Conduits Identified As 100 Percent Continuous in Pullboxes
- a. All conduits identified as 100 percent continuous passing through, or terminating in, a pullbox shall terminate in a TYPE J1, TYPE J2, or TYPE J3 junction box for pulling purposes, termination, and rerouting.
  - b. Provide separate junction boxes for the types of circuits listed below. Under no circumstance shall these circuit types be combined in a common junction box.
    - i. Non-linear power circuits (TYPE J1).
    - ii. Intrinsically safe circuits (TYPE J2). Note: intrinsically safe instrumentation and control circuits may be combined in TYPE J2 junction boxes.
    - iii. Instrumentation circuits, not intrinsically safe (TYPE J3).
  - c. All conduit entries into junction boxes shall be watertight. Conduit entries made into the side or top shall be made with Myer-type hubs.

- d. All conduits shall be mounted and supported with 316L stainless steel hardware.
- e. Conduit composition and protective coating shall be per Sections 3.1 and 3.2.



**Figure 4.3.B**

**Typical Conduit Penetrations in Pullboxes**

3. Installing Junction Boxes in Pullboxes
  - a. Junction boxes shall be NEMA 4X, 316L stainless steel, 18" x 18" x 6" (minimum) and shall comply with NEC 314.28(A)(1) and 314.28(A)(2).
  - b. Junction boxes shall be mounted with 316L stainless steel hardware at a height of 24 inches minimum from the bottom of the junction box to the floor of the pullbox.
  - c. Junction boxes shall be mounted on separate walls.
  - d. Junction boxes shall be provided with a water drip fitting mounted to the bottom of the box.

- e. Coil 4 wraps at 12 inches per wrap of each cable and conductor in a junction box.
- f. Splicing shall not be allowed in junction boxes.

**Exception:**

- *Unless specifically called out otherwise in the Plans.*

4. Installing Grounding in Pullboxes

Reference Specification 16060.

#### 4.4 EQUIPMENT VAULTS

A. EQUIPMENT VAULT INSTALLATION

Install vaults for underground raceway systems true to line and grade. Provide a compacted foundation of 3/8-inch minus crushed rock for the support of the vault. The minimum size for the foundation gravel base is 6 inches greater in each direction of the length and width of the vault and 6-inches deep. Ground vaults as per Section 16060-3.

B. EQUIPMENT VAULT CONDUIT INSTALLATION

Reference Figure 4.4.B.

1. All conduits entering an equipment vault shall terminate in a junction box.

**Exception:**

- *Unless specifically called out otherwise in the Plans.*

2. Conduit composition and protective coating shall be per Sections 3.1 and 3.2.
3. Conduits NOT identified as 100 percent continuous shall change from PVC to PVC-Coated RGS at least 24 inches before entering the equipment vault.

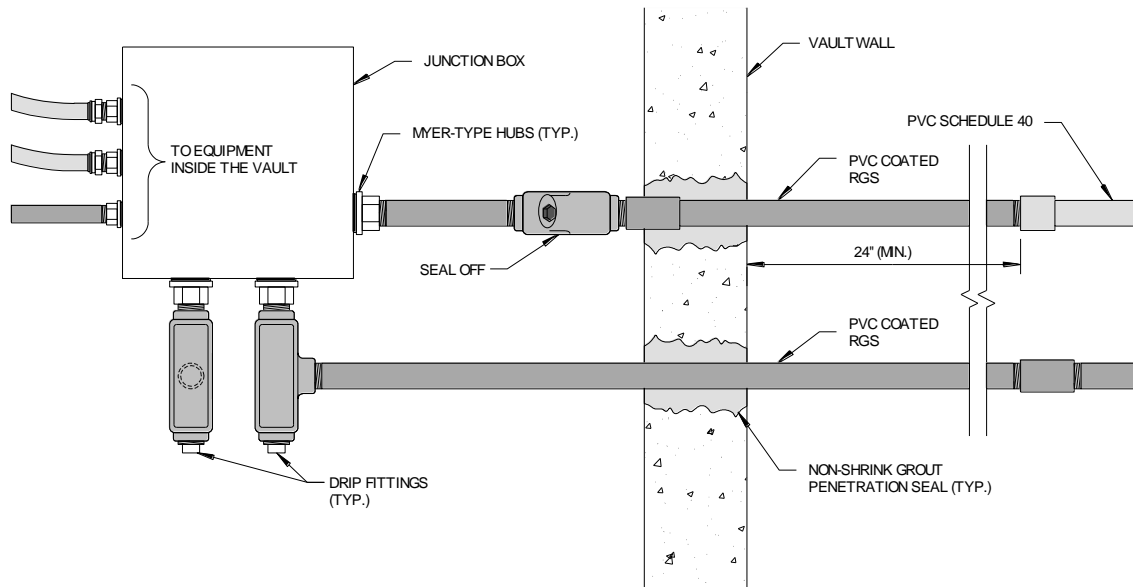
4. Conduits identified as 100 percent continuous shall terminate in a TYPE J1, TYPE J2, or TYPE J3 junction box.
  - a. Provide separate junction boxes for the types of circuits listed below. Under no circumstance shall these circuit types be combined in a common junction box.
    - i. Non-linear power circuits (TYPE J1).
    - ii. Intrinsically safe circuits (TYPE J2). Note: intrinsically safe instrumentation and control circuits may be combined in TYPE J2 junction boxes.
    - iii. Instrumentation circuits, not intrinsically safe (TYPE J3).
5. All conduit entries into junction boxes shall be watertight. Conduit entries made into the side or top shall be made with Myer-type hubs.
6. All conduits shall be mounted with 316L stainless steel hardware.
7. Conduits entering an equipment vault shall connect to the equipment through a wall-mounted junction box.
8. Conduits shall enter the vault below the junction box and connect to the box through a conduit “T” with a drain fitting as shown. Moisture from the conduit shall not be allowed to enter the junction box.

**Exceptions:**

- *Conduits in classified vaults shall be provided with a conduit seal-off fitting and may enter the vault at or above the junction box.*
- *Conduits in non-classified vaults may enter the vault at or above the height of a junction box if the conduit “T” with drain fitting is replaced with a conduit seal-off fitting. This fitting may be filled with a removable product but shall be properly filled to eliminate the possibility of the passage of water or water vapor.*

9. Seal around all conduit penetrations with non-shrink grout.





**Figure 4.4.B**

**Typical Conduit Terminations in Equipment Vaults**

**C. EQUIPMENT VAULT JUNCTION BOX INSTALLATION**

1. Junction boxes shall be NEMA 4X, 316L stainless steel, 12" x 12" x 6" (minimum) and shall comply with NEC 314.28(A)(1) and 314.28(A)(2).
2. Junction boxes shall be mounted with 316L stainless steel hardware at a height of 24 inches minimum from the bottom of the junction box to the floor of the vault.
3. Coil 4 wraps at 12 inches per wrap of each cable and conductor in a junction box.

**D. EQUIPMENT VAULT GROUNDING INSTALLATION**

Reference Specification 16060, Grounding and Bonding.

**E. CONNECTIONS TO THE EQUIPMENT**

1. LFMC conduit shall be provided from the wall to the equipment.

## 4.5 HANDHOLES

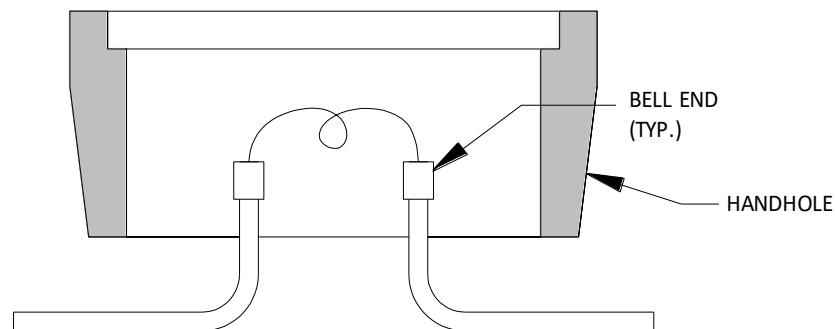
### A. HANDHOLE INSTALLATION

Install handholes for underground raceway systems true to line and grade. Provide a compacted foundation of fine sand or 3/8 minus crushed rock for the bearing surface edges of the handholes.

The handholes shall be installed per the NEC sections 314, and other applicable sections of the NEC.

### B. HANDHOLE CONDUIT INSTALLATION

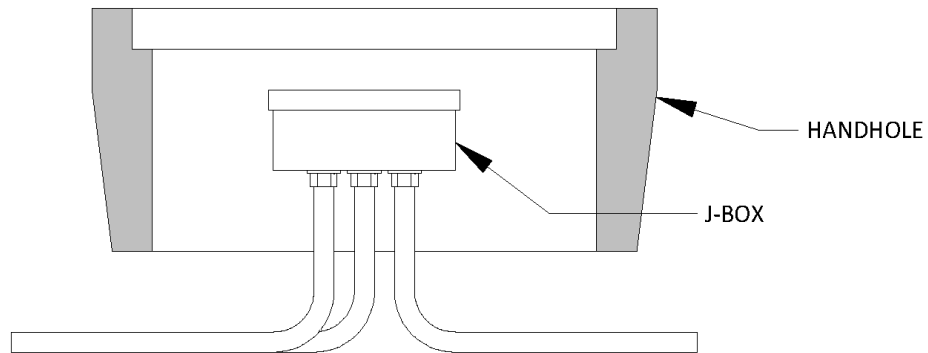
1. End all conduits with a vertical riser.
2. Conduits NOT identified as 100 percent continuous shall be allowed to extend into the handhole as a PVC conduit. Provide a PVC bell-end in each conduit as shown in Figure 4.5.B.2. Provide a removable filler at the end of each conduit to eliminate the possibility of water entry.



**Figure 4.5.B.2**

#### **Typical PVC Conduit Terminations in a Handhole**

3. Conduits identified as 100 percent continuous shall terminate into the bottom of a TYPE J1, TYPE J2, or TYPE J3 junction box, in PVC-Coated RGS conduit as shown in Figure 4.5.B.3. The door of the J-Box shall face upwards.



**Figure 4.5.B.3**

**Typical 100 Percent Continuous Conduit Terminations in a Handhole**

**Exception:**

- *Where a handhole contains only two conduits, and is being used solely as a pulling point, where one conduit is simply an extension of the other, a junction box may be replaced with a PVC-Coated RGS conduit pulling body.*

**C. HANDHOLE GROUNDING**

1. All handholes with metal conduits or with metal lids shall be grounded per Section 16060-3.

**4.6 INSTALLATION OF CONDUITS UNDERGROUND AND IN CONCRETE**

**A. UNDERGROUND RACEWAYS**

1. The minimum conduit depth shall be 24 inches.

**Exceptions:**

- *Electrical utility conduit depth shall be 36 inches.*
- *Unless required otherwise by utility company.*
- *Unless required to be shallower due to physical constraints (see requirements below).*
- *Unless under a concrete slab (see requirements below).*

- *Conduits contains a grounding electrode conductor shall be 30-inches deep.*
2. Conduits that require a buried depth of less than 18 inches shall require a 6-inch-thick concrete covering over that portion of such conduits. Such concrete covers need not be formed but shall be colored red or shall be painted red on top.
  3. Conduits under a concrete slab-on-grade shall be separated from the slab and from the supporting soil by at least 3 inches with soft sand on all sides.
  4. Provide separation of underground instrumentation conduits from power and control conduits by a minimum of 12 inches. Avoid parallel runs of instrumentation conduits with power and control conduits as much as possible. Where instrumentation conduits are required to crossover power or control conduits, maintain the 12-inch separation using depth and make the crossover as close to 90 degrees as possible.

**Exception:**

- *Provide 18 inches of separation between instrumentation conduits and non-linear power conduits.*
5. Run conduits as straight as practicable. Make changes in direction and/or grade of sufficient length to allow a gradual change (3-foot radius minimum). Make slight offsets with 5-degree couplings.
  6. Run trenches true and clear of stones or soft spots. Place 4-inches of fine sand in the trench bottom and tamp into place. Provide preformed plastic spacers on top of sand spaced 5-feet on center.

After the raceway is placed in the trench, backfill 6 inches with sand, then with native earth backfill passing a No. 8 sieve, free of stones. Do not tamp on top of the conduit until the final backfill is placed. Tamp or water-settle the final backfill to finish the grade. Compact the backfill as specified under Section 02300 "Site Earthwork."

7. Mark direct buried conduit by placing a red marking tape a minimum of 12 inches below grade during backfilling of the trench.
8. Seal conduit connections to eliminate leakage.

## B. CONCRETE ENCASED RACEWAYS

Raceways encased in structural concrete must be defined in detail and presented to the Structural Engineer for approval at least 7 days prior to installation. As a minimum, approval will be based on the assurance that there will be no physical interference and that structural integrity will not be jeopardized.

1. In general, conduits encased in concrete may take the most direct route providing they do not jeopardize the structural integrity of the slab or interfere with process-related piping or equipment.
2. Conduits shall be at least 1-1/2 inches to the edge of a concrete body. If a structural block-out is desired for conduit bundling near the edge of a concrete body, then submit the desired layout to the Engineer for approval and design as defined in this Section.
3. Conduit density, crossover, and routing must be minimized and coordinated to assure that structural integrity is not jeopardized.
4. At the point-of-exposure out of the slab, conduits must be perpendicular to the slab surface from all angles.
5. No part of an elbow's bending radius shall be seen at the point-of-exposure from the slab.

## C. CONDUITS IN ELEVATED SLABS

See "CONCRETE ENCASED RACEWAYS" above.

## D. CONDUITS UNDER SLABS ON GRADE

1. No conduits will be encased in slabs less than 8 inches in depth.
2. For slabs-on-grade, all conduits larger than 3/4-inch trade size must be run underground below the slab.
3. All conduits desired to be installed within slabs on grade shall be submitted to the Engineer for approval and design as defined in this Section.

**Exceptions:**

- *Conduits shown on the Plans as being designed into slabs on grade do not require further Engineering approval.*

E. CONDUIT TRANSITIONS

Where raceway exits from grade or concrete, provide the following:

1. All conduits exiting grade or concrete shall be PVC-Coated RGS.

**Exception:**

- *Raceways used for the containment and protection of bare grounding electrode conductors shall be PVC Schedule 80. No portion of these conduits shall be metallic.*
2. For equipment to be moved into place at a later date, install a PVC-Coated RGS coupling flush with the floor slab. Insert a threaded flush plug into the coupling. Provide a pull wire looped backed into the conduit that can be reached after removal of the plug.
  3. Only the straight portion of conduits shall exit grade or concrete. No curved portion of a factory or field-bent conduit shall be visible existing the penetration, even when covered or hidden by equipment.

F. CONDUIT STUB-UPS INTO EQUIPMENT AND ENCLOSURES

1. Where conduits are stubbed up into open bottom equipment and enclosures, extend the bottom of the conduit threads 1/2 inch above grade. Provide ground bushing and end fittings, flush with fitting and 2-inch stub, above the bottom of the enclosure. Stub conduits to a uniform height (plus or minus 1/8 of an inch) and align within plus or minus 1/4 inch.

**Exception:**

- *Conduits that do not meet the requirements of being 100 percent continuous, stubbing up directly under a Motor Control Center that is mounted on a housekeeping pad, shall be allowed to terminate as a PVC conduit with a bell-end.*

2. Locate stub-ups directly under the section gutter into which the conductors they contain are to be routed. Terminate conduit with insulating, grounding type bushing bonded to the ground bus of the equipment.
3. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends are not visible above the finished slab.
4. Unless otherwise noted on the Plans, spare conduits stubbing up through concrete floors and not adjacent to a wall shall be finished flush with floor with an RGS coupling. Provide an in-set metal plug (male thread) into coupling flush with floor.
5. Unless otherwise noted on the Plans, spare conduits stubbing up through concrete floors or grade, and adjacent to a wall or housekeeping pad shall extend 12 inches above slab/grade. The exterior edge of the conduit shall be a minimum of 1 inch from the wall/pad.
6. All stub-ups shall be provided with pull string.
7. Provide conduit labels on all stub-ups which are not flush mounted.

#### G. FIBERGLASS/RTR ELBOWS

1. Types of Joints
  - a. Adhesive Joints: When using an adhesive type joint, the manufacturer's instructions should be followed.
  - b. Adhesive for Fiberglass: The adhesive for fiberglass consists of two parts: resin and hardener. The two materials must be combined before they can be used,
2. Recommended Joining Procedures
  - a. Surfaces to be joined should be clean and free from dirt, foreign materials and moisture. Allow Cleaner to evaporate before applying adhesive.
  - b. Adhesive curing time is the time required for the adhesive in the assembled joint to harden. Cure time is dependent on ambient temperature.

#### **4.7 PROTECTION**

Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensures coatings, and finishes are without damage or deterioration at the time of Substantial Completion.

- A. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
- B. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

#### **4.8 CLEANING**

On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

#### **4.9 QUALITY CONTROL**

##### **A. TESTS**

- 1. Conduits identified as meeting the requirements of 100 percent continuity shall be tested between source and destination as follows:
  - a. Testing shall be performed using a Digital Voltmeter or Biddle ohmmeter.
  - b. Testing values shall not exceed 5 ohms.
  - c. If testing values exceed 5 ohms, then corrective action shall be taken to reduce the resistance to 5 ohms or below.
  - d. These measurements shall be documented, signed, and submitted to the Engineer for approval.

**\*\*\* END OF SECTION \*\*\***



## SECTION 16140

### WIRING DEVICES

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes the various types of receptacles, connectors, switches, and finish plates.

##### 1.2 RELATED WORKS SPECIFIED ELSEWHERE

<u>Section</u>	<u>Items</u>
16050	Basic Electrical Materials and Methods
16130	Raceways and Boxes

##### 1.3 SUBMITTALS

See Section 01300.

##### 1.4 QUALITY ASSURANCE

See Section 16050.

##### 1.5 COORDINATION

###### A. WIRING DEVICES FOR OWNER FURNISHED EQUIPMENT

Match devices to plug connectors for Owner-furnished equipment.

###### B. CORD AND PLUG SETS

Match cord and plug sets to equipment requirements.

##### 1.6 DEFINITIONS

Reference Section 16050, "Definitions."

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

#### **A. AVAILABLE MANUFACTURERS**

Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include the following:

1. Wiring Devices
  - a. Arrow Hart Div., Cooper Industries.
  - b. Bryant Electric, Inc.
  - c. Hubbell Inc.
  - d. Killark Electrical Mfg. Co.
  - e. Leviton Mfg. Co., Inc.
  - f. Pass & Seymour/Legrand.
2. Multi-Outlet Assemblies
  - a. Wiremold Co.

### **2.2 WIRING DEVICES**

Comply with NEMA Standard WD 1, "General Purpose Wiring Devices." Terminals shall be rated for 75 degrees C (min.).

#### **A. ENCLOSURES**

NEMA 1 equivalent, except as otherwise indicated.

#### **B. COLOR**

Ivory except as otherwise indicated or required by Code.

#### **C. RECEPTACLES, STRAIGHT-BLADE AND LOCKING TYPE**

Except as otherwise indicated, comply with Federal Specification W-C-596 and heavy-duty grade of UL Standard 498, "Electrical

Attachment Plugs and Receptacles.” Provide NRTL labeling of devices to verify compliance.

1. General Purpose Convenience Outlets
  - a. Duplex receptacle configuration
  - b. Nylon face
  - c. Staked screw terminals for line, neutral, and ground connections.
  - d. Provisions for split bus
  - e. NEMA 5-20R
2. Special Purpose Receptacles
  - a. Staked screw terminals for line, neutral, and ground connections.
  - b. NEMA configuration as indicated.

**D. RECEPTACLES, STRAIGHT-BLADE, SPECIAL FEATURES**

Comply with the basic requirements specified above for straight-blade receptacles of the class and type indicated, and with the following additional requirements:

1. Ground-Fault Circuit Interrupter (GFCI) Receptacles – Class A (5 mA) Personal Protection

UL Standard 943, “Ground Fault Circuit Interrupters,” with integral NEMA 5-20R duplex receptacle arranged to protect only the connected receptacle and no other receptacles connected on the same circuit. Design units for installation in a 2-3/4-inch-deep outlet box without an adapter.
2. USB Charging Receptacles

UL Listed NEC Class 2 Power Supply integrated into NEMA 5-20R duplex receptacle. Power supply shall feature two USB Type A ports and shall comply with the USB Battery Charging Specification 1.2. Charging output shall be at least 1.5 Amps at each port simultaneously. Power supply shall be FCC Part 15

compliant. Units shall be suitable for installation in a 2-3/4-inch-deep outlet box without an adapter, and shall be compatible with standard GFCI-style faceplates. Leviton T5832 or equal.

E. RECEPTACLES, INDUSTRIAL HEAVY-DUTY

Conform to NEMA Standard PK 4 “Plugs, Receptacles, and Cable Connectors of the Pin and Sleeve Type for Industrial Use.”

Refer to Specification Section 16230 for pin and sleeve generator receptacles.

F. RECEPTACLES IN HAZARDOUS (CLASSIFIED) LOCATIONS

Comply with NEMA Standard FB 11 “Plugs, Receptacles, and Connectors of the Pin and Sleeve Type for Hazardous Locations” and UL Standard 1010 “Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations.”

120 VAC, 1 PH, 20 A and less, receptacles used in Class I, Divisions 1 and 2 areas, shall be dead-front, delayed action, circuit breaking type, rated for use in Class I, Division 1 and 2, Groups B, C, and D areas. These receptacles shall be rated NEMA 3, 7BCD, 9FG, and 12 and shall be suitable for use in explosion proof, dust-ignition proof, and raintight applications. Receptacles shall be rated 20 A, 125 VAC with 3/4” hubs; Crouse-Hinds #ENR 21201 with ENP 5201 plug; Killark UGR2-20231 with UGP-20231QW plug, or equivalent.

G. CONVENIENCE RECEPTACLES IN WET LOCATIONS

Convenience receptacles in wet locations shall comply with NEC Article 406.9 and shall be 20 A, 125 VAC rated terminated with binding screws.

H. PENDANT CORD/CONNECTOR DEVICES

Matching, locking type, plug and plug receptacle body connector, NEMA L5-20P and L5-20R, heavy-duty grade.

1. Bodies

Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.

2. External Cable Grip

Woven wire mesh type made of high-strength galvanized-steel wire strand and matched to cable diameter and with attachment provision designed for the corresponding connector.

I. CORD AND PLUG SETS

Match voltage, current ratings, and number of conductors to requirements of the equipment being connected.

1. Cord

Rubber-insulated, stranded copper conductors, with type SOW-A jacket. Grounding conductor has green insulation. Ampacity is equipment rating plus 30 percent minimum.

2. Plug

Male configuration with nylon body and integral cable-clamping jaws. Match to cord and to receptacle type intended for connection.

J. SNAP SWITCHES

Quiet-type ac switches, NRTL listed and labeled as complying with UL Standard 20 “General Use Snap Switches,” and with Federal Specification W-S-896.

1. Lighting Switches

120/277 Vac only, rated 20 amperes.

2. Motor Rated Switches

Horsepower rated for application indicated.

K. OCCUPANCY SENSING LIGHT SWITCH

Provide occupancy sensing light switches in all office, lab, kitchen, break rooms, and restrooms.

1. Switches shall be 120/277 V, passive infrared/ultrasonic, commercial grade, white, with adjustable time delay of 30 seconds to 30 minutes, Leviton OSSMT-MDW or equal.

**L. WALL PLATES**

Single and combination types that mate and match with corresponding wiring devices. Features include the following:

1. Color  
Matches wiring device except as otherwise indicated.
2. Plate-Securing Screws  
Metal with heads colored to match plate finish.
3. Material for Interior Finished Spaces  
Lexan, except as otherwise indicated.
4. Material for Interior Unfinished Spaces: Galvanized steel.
5. Material for Laboratories: Stainless steel.
6. Material for Exterior or Wet Locations: Cast Aluminum.

**2.3 MULTI-OUTLET ASSEMBLIES**

A. Comply with Standard UL 5, "Surface Metal Raceways and Fittings."

**B. COMPONENTS OF ASSEMBLIES**

Products of a single manufacturer designed to be used together to provide a complete matching assembly of raceways and receptacles.

**C. RACEWAY MATERIAL**

Metal, with manufacturer's standard corrosion-resistant finish.

**D. WIRE**

No. 12 AWG.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

#### **A. IDENTIFICATION**

Each receptacle, whether convenience, or dedicated, shall be labeled with the circuit from which its power is derived. Label as “CKT-XX” where XX = numerical circuit number.

1. Only one Panelboard servicing the site:

Label as “CKT-XX” where XX = numerical circuit number within the Panelboard.

2. More than one Panelboard servicing the site:

Label as “CKT XX-YY” where XX = Panelboard number and YY = numerical circuit number within the Panelboard.

Example:

A receptacle powered from circuit 03 of Panelboard [01 PB 02] would be labeled “CKT 02-03.”

#### **B. RECEPTACLE BOXES**

1. Reference Section 16130 for box types.

2. Mounting Height

- a. Indoor, in DRY Areas

Indoor receptacle boxes in DRY areas shall be mounted 12 inches above the floor unless shown otherwise on the Plans.

- b. Indoor, in WET Areas

Indoor receptacle boxes in WET areas shall be mounted 42 inches above the floor unless shown otherwise on the Plans.

c. Outdoor

Outdoor receptacle boxes shall be mounted 18 inches above grade unless shown otherwise on the Plans.

3. Reference Section 16130 for box cover types.

C. CONVENIENCE RECEPTACLES

Convenience receptacles shall be 20 A, duplex, white, GFCI, straight blade, 3-wire, grounding, unless called out otherwise on the Plans.

In addition to any GFCI requirements, all receptacles, convenience or dedicated, located in break rooms and kitchens shall be AFCI.

D. DEDICATED RECEPTACLES

Dedicated receptacles shall be 20 A, simplex, gray, non-GFCI, straight blade, 3-wire, grounding, unless called out otherwise on the Plans.

In addition to any GFCI requirements, all receptacles, convenience or dedicated, located in break rooms and kitchens shall be AFCI.

Dedicated receptacles shall include a red phenolic placard with 3/8-inch lettering over the receptacle stating:

<p>NON-GFCI RECEPTACLE FOR (<i>specific device</i>) NOT INTENDED FOR GENERAL USE</p>
--

E. ARRANGEMENT OF DEVICES

Except as otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.

1. See “Raceways and Boxes” Section for mounting height of devices.
2. Verify locations of outlets and switches in cabinetry with cabinet supplier and Owner prior to installation.



## F. INSTALLATION PRACTICES

1. Install devices and assemblies plumb, level, flush and secure. Provide spacers on device screws to flush yokes or flanges to surface of wall within 1/16 of an inch where boxes are not flush with the wall surface. Install wiring devices such as receptacles to withstand 50 pounds force applied perpendicular to the device face with a maximum deflection of 1/16 of an inch.
2. Protect devices and assemblies during painting.
3. Use corrosion resistant devices in kitchen areas and outdoors.
4. Wiring connections shall be made by compression on the screw terminals. The wire shall be neatly and symmetrically wrapped around the screw a minimum of 180 degrees.

## G. LIGHT SWITCH ORIENTATION

Install switches with the “off” position down. Install three and four way switches so the load is “off” when all switch handles are down.

## H. TERMINATION PRACTICES

Connect phase, neutral, and grounding wires to devices with full loops around screws installed to tighten with tightening of the screw. Trim insulation to within 1/8 of an inch of screw terminal.

## I. WALL PLATES

Install after painting is complete. Install with an alignment tolerance of 1/16 of an inch to plumb. Install at flush mounted devices so that all four edges are in continuous contact with finished wall surface without the use of mats or similar devices. Do not use plaster fillings.

### 3.2 GROUNDING

Connect receptacle or switch ground lug to device box for devices other than isolated ground type.

### 3.3 FIELD QUALITY CONTROL

Test wiring devices for proper connections, polarity, and ground continuity. Perform this testing with testing equipment designed for testing polarity and connections.

Operate each operable device at least six times.

Demonstrate charging the owner's electronic devices at each USB receptacle.

Test ground-fault circuit interrupter operation with local fault simulations, using a tester designed for such testing, and according to manufacturer recommendations. Testing with integral test switches on the receptacle is not sufficient for this testing.

Replace damaged or defective components, and retest.

**\*\*\* END OF SECTION \*\*\***

## SECTION 16210

### ELECTRICAL UTILITY SERVICES

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section consists of electrical service and connection to the commercial power utility system (Power Company) and the work required in conjunction with the Power Company for their revenue metering. For this project the Power Company is Puget Sound Energy.

##### 1.2 RELATED WORKS SPECIFIED ELSEWHERE

<u>Section</u>	<u>Items</u>
01500	Temporary Facilities
16050	Basic Electrical Materials and Methods
16060	Grounding and Bonding
16120	Conductors and Cables
16130	Raceway and Boxes

#### PART 2 PRODUCTS

##### 2.1 MATERIALS

- A. Primary circuit to utility transformer, including vaults conduit, primary cable and utility transformer: provided by the Power Company.
- B. Current transformer and revenue metering: provided by the Power Company.
- C. Meter socket, current transformer enclosure, and connecting conduit: provided by the Contractor.

#### PART 3 EXECUTION

##### 3.1 APPLICATION

The Contractor shall make application for service to the Power Company on the Owners behalf. A lump sum bid item has been added to the bid proposal for purposes of bid evaluation. Contractor shall be paid the actual invoice cost from the Power Company.

Coordinate with the Power Company to ensure that their metering and service requirements are met.

- A. The Contractor is responsible for any work necessary to place the service in operation as a complete installation. Provide any materials required and do any work necessary that is not provided or completed by the Power Company.
- B. Pay any service charges or construction fees required for the electrical services to the Project.
- C. Provide excavation and backfill for the Power Company's circuits and vaults. Locate the trench for such circuits as directed by the utility.
- D. Provide excavation, for vaults and conduits, to utility requirements.

### **3.2 INSTALLATION**

- A. The Power Company will:
  - 1. Install the revenue meter.
  - 2. Install the primary conductors, conduits, and utility transformer.
- B. The Contractor is responsible to provide and/or install the following:
  - 1. Excavation for vaults/junction boxes and trench associated with the Primary circuit.
  - 2. Meter base and current transformer (CT) enclosure.
  - 3. Secondary conduits and conductors from the utility transformer to the service disconnect.

**\*\*\* END OF SECTION \*\*\***

## SECTION 16280

### SURGE PROTECTIVE DEVICES

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section describes the materials and installation requirements for Surge Protective Devices (SPD).

##### 1.2 RELATED WORK SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
16050	Basic Electrical Materials and Methods
16060	Grounding and Bonding

##### 1.3 DEFINITIONS

###### A. SURGE PROTECTIVE DEVICE (SPD)

Device(s) used for the protection of all AC electrical circuits from the effects of lightning induced currents, substation switching transients, and internally generated transients. The primary technology is a metal oxide varistor(s) (MOV). This term is typically used in our Plans and Specifications with reference to providing system wide protection at the highest voltage level in the system on the Owner side of the Utility and lower voltage distribution.

###### B. SURGE SUPPRESSOR

A surge protective device which protects AC circuits as above. All surge suppressors are SPDs but the term is typically used in our Plans and Specifications with reference to protection of process and instrumentation circuits at 120 VAC or less. The protective amp rating specified for what we call a surge suppressor is less than that of what we call a SPD. Refer to specific Section 16940 for control system surge suppressors.

###### C. TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS)

This term has the same definition as SPD above.

D. UL DEFINED “TYPES” OF SPDs

1. Type 1

A permanently connected SPD intended for installation between the secondary of the service transformer and the line side of service disconnect/overcurrent device, as well as the load side, including watt-hour meter socket enclosures and intended to be installed without an external overcurrent protective device.

2. Type 2

A permanently connected SPD intended for installation on the load side of the service disconnect overcurrent device, including SPDs located at the branch panel.

E. USER DEFINED TYPES OF SPDs

1. Power SPDs

Power SPDs are those units  $\geq 150$  VAC and  $\geq 30$  A.

2. Control SPDs

Control SPDs are those units  $< 150$  VAC and  $< 30$  A.

## 1.4 REFERENCES

Most recent editions of:

- A. ANSI/IEEE: C62.41.1, C62.41.2, C62.45, and C62.48.
- B. National Electric Code: Articles 240 and 285.
- C. Underwriters Laboratories: UL1449 3<sup>rd</sup> Edition, UL1283 and UL 96A.
- D. Milstandard 220: Test Method Standard.

## **1.5 SUBMITTALS**

- A. Submit under the provisions of Section 01300.

Submittals shall include the following:

1. Published specifications, cut sheets and product data showing that all the requirements of the Plans and Specifications have been met. Clearly identify the product series, model(s) and part numbers being submitted.
2. The Engineer reserves the right to accept or reject any or all submittals, to request additional information as deemed necessary, or to request submittals for a different unit deemed more appropriate for this installation.
3. Proof of UL1449 Third Edition compliance from Nationally Recognized Test Lab (NRTL) accepted by local authority having jurisdiction, including Voltage Protection Rating (VPR) and Nominal Discharge Ratings.
4. UL1283 filter compliance documentation (where filtering is provided).
5. Warranty Terms, Conditions and Documentation.
6. Electrical and mechanical shop drawings.
7. Installation requirements/instructions.

## **1.6 QUALITY ASSURANCE**

- A. See Section 16050.
- B. Manufacturer shall have local representation and distribution within 400 miles of the project location to provide technical, warranty claim, and installation support for the project.
- C. Only firms regularly engaged in the manufacture of SPD products for not less than 5 years, shall be considered.
- D. Single manufacturer shall be capable of providing all power system SPDs.
- E. Manufacturer shall have ISO 9001 Certification for products.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

A. The following manufacturer(s) have been preapproved and are the only products which shall be accepted. Additional manufacturers shall contact the Engineer for consideration on future projects but shall not submit here.

1. Innovative Technology – PTX and PTE series.
2. Schneider Electric – EMA and EBA series.
3. Total Protection Solutions – ST series and LP series.

#### **Exceptions:**

- *Units listed above which have been rebranded for use in other manufacturer's equipment.*
- *Units that are required to be used for maintaining a UL listing as part of a larger UL assembly.*

### **2.2 SURGE PROTECTIVE DEVICE**

#### **A. DESIGN**

1. Surge Protective Devices shall be NRTL listed in accordance with 1449 3rd Edition and UL1283.
2. This specification includes power SPDs only. Reference Specification 16940, Control Panels for control SPDs.
3. SPD shall be compatible with the electrical system voltage, current, system configuration and intended applications.
4. Parallel design only with individual protection components for the following modes:
  - a. Line to Ground and Line to Line for Delta and High Resistance Grounded systems.
  - b. Line to Ground, Line to Neutral and Neutral to Ground for Wye and Single Phase distribution systems.



5. SPD shall be NRTL listed and SCCRs shall have a 200 kA rating. It is providers' responsibility to obtain this information and verify SPD is appropriately rated for application.
6. At the service entrance, on the load side of the service disconnect, a UL approved disconnect switch shall be provided as a means of disconnect if a breaker is not available.
7. Metal-Oxide Varistors (MOV) components shall be utilized as primary energy mitigation. Selenium cell, air gaps, gas tubes are not allowed.
8. Protection Status
  - a. Visual indication of protection status on each phase, or indication of a failure, visible from the front of the equipment.
  - b. Normally Open and Normally Closed Form C contacts rated a minimum of .5 Amps AC or DC. Contacts shall change state upon failure of SPD or power loss.
9. Enclosure
  - a. NEMA rated metal enclosure appropriate for environmental conditions and exposure at point of installation. NEMA 12 unless otherwise shown in the Plans.
  - b. Designed to allow connection of the SPD without sharp bends in the conductors without exceeding NEC maximum bending radius of conductors.
10. SPD shall also include a passive filter circuit which allows the SPD to actively follow the voltage waveform and provide a clamping envelope to limit low level IEEE C62.41 ringwaves (of either polarity) at all locations on the sine wave. This circuit shall also perform in the Neutral to Ground Mode.
11. Maximum continuous operating voltage (MCOV) of all components (based on ANSI C84.1 standard voltages), not less than 115 percent for all installations.

12. Surge Protective Device Warranty Requirements

a. Period

20 years from the date of substantial completion of service and activation of the system to which the SPD is attached.

b. Full replacement of a suppressor which is damaged or fails to meet manufacturers published specifications and specifications provided within, without pro-rating value.

c. No exclusions from failure or damage from any system anomaly (over-voltage, single phasing, lightning strike, etc. (IEEE 62.41.1). Exceptions: failure caused by wiring error, loose or missing Neutral to Ground Bond or Meggar Testing with SPD connected to power system.

d. Factory or third party testing shall not be required.

e. Warranty shall apply independent of facility ownership/purchaser.

f. Replacement unit to be at facility within 10 business days of receipt of written notification of failure at no cost to the customer (exception – custom configuration or special order units).

g. Replacements

Same make, model and configuration as original unit unless otherwise requested or approved.

h. No shipping, handling, examination or other fees are allowed.

B. PERFORMANCE AND RATINGS

1. Minimum durability and performance requirements are described below in accordance with test procedures outlined in ANSI/IEEE C62.45 and UL1449 Third Edition.

a. Provide Peak Surge Current (Single Pulse Rated, 8/20 $\mu$ S, by mode, Amperes) with submittals document for each SPD proposed. Ratings shall be provided for each applicable protection mode (L-L, L-N, L-G & N-G).

- b. Unless shown otherwise in the Plans, the minimum surge current capability (single pulse rated) per phase shall be:
  - i. Service Entrance: [240kA per phase/120kA per mode] or [160 kA per phase/80kA per mode]
  - ii. Distribution panelboards and MCC: 160 kA per phase/80kA per mode
  - iii. Branch panelboards: 120 kA per phase/60kA per mode
- c. All SPD devices (including branch panel) shall withstand a minimum of 2,000, 20kV/10kA, 1.2 x 50 $\mu$ S - 8x20 $\mu$ S combination waveform hits delivered at a rate not exceeding one pulse per minute without failure or degradation exceeding 5 percent using IEEE B3 6kV/3kA combination waveform for pre and post durability let through measurement evaluation. Lead length for testing and let through measurements shall be 6 inches.
- d. UL Third Edition Nominal Discharge Current Ratings shall be a minimum of 20kA per mode for SPD's to be installed at the Service Entrance and a minimum of 10kA per mode for all other locations.
- e. EMI/RFI Attenuation values shall be provided (as per Mil Std-220). Attenuation shall be 40dB at 100kHz.
- f. Maximum SPD let through voltage values are provided in Table 1 and 2 below.

**Table 1 - Peak Voltage Let Through Voltage Table for  $\geq 160$  kA Units (at/ near Service Entrance locations)**

\*Peak Let Through Voltages (measured from zero reference) shall not exceed:

Voltage/Configuration	Test/IEEE Wave	L-N	L-G	L-L	N-G	Phase Angle
480/277 Wye - Grounded	C3 – 20kV/10kA	1500	1800	2200	1600	90
480/277 Wye - Grounded	B3/C1 – 6 kV/3kA	1000	1075	1725	1075	90
480/277 Wye - Grounded	A1 – 2kV/67A	520	530	830	250	90
480/277 Wye - Grounded	A1 – 2kV/67A	85	155	115	110	180
480/277 Wye - Grounded	UL1449 VPR	1000	1000	1800	1000	----
480 Delta	C3 – 20kV/10kA	N/A	2200	2200	N/A	90
480 Delta	B3/C1 – 6 kV/3kA	N/A	1775	1750	N/A	90
480 Delta	A1 – 2kV/67A	N/A	1300	780	N/A	90
480 Delta	A1 – 2kV/67A	N/A	1200	100	N/A	180
480 Delta	UL1449 VPR	N/A	1800	1800	N/A	----
120/208 Wye	C3 – 20kV/10kA	1000	1200	1300	1100	90
120/208 Wye	B3/C1 – 6 kV/3kA	565	590	925	550	90
120/208 Wye	A1 – 2kV/67A	260	390	360	260	90
120/208 Wye	A1 – 2kV/67A	75	115	90	100	180
120/208 Wye	UL1449 VPR	600	700	900	600	-----
120/240 Split Phase	C3 – 20kV/10kA	1000	1200	1300	1100	90
120/240 Split Phase	B3/C1 – 6 kV/3kA	565	590	925	550	90
120/240 Split Phase	A1 – 2kV/67A	260	390	360	250	90
120/240 Split Phase	A1 – 2kV/67A	75	115	90	100	180
120/240 Split Phase	UL1449 VPR	600	700	900	600	-----

\*Testing shall be completed with a minimum of 6 inches of lead length outside of device enclosure and shall be measured from zero voltage crossing.

Note: Category A1 Ringwave applicable for locations where Active Tracking units are to be installed, including 120/208 and 120/240 Branch Panels and protection for dedicated equipment loads (where noted).

**Table 2 – Peak Limiting (Let Through) Voltage Table for ≥ 80 kA Units (Branch/Sub Panel, MCC, etc.)**

\*Peak Let Through Voltages (measured from zero reference) shall not exceed:

Voltage/Configuration	Test/IEEE Wave	L-N	L-G	L-L	N-G	Phase Angle
480/277 Wye - Grounded	C3 – 20kV/10kA	1500	1800	2200	1600	90
480/277 Wye - Grounded	B3/C1 – 6kV/3kA	1050	1070	1750	970	90
480/277 Wye - Grounded	A1 – 2kV/67A	490	530	830	270	90
480/277 Wye - Grounded	A1 – 2kV/67A	100	150	150	100	180
480/277 Wye - Grounded	UL1449 VPR	1000	1000	1800	1000	----
480 Delta	C3 – 20kV/10kA	N/A	2200	2200	N/A	90
480 Delta	B3/C1 – 6 kV/3kA	N/A	1700	1700	N/A	90
480 Delta	A1 – 2kV/67A	N/A	1300	780	N/A	90
480 Delta	A1 – 2kV/67A	N/A	1100	75	N/A	180
480 Delta	UL1449 VPR	N/A	1800	1800	N/A	----
120/208 Wye	C3 – 20kV/10kA	1000	1200	1300	1100	90
120/208 Wye	B3/C1 – 6 kV/3kA	560	575	900	500	90
120/208 Wye	A1 – 2kV/67A	260	400	370	250	90
120/208 Wye	A1 – 2kV/67A	75	100	75	75	180
120/208 Wye	UL1449 VPR	600	700	900	600	-----
120/240 Split Phase	C3 – 20kV/10kA	1000	1200	1300	1100	90
120/240 Split Phase	B3/C1 – 6 kV/3kA	560	575	900	500	90
120/240 Split Phase	A1 – 2kV/67A	260	400	370	250	90
120/240 Split Phase	A1 – 2kV/67A	75	100	75	75	180
120/240 Split Phase	UL1449 VPR	600	700	900	600	-----

\*Testing shall be completed with a minimum of 6 inches of lead length outside of device enclosure and shall be measured from zero voltage crossing.

Note: Category A1 Ringwave applicable for locations where Active Tracking units are to be installed, including 120/208 and 120/240 Branch Panels and protection for dedicated equipment loads (where noted). Please note the phase angle is 90 degrees and measurement is positive peak voltage measured from zero reference. Measurements at 180 degrees will show significantly lower let through voltages (sine wave peak voltage is zero at 180 degrees).

### C. ADDITIONAL REQUIREMENTS

1. Surge Protective Devices shall be provided with integral disconnect switch, short circuit and overcurrent device when a breaker is not available for connection the suppressor. Type 1 locations do not require short circuit and overcurrent protection.
2. Multi-function surge counter, phase loss indicator and system status monitor LCD event indication, LED phase loss indication and audible alarm (Plan designation – SD). Provide for system reset and silence audible alarm.]

## 2.3 EXECUTION

- A. Surge Protective Devices shall be installed per manufacturer's installation instructions with lead lengths not to exceed 24 inches. Gently twist conductors together. Sharp bends shall not be made.
- B. Surge Protective Devices shall be installed in electrical circuit locations shown on the Plans.
- C. Units other than Type 1 devices shall not tap directly to the bus without upstream over-current protection unless tap conductors are protected at their termination by NRTL listed Disconnect, Over-current and Short Circuit Protective Devices (Fuse with Disconnect and/or Circuit Breaker) properly rated for conductor and SPD Device Protection as per NRTL listing and NEC requirements.
- D. Inspect and test SPD devices as per manufacturer specification and installation guidelines.
- E. The Owner or their appointed representative may perform inspection of the installed suppressors. Owner reserves the right to require corrections to the installation to comply with manufacturer installation requirements and project specifications.
- F. Service Entrance Installation Requirements
  - 1. One primary suppressor at each utility service entrance to the facility or as indicated on the Plans.
  - 2. Suppressors shall be connected to properly rated disconnect with overcurrent and short circuit protective device connected on the load side of the service entrance disconnecting means in accordance with NEC requirements.
  - 3. Conductors between suppressor and point of attachment shall be kept as short and straight as possible and shall be grouped together (via tie wrap) where possible. Lead length of connecting conductor shall not exceed 2 feet without written permission of the Engineer.
  - 4. Suppressor's ground shall be bonded to enclosure frame and the service entrance ground bus, and conduit between the SPD and the switchboard must provide secure electrical/mechanical connections.

**G. DISTRIBUTION CENTERS, MOTOR CONTROL CENTERS,  
BUSWAY AND BRANCH PANEL APPLICATIONS**

1. Where required, suppressor shall be connected to properly rated disconnect with overcurrent and short circuit protective device in accordance with NEC requirements.
2. The SPD shall not limit the use of feed through lugs, sub-feed lugs and sub-feed breaker options. Where feed through lugs, bus tap or circuit breaker is used to feed adjacent sub-panel, SPD shall be installed at first panel served by feeder and conductor terminations between primary panel and adjacent panel shall be installed in such a manner to keep wiring as short as possible (i.e., use bottom lug on output of panel and bottom lugs on input of second panel).
3. Conductors between suppressor and point of attachment shall be kept as short and straight as possible and shall be grouped together (via tie wrap) where possible. Mount the SPD directly adjacent to the circuit breaker closest to the neutral bus, so the maximum length of connecting wiring shall not exceed 18 inches for all leads without written permission of the Engineer.
4. Suppressor's ground shall be bonded to enclosure frame and the equipment ground bus, and the electrical fitting between the SPD and the switchboard must provide secure electrical/mechanical connections.
5. The electrical gear shall be capable of being re-energized upon removal of the SPD.

**\*\*\* END OF SECTION \*\*\***

## **SECTION 16410**

### **ENCLOSED SWITCHES, FUSES AND CIRCUIT BREAKERS**

#### **PART 1 GENERAL**

##### **1.1 SCOPE**

The work specified in this Section consists of individually mounted switches and circuit breakers used for the following:

- A. Feeder and equipment disconnect switches
- B. Feeder and branch-circuit protection

##### **1.2 RELATED WORKS SPECIFIED ELSEWHERE**

<u>Sections</u>	<u>Item</u>
01300	Submittals
16050	Basic Electrical Materials and Methods
16140	Wiring Devices

##### **1.3 SUBMITTALS**

Submit under the provisions of Section 01300.

Manufacturer's Product Data for disconnect switches, circuit breakers, and accessories specified in this Section.

Maintenance data for tripping devices to include in the operation and maintenance manual specified in Section 16050.

##### **1.4 QUALITY ASSURANCE**

See Section 16050.

Obtain disconnect switches and circuit breakers from one source and by a single manufacturer.



## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

#### **A. AVAILABLE MANUFACTURERS**

Subject to compliance with requirements, manufacturers offering disconnect switches and circuit breakers that may be incorporated into the work include the following:

1. General Electric Co.; Electrical Distribution and Control Division.
2. Siemens Energy & Automation, Inc.
3. Square D Co.
4. Eaton, Cutler Hammer.

### **2.2 ENCLOSED CIRCUIT BREAKERS**

#### **A. ENCLOSED, MOLDED-CASE CIRCUIT BREAKER**

NEMA AB 1, with lockable handle in both the open and closed positions.

#### **B. CHARACTERISTICS**

Frame size, trip rating, number of poles, and auxiliary devices as indicated on the Plans with interrupting rating to meet available fault current.

1. Main and feeder breakers shall be molded case breakers with thermal magnetic trip.
2. Motor circuit breakers shall be magnetic only trip with adjustable trip setting.
3. Branch circuit breakers shall be molded case, thermal-magnetic trip, trip-free with non-interchangeable, non-adjustable trip unless otherwise noted.

#### **C. APPLICATION LISTING**

Appropriate for application, including switching fluorescent lighting loads (SWD) or heating, air-conditioning, and refrigerating equipment (HACR).

D. MOLDED-CASE SWITCH

Where indicated, molded-case circuit breaker without trip units.

E. LUGS

Mechanical lugs and power-distribution connectors suitable for copper conductors of the number and size indicated.

F. SHUNT TRIP

Where indicated.

G. ACCESSORIES

As indicated.

NEMA AB 1, Type 4X stainless steel unless stated otherwise in the Plans.

### **PART 3 EXECUTION**

#### **3.1 COORDINATION OF ELECTRICAL PROTECTION DEVICES**

- A. The Contractor shall provide coordination of circuit breakers, fuses, and other associated protective devices.
1. For adjustable breakers, provide the values for continuous, short-time, instantaneous, ground fault, and other relevant trip and delay settings. Adjust breakers as per 3.4.
  2. Provide to the Owner and Engineer calculations, plots, and overlays that clearly show proper coordination of protection circuits.

#### **3.2 INSTALLATION**

- A. Install the disconnect switches and circuit breakers level and plumb in locations as indicated, according to manufacturer's written instructions.
- B. Install wiring between disconnect switches, circuit breakers, control, and indication devices.

- C. Connect disconnect switches and circuit breakers and components to wiring system and to ground as indicated and as instructed by manufacturer.
  - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- D. Identify each disconnect switch and circuit breaker according to requirements specified in Section 16050.

### **3.3 FIELD QUALITY CONTROL**

#### **A. TESTING**

##### **1. Prior to Energization**

After installing disconnect switches and circuit breakers, perform visual and mechanical inspection of enclosure and devices.

Provide third party breaker testing per Specification 16050, Section 3.

Check connections and mounting for proper torque.

Remove any burrs, filings, or other foreign materials from enclosure. Completely wipe down and vacuum enclosure.

##### **2. After Energization**

After electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

Correct malfunctioning units on site where possible and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

**\*\*\* END OF SECTION \*\*\***

## SECTION 16440

### PANELBOARDS

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section consists of lighting, power, and distribution panelboards, and associated auxiliary equipment rated 600 V and less.

##### 1.2 RELATED WORKS SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
16050	Basic Electrical Materials and Methods
16060	Grounding and Bonding

##### 1.3 SUBMITTALS

Submit under the provisions of Section 01300.

###### A. PRODUCT DATA

For each type of panelboard, accessory item, and component specified.

###### B. SHOP DRAWINGS

For panelboards. Include dimensioned plans, sections, and elevations. Show tabulations of installed devices, major features, and voltage rating. Include the following:

1. Enclosure type and mounting.
2. Bus configuration and current ratings.
3. Short-circuit current rating of panelboard.
4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.

###### C. PANELBOARD SCHEDULES

For installation in panelboards and inclusion in the maintenance manuals specified in Division 1. Submit final versions prior to closeout of project.

D. MAINTENANCE DATA

For panelboard components to include in the maintenance manuals specified in Division 1. Include manufacturer's written instructions for testing circuit breakers.

**1.4 QUALITY ASSURANCE**

See Section 16050.

Subject to compliance with requirements, provide products by the following:

A. REFERENCED STANDARDS

1. National Electrical Manufacturers Association (NEMA):
  - a. NEMA 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
  - b. NEMA PB 1, Panelboards.
2. National Fire Protection Association (NFPA):
  - a. 70, National Electrical Code (NEC).
3. Underwriters Laboratories, Inc. (UL):
  - a. 50, Standard for Safety Cabinets and Boxes.
  - b. 67, Standard for Safety Panelboards.

**1.5 EXTRA MATERIALS**

Reference Specification Section 16050 for spare parts.

All panelboards associated with a project shall be the same manufacturer.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

#### **A. MANUFACTURERS**

Subject to compliance with requirements, provide products by the following:

1. General Electric Co.; Electrical Distribution & Control Div.
2. Eaton, Cutler-Hammer.
3. Siemens Energy & Automation, Inc.
4. Square D Co.

### **2.2 PANELBOARD FABRICATION**

#### **A. MANUFACTURED UNITS**

Standards: NEMA PB 1, NFPA 70, UL 50, UL 67.

#### **B. RATINGS**

1. Bus current, voltage, number of phases, and number of wires as shown on the Plans.
2. Short Circuit Fault Rating
  - a. 250 Vac or Less  
  
10 kAIC minimum short circuit rating or as indicated on the Plans, whichever is the greater.
3. Service Entry Equipment rated when indicated on the Plans.

#### **C. BUS BARS**

1. Main Bus Bars
  - a. Plated drawn copper of 98 percent conductivity sized to limit temperature rise to a maximum of 65 degrees C above an ambient temperature of 40 degrees C.

- b. Drilled and tapped and arranged for sequence phasing of the branch circuit devices.
2. Ground Bus
- a. Ground bus shall be full size (100 percent) rated unless shown otherwise on the Plans.
  - b. Ground bus shall be bonded to the box.
  - c. Provide additional isolated ground bus when indicated on the Plans.
  - d. Compression type connectors.
3. Neutral Bus Bars
- a. Insulated, full size (100 percent) rated unless shown otherwise on the Plans.
  - b. Compression type connectors.

D. CONSTRUCTION

- 1. Interiors shall be factory assembled and designed such that switching and protective devices can be replaced without disturbing adjacent unit and without removing the main bus connectors.
- 2. Main Lugs
  - a. Compression type approved for copper and aluminum.

E. ENCLOSURES

- 1. Boxes
  - a. Code gauge galvanized steel, furnished without knockouts.
- 2. Trim Assembly
  - a. Code gauge galvanized steel, finished with rust-inhibited primer and manufacturer's standard paint inside and out.

3. Distribution, Lighting and Appliance Panelboard
  - a. Trims supplied with hinged door over all circuit breaker handles.
  - b. Trims for surface mounted panelboards shall be the same size as the box.
  - c. Trims for flush mounted panelboards shall overlap the box by 3/4 inch on all sides.
  - d. Doors on panelboard front, with concealed hinges, secured with corrosion resistant chrome-plated flush catch and tumbler lock, all keyed alike.
  - e. Nominal 20-inch wide by 5-3/4-inch deep with gutter space in accordance with NEC.
  - f. Clear plastic cover for directory card on the inside of each door.
  - g. Enclosure
    - i. Outdoor Locations: NEMA 3R unless stated otherwise on the Plans.
    - ii. Indoor Wet Locations: NEMA 12 unless stated otherwise on the Plans.
    - iii. Indoor Dry Locations: NEMA 1 unless stated otherwise on the Plans.
4. Power Distribution Panelboard
  - a. Trims cover all live parts with switching device handles accessible.
  - b. Less than or equal to 12-inches deep with gutter space in accordance with NEC.
  - c. Doors on panelboard front, with concealed hinges, secured with corrosion resistant chrome-plated flush catch and tumbler lock, all keyed alike.



- d. Clear plastic cover for directory card on the inside of each door.
- e. Enclosure
  - i. Outdoor Locations: NEMA 3R unless stated otherwise on the Plans.
  - ii. Indoor Wet Locations: NEMA 12 unless stated otherwise on the Plans.
  - iii. Indoor Dry Locations: NEMA 1 unless stated otherwise on the Plans.

F. HAZARDOUS AREAS INDICATED ON PLANS

NEMA 250, Type 7C.

G. SERVICE EQUIPMENT APPROVAL

Listed for use as service equipment for panelboards with main service disconnect.

1. Future Devices

Equip with mounting brackets, bus connections, and necessary appurtenances, for the overcurrent protective device ampere ratings indicated for future installation of devices.

H. SPECIAL FEATURES

Include the following features for panelboards:

1. Skirt for Surface-Mounted Panelboards

Same gage and finish as panelboard front, removable, with flanges for attachment to panelboard, wall, and floor.

I. Provide same size boxes for multisection panelboards.

1. Extra Gutter Space

Dimensions and arrangement as indicated.

2. Subfeed  
Overcurrent protective device or lug provision as indicated.
3. Feed-through Lugs  
Sized to accommodate feeders indicated.
4. Main Breaker: Vertical mounting.

## **2.3 OVERCURRENT AND SHORT CIRCUIT PROTECTIVE DEVICES**

### **A. MAIN OVERCURRENT PROTECTIVE DEVICE**

1. Molded-Case Circuit Breaker, NEMA AB 1, handle lockable.
2. Vertical mounting unless stated otherwise in the Plans.

### **B. BRANCH OVERCURRENT PROTECTIVE DEVICES**

1. Shall be bolt-on molded case circuit breakers
2. The minimum breaker size shall be 15 Amp unless stated otherwise on the Plans.
3. Characteristics
  - a. Frame size, trip rating, number of poles, and auxiliary devices as indicated on the Plans.
  - b. Fault current rating as defined herein and as indicated on the Plans.
  - c. Where branch circuit breakers are shown on the Plans to be GFCI the GFCI shall be Class A (5 mA), sometimes called a “Personal Protection” GFCI.
4. Application Listing
  - a. Appropriate for application, including Type SWD for switching fluorescent lighting loads and Type HACR for heating, air-conditioning, and refrigerating equipment.

5. Circuit Breakers, 200 A and Larger
  - a. Trip units shall be interchangeable within frame size.
6. Circuit Breakers, 400 A and Larger
  - a. Field-adjustable short-time and continuous current settings.
7. Circuit breakers, under 200 A
  - a. Thermal-magnetic, trip-free, non-interchangeable, non-adjustable.
8. Lugs
  - a. Mechanical lugs and power-distribution connectors for copper conductors of number and size indicated.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

Install panelboards and accessory items according to NEMA PB 1.1.

Setup, adjust and fasten in place flush trim and interiors.

Install circuit breakers as shown on the "Panelboard Schedule" for each panelboard. Record all circuit breaker installation deviations from the "Panelboard Schedule" and show on the Record Drawings the actual size and pole position of all circuit breakers installed.

Do not remove knockouts for breaker positions unless a breaker is to be installed (reference EXTRA MATERIALS, UNUSED CIRCUITS in this Section). Where twistouts or knockouts are removed in error, provide a circuit breaker (one pole, 20-ampere) to fill each position removed.

#### **A. MOUNTING HEIGHTS**

Top of trim 74 inches above finished floor, unless otherwise indicated.

#### **B. MOUNTING**

Plumb and rigid without distortion of box. Mount flush panelboards uniformly flush with wall finish. Provide spacers of neoprene or fiberglass to shim out from irregular surfaces or from damp surfaces.

**C. CIRCUIT DIRECTORY**

Prepare neatly typewritten panelboards directories in the same pole sequence as the panelboard stamping. Send a copy to the Owner for his records. Prior to typing the final directories, verify room and equipment names and numbers with the Owner and modify circuit descriptions of areas/spaces to conform with the Owner's desires. Obtain approval before installing.

**D. PROVISION FOR FUTURE CIRCUITS**

Install panelboards in such a manner as to leave access to the box, building chases, knockouts, etc., for future circuit additions. Place conduit in the rear line of knockouts where possible. Install spare conduits from flush-mounted panels up to accessible spaces.

**E. WIRING IN PANELBOARD GUTTERS**

Run neatly parallel and perpendicular to enclosure. Arrange conductors into groups, and bundle and wrap with wire ties.

**3.2 IDENTIFICATION**

Identify field-installed wiring and components and provide warning signs as specified in Section 16050.

Label each panelboard with engraved laminated-plastic or metal nameplates mounted with corrosion-resistant screws.

**3.3 GROUNDING**

Connect equipment grounding conductors to ground bus, except for circuits requiring isolated grounding.

Provide ground continuity to main electrical ground bus as indicated.

**3.4 CONNECTIONS**

Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### **3.5 FIELD QUALITY CONTROL**

A. Prepare for acceptance tests as follows:

1. Make insulation-resistance tests of each panelboard bus, component, and connecting supply, feeder, and control circuits.
2. Make continuity tests of each circuit.

B. TESTING AGENCY

Provide services of a qualified independent testing agency to perform specified testing.

C. TESTING

1. Prior to Energization

Provide third party breakers testing per Specification 16050, Section 3.

Perform visual and mechanical inspection of panelboard, bus, and breakers.

Check connections and mounting for proper torque.

Remove any burrs, filings, or other foreign materials. Completely wipe down and vacuum panelboard.

2. After Energization

After electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

Correct malfunctioning units on site where possible and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

### **3.6 ADJUSTING**

Set field-adjustable switches and circuit-breaker trip ranges as indicated.

**\*\*\* END OF SECTION \*\*\***

## SECTION 16510

### INTERIOR LUMINAIRES

#### PART 1 GENERAL

##### 1.1 SCOPE

This work specified in this Section covers interior lighting devices, including luminaires, lamps, and power supplies, along with lighting accessories and controls; as well as luminaire mounting, installation, lamping, and testing.

##### 1.2 RELATED WORKS SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
16050	Basic Electrical Materials and Methods

##### 1.3 DEFINITIONS

###### A. BALLAST

The power circuit of a gas-discharge (fluorescent, HID, etc.) lamp. Ballasts are either inductive or electronic.

###### B. COLOR RENDERING INDEX (CRI)

A figure-of-merit adopted by the Department of Energy that quantifies the color accuracy of lighting devices compared to incandescent light. CRI is normalized such that a score of 100 represents the output of an incandescent lamp.

###### C. COLOR TEMPERATURE

The color of the light produced by a particular lighting device, measured in kelvin. A higher kelvin temperature results in a “cooler” blue light, while lower kelvin temperatures are “warmer,” and more orange.

###### D. DIFFUSER

A modifier placed in front of a lamp to change the light intensity and distribution. Part of a LUMINAIRE.

E. DRIVER

The power circuit of an LED LAMP. May be part of a luminaire, or integrated into the lamp itself.

F. EMERGENCY LUMINAIRE

A LUMINAIRE intended to automatically supply illumination to critical areas in the event of failure of the normal supply.

G. ENGINE

See DRIVER in this section.

H. EXIT LIGHT

An illuminated sign or LUMINAIRE intended to indicate the path of egress. An exit light may or may not be an EMERGENCY LUMINAIRE.

I. GAS-DISCHARGE LAMP

General category of lamps that produce light by discharge of electricity through ionized gas. Types include Fluorescent and High-Intensity Discharge (HID). Powered by a BALLAST.

J. LAMP

The part of a LUMINAIRE that produces light.

K. LED LAMP

A lamp that uses Light Emitting Diodes (LEDs) to produce useful light. Powered by a DRIVER.

L. LUMEN MAINTENANCE FACTOR

The percent of the rated lumen output of a lamp still available after a specified period of time. A lamp capable of only half of its original output after will have a lumen maintenance factor of 0.50 or **L50**. May be used to specify the performance of a lamp after a particular number of hours, or the number of hours of operation at a particular level.

M. LUMINAIRE

A complete lighting device, exit light, or emergency lighting device. Luminaires consist of one or more LAMPS mounted in a fixture, along with DRIVERS or BALLASTS to power them, and lenses or diffusers to provide the correct lighting distribution.

N. OCCUPANCY SENSOR

A control device that switches a lighting circuit when a space is occupied.

O. PHOTOCCELL

A control device that switches a lighting circuit in response to ambient light level.

P. TOTAL HARMONIC DISTORTION (THD)

The ratio of the root mean square of the harmonic content of a voltage or current signal, expressed as a percent of the magnitude of the fundamental.

#### 1.4 REFERENCES

All applicable ANSI and UL standards.

IES LM-79, LM-80, TM-21.

NFPA 70 [NEC] (latest edition, with Washington State Amendments).

Washington State Energy Code (latest edition).

Washington State Administrative Code [WAC] (current edition).

International Building Code (latest edition, with Washington State Amendments).

#### 1.5 SUBMITTALS

Submit under the provisions of Section 01300.

For each required product, submit data sheets with detailed descriptions of the product to be purchased. Identify each data sheet with the corresponding entry on the Lighting Schedule or Bill of Materials. Where data sheets offer a range of options and accessories, mark or highlight each selection, along with all final part numbers.

A. Submit on each luminaire in the Lighting Schedule. Submittal shall contain the following information, as a minimum:

1. Manufacturer and part number.



2. Product dimensions and weight.
  3. Product environmental rating (NEMA rating).
  4. Electrical ratings:
    - a. Voltage, Current, and Power
    - b. Power factor
    - c. Efficacy
  5. Lighting metrics:
    - a. Lumen output
    - b. Lumen maintenance factor at 25,000 hours
    - c. Color temperature
    - d. Color Rendering Index (CRI)
    - e. Lighting distribution
  6. Regulatory approvals and certifications, including NRTL listing
  7. Battery and charging data (if applicable).
- B. Submit on all lighting controls (switches, photocells, occupancy sensors, etc.). Submittal shall contain the following information, as a minimum:
1. Manufacturer and part number.
  2. Product dimensions and weight.
  3. Environmental rating (NEMA rating).
  4. Electrical ratings (Voltage, Current, and Power).
  5. Regulatory approvals, certifications, and labels.
  6. Wiring diagrams showing both factory- and field-installed wiring for the specific application in this Project. Differentiate between factory- and field-installed wiring.
- C. Submit maintenance data for luminaires and lighting controls in the operation and maintenance manual specified in Section 01300.

## **1.6 QUALITY ASSURANCE**

See Section 16050. Coordinate luminaires, mounting hardware, and trim with all other items to be mounted on the ceiling, and all reserved or classified areas, including work of other trades.

## **1.7 WARRANTY**

### **A. WARRANTY**

1. The manufacturer shall warrant the materials and workmanship of all luminaires for a minimum of 2 years from the time of Substantial Completion.
2. The warranty shall be comprehensive and shall include all components included in the luminaire package.
3. If during the warranty period the manufacturer refuses to honor a claim due to the actions of the contractor, the contractor shall replace all affected items at no cost to the owner.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

#### **A. AVAILABLE MANUFACTURERS**

Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include the following:

1. Acuity Brands, Inc.; Holophane, Lithonia
2. Eaton Corp.
3. GE Lighting
4. OSRAM Sylvania, Inc.

#### **B. "OR EQUAL" PRODUCTS**

Luminaires shall be the products specified in the Lighting Schedule in the Plans, or equal. Substitute products shall:

1. Use the same lighting technology (LED) as the specified luminaire;

2. Have the same lumen output, color temperature, CRI, and IES distribution;
3. Not have an input wattage greater than 110 percent of the specified luminaire; and
4. Have the same environmental ratings.

## **2.2 LUMINAIRES**

### **A. POWER**

1. Luminaires shall be powered at the voltage specified in the Lighting Schedule.
2. Power supplies, including drivers and transformers shall be self-contained within luminaires.

### **B. QUALITY**

#### **1. Manufacturer Labels and Markings**

The exterior of lenses and diffusers shall have no visible logos, labels, trademarks, or monograms.

#### **2. Metal Parts**

Metal parts shall be free from burrs, scratches, and sharp corners and edges.

#### **3. Transmitting and Reflecting Surfaces**

Luminaires shall be provided and installed with all transmitting and reflecting surfaces required to produce the same distribution as the luminaires used as the basis of design, as shown in the Lighting Schedule.

#### **4. Finish**

Provide manufacturer's standard finish, except where otherwise indicated, applied over corrosion-resistant treatment or primer. Finish shall be free from streaks, runs, holidays, stains, blisters, and other defects.

C. MAINTENANCE ACCESS

Any parts of luminaires not subject to the manufacturer's warranty shall be accessible for maintenance and owner-replaceable.

D. UV RADIATION

LED Luminaires shall not emit UV radiation

E. WET LOCATION LUMINAIRES

Unless otherwise stated in the Plans, luminaires installed in wet locations shall be rated:

1. NEMA 3R where not subject to splashing or hose-directed water.
2. NEMA 4 where subject to splashing or hose-directed water.
3. NEMA 4X where subject to corrosion or exposed to the process.

Contractor shall provide all materials required to obtain labeled environmental ratings.

F. HAZARDOUS (CLASSIFIED) LOCATION LUMINAIRES

Luminaires shall be NRTL listed for installation in the specific class, division, and group marked in the Plans (see Schedule of Classified Areas; Lighting Schedule).

G. FUSED LUMINAIRES

Provide fused luminaires for applications:

1. Installed more than eight feet above the floor,
2. Where required by code.

Install a listed fuse and fuse holder approved for the application by the luminaire manufacturer.

H. BATTERY BACKED LUMINAIRES

All battery backed luminaires shall be UL 924 listed. Additionally, emergency luminaires located in classified areas shall be UL 844 listed.

Battery backed luminaires shall have the following features:

1. Self-contained internal battery, rated to provide a minimum of 90 minutes of emergency level illumination in the event of a power failure.

#### I. EXIT LIGHTS

All exit lights shall be UL 924 listed, and shall have the following features:

1. Internal illumination, always on.
2. Illuminated arrow indicating direction of egress.
3. Self-contained internal battery, rated to provide a minimum of 90 minutes of emergency level illumination in the event of a power failure.
4. 120VAC input power unless stated otherwise on the Plans.

### **2.3 LIGHTING TECHNOLOGIES**

Each luminaire shall use the technology specified in the lighting schedule.

#### A. LED LUMINAIRES

LED Luminaires shall conform to UL 1598 (Luminaires) and UL 8750 (LED Equipment for Use in Lighting Products).

##### 1. Drivers

LED Drivers shall be manufacturer approved for the specific model of luminaire to be installed. Drivers shall meet the following specifications:

- a. UL 8750 listed.
- b. Certified by NRTL acceptable to the State of Washington.
- c. Compliant with FCC Part 15, Class A.
- d. Power Factor: greater than 0.90.
- e. Supply circuit THD: less than 10%.

- f. Temperature Rating: -20 to +40 degrees Celsius.
2. Lamps
- LED Lamps shall be an integral part of the luminaire, and rated to last the entire design lifetime of the luminaire. LED lamps shall have the following specifications:
- a. Color Temperature: 4000K, unless otherwise indicated.
  - b. CRI: at least 80 CRI.
  - c. Lamp Life: at least 60,000 hours, L80.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

##### **A. COORDINATION WITH OTHER WORK**

- 1. Coordinate lighting with general electrical work, and with other trades.
- 2. Locate luminaires outside of classified areas and reserved electrical space, unless explicitly called for by the Plans.
- 3. Process equipment and piping has priority over lighting. Luminaires shall be placed to avoid conflict with the process and maintenance thereof.
- 4. Heating, Ventilation, and Air Conditioning (HVAC) equipment and ductwork has priority over lighting. Luminaires shall be placed to avoid conflict with HVAC.
- 5. Maintenance vehicle access has priority over lighting. Luminaires shall be placed to not impede maintenance vehicles.
- 6. Luminaires shall be mounted parallel to finished floor or grade, with no tilt angle unless explicitly called for by the Plans.
- 7. Adjust stem or chain lengths to suit field conditions where indicated mounting heights are not feasible.

## B. LUMINAIRE SUPPORTS

1. Install luminaires with supports, brackets, and trim recommended by the luminaire manufacturer.
2. Bottom of luminaires shall be at the elevation noted in the Plans.
3. Luminaires shall be secured by manufacturer hardware and fasteners. Nails shall not be used to secure luminaires.
4. Supports shall be rated for four times the weight of the luminaire, or 45 kilograms (100 lbs.), whichever is greater. Luminaires weighing more than 23 kilograms (50 lbs.) shall be supported independently from the outlet box.
5. Luminaires shall be supported from building structure or ceiling framing. Provide additional framing to support luminaires that cannot be directly mounted to structural members. Structural integrity shall not be compromised due to installation of luminaires.
6. Hanging luminaires shall be supported at each quarter point and every eight feet, minimum, by hardware that cannot be dislodged by upward force. Pendants and rods over 120 centimeters long (48 inches) shall be braced to limit swinging.
7. Luminaires in grid-type ceilings shall be supported by additional wires at each corner, independently anchored to the structural system above. Wires shall be the same type and size as the wires supporting the grid ceiling structure.
8. Surface-mounted luminaires shall be installed flush and tight to the finished ceiling. Surface-mounted luminaires more than 45-centimeters wide (18 inches) shall be supported at each corner, in addition to the outlet box.
9. Fluorescent luminaires with lamps longer than 120 centimeters (48 inches) shall be supported independently from the outlet box.

## C. INSTALLATION METHODS

1. Unless preempted by other work, luminaires shall be installed at the positions and spacings shown on the Lighting Plan(s). Inform the Engineer of all lighting changes in writing. Plan symbols show

the required position of the center of each luminaire, but may be undimensioned.

2. Luminaires in rows or grids shall be installed true to line. Continuous runs of luminaires shall be installed straight and true, with manufacturer's joining hardware.
3. Luminaires located in a common area shall be installed at the same level.

#### D. ELECTRICAL CONNECTIONS

1. All luminaires shall be grounded.
2. Each luminaire shall be powered by the circuit and operated by the control device(s) shown on the Plans.
3. All luminaires shall be connected according to manufacturer's wiring diagrams.
4. All screw terminals shall be torqued to manufacturer's specifications. If no torque values are published by the manufacturer, terminals shall be torqued to values specified in UL 486A.
5. All luminaires (except emergency luminaires and exit luminaires) shall be fitted with NEC 410.130(G)-type luminaire disconnect plugs. Ideal PowerPlug or equal.
6. Emergency and battery-backed luminaires shall be supplied by both switched lighting conductors AND unswitched charging conductors, powered by the same circuit.
7. Power conductors to exit lights shall not be switched.

#### E. LIGHTING CONTROLS

Lighting controls shall be installed according to the Plans.

Process areas shall have manual lighting controls.

Restrooms, garages, storage rooms, and other enclosed non-process spaces shall have occupancy sensors.



F. LAMPING

Lamps shall be selected and installed according to the Lighting Schedule and manufacturer's instructions.

Test lamp sockets and holders before installing lamps.

G. ENVIRONMENTAL RATINGS

Installation of luminaires shall meet all manufacturer requirements to maintain labeled environmental ratings.

H. CLEANING

Thoroughly clean dirt and debris from all internal and external surfaces. Vacuum interior of luminaires after installation.

Prior to commissioning, wipe all transmitting and reflecting surfaces with damp cloth.

I. SAFE DISPOSAL

Disposal of lamps and luminaires containing hazardous materials (mercury, etc.) shall comply with state and local rules.

**3.2 FIELD QUALITY CONTROL**

A. DAMAGED LUMINAIRES

During commissioning, Contractor shall inspect each installed luminaire for damage. Damaged luminaires and components shall be replaced at no cost to the owner. Contractor shall replace any transmitting or reflecting surface that is scratched, shattered, or otherwise damaged before completion of work at no cost to the owner.

Metal parts that demonstrate corrosion during the project warranty period shall be replaced at no cost to the owner.

Contractor shall provide replacements for any lamps that fail prior to completion of work.

B. TESTING

Contractor shall demonstrate normal operation of each luminaire.  
Contractor shall interrupt electrical power to demonstrate proper operation of emergency luminaires.

Malfunctioning luminaires and components shall be repaired or replaced, then tested again.

Contractor shall demonstrate each lighting control to show correct operation, and repair or replace malfunctioning controls.

**\*\*\*END OF SECTION\*\*\***

## SECTION 16520

### EXTERIOR LUMINAIRES

#### PART 1 GENERAL

##### 1.1 SUMMARY

The work specified in this Section covers exterior lighting devices, including luminaires, lamps, and power supplies; along with outdoor lighting accessories and controls; as well as outdoor mounting hardware, light poles, and accessories; and luminaire mounting, installation, lamping and testing.

##### 1.2 RELATED SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
16050	Basic Electrical Materials and Methods

##### 1.3 DEFINITIONS

###### A. BALLAST

The power circuit of a gas-discharge (fluorescent, HID, etc.) lamp. Ballasts are either inductive or electronic.

###### B. DRIVER

The power circuit of an LED Lamp. May be part of a luminaire, or integrated into the lamp itself.

###### C. EXTERIOR LUMINAIRE

Any LUMINAIRE mounted in an OUTDOOR AREA (as defined in Specification Section 16050).

###### D. GAS-DISCHARGE LAMP

General category of lamps that produce light by discharge of electricity through ionized gas. Types include Fluorescent and High-Intensity Discharge (HID). Powered by a BALLAST.

E. LAMP

The part of a LUMINAIRE that produces light.

F. LED LAMP

A lamp that uses an array of Light Emitting Diodes (LEDs) to produce useful light. Powered by a DRIVER.

G. LUMEN MAINTENANCE FACTOR

The percent of the rated lumen output of a lamp still available after a specified period of time. A lamp capable of only half of its original output after will have a lumen maintenance factor of 0.50 or **L50**.

H. LUMINAIRE

A complete lighting device, exit light, or emergency lighting device. Luminaires consist of one or more LAMPS mounted in a fixture, along with DRIVERS or BALLASTS to power them, and lenses or diffusers to provide the correct lighting distribution.

I. PHOTOCELL

A control device that switches a lighting circuit in response to ambient light level.

J. TOTAL HARMONIC DISTORTION (THD)

Total Harmonic Distortion (THD) is defined as the ratio of the sum of the levels of all harmonic components to the level of the fundamental frequency.

## 1.4 REFERENCES

All applicable ANSI standards.

American Association of State Highway and Transportation Officials [AASHTO]  
UL 844, 924, 935, 1029, 1598, 8750.

IES LM-79, LM-80, TM-21.

NFPA 70 [NEC] (latest edition, with Washington State Amendments).

Washington State Energy Code (latest edition).

Washington State Administrative Code [WAC] (current edition).

International Building Code (latest edition, with Washington State Amendments).

## 1.5 SUBMITTALS

Submit under the provisions of Section 01300.

For each required product, submit data sheets with detailed descriptions of the product to be purchased. Identify each data sheet with the corresponding entry on the Lighting Schedule or Bill of Materials. Where data sheets offer a range of options and accessories, mark or highlight each selection, along with all final part numbers.

A. Submit on each luminaire in the Lighting Schedule. Submittal shall contain the following information, as a minimum:

1. Manufacturer and part number.
2. Product dimensions and weight.
3. Environmental rating (NEMA rating).
4. Electrical ratings:
  - a. Voltage, Current, and Power
  - b. Power factor
  - c. Efficacy
5. Lighting metrics:
  - a. Lumen output
  - b. Lumen maintenance factor
  - c. Color temperature
  - d. Color Rendering Index (CRI)
  - e. Lighting distribution
6. Regulatory approvals, certifications, and labels.

B. Submit on all lighting controls (photocells, motion detectors, etc.). Submittal shall contain the following information, as a minimum:

1. Manufacturer and part number.

2. Product dimensions and weight.
  3. Environmental rating (NEMA rating).
  4. Electrical ratings (Voltage, Current, and Power).
  5. For luminaires to be mounted on poles:
    - a. Effective Projected Area (EPA)
  6. Regulatory approvals, certifications, and labels.
  7. Detailed wiring diagrams showing both factory- and field-installed wiring for the specific application in this Project. Differentiate between factory- and field-installed wiring.
- C. Submit on all light poles. Submittal shall contain the following information as a minimum:
1. Manufacturer and part number.
  2. Detailed dimensions and weight.
  3. Mounting height.
  4. Anchor bolt design.
  5. Regulatory approvals, certifications, and labels.
  6. Color and manufacturer finish.
- D. Submit maintenance data for luminaires and lighting controls in the operation and maintenance manual specified in Section 01300.

## **1.6 QUALITY ASSURANCE**

See Section 16050. Coordinate luminaires, mounting hardware, light poles with all other items to be mounted on the exterior of buildings, or on the facility grounds, including the work of other trades.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

#### **A. AVAILABLE MANUFACTURERS**

Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include the following:

1. Acuity Brands, Inc.; Holophane, Lithonia
2. Eaton Corp.; Crouse-Hinds, Cooper
3. GE Lighting
4. OSRAM Sylvania, Inc.

#### **B. "OR EQUAL" PRODUCTS**

Luminaires shall be the products specified in the Lighting Schedule in the Plans, or equal. Substitute products shall:

1. Use the same lighting technology (LED) as the specified luminaire,
2. Have the same lumen output, CRI, and IES distribution,
3. Not have an input wattage greater than 110 percent of the specified luminaire, and,
4. Have the same environmental rating.

### **2.2 LUMINAIRES**

#### **A. POWER**

1. Luminaires shall be powered at the voltage specified in the Lighting Schedule.
2. Power supplies, including ballasts, drivers, and transformers, shall be self-contained within luminaires.

## B. QUALITY

### 1. Manufacturer Labels and Markings

The exterior of lenses and diffusers shall have no visible logos, labels, trademarks, or monograms.

### 2. Metal Parts

- a. Metal parts shall be free from burrs, scratches, and sharp corners and edges.
- b. Sheet metal components shall be corrosion-resistant aluminum, except as otherwise indicated. Sheet metal shall be formed and supported to prevent warping and sagging.
- c. Exposed structural metal shall be stainless steel.

### 3. Reflecting Surfaces

Minimum reflectance shall be as follows, except as otherwise indicated:

- a. White surfaces: 85 percent.
- b. Specular surfaces: 83 percent.
- c. Diffusing specular surfaces: 75 percent.
- d. Laminated silver metallized film: 90 percent.

### 4. Transmitting Surfaces

Transmitting surfaces (including lenses, diffusers, covers, globes, etc.) shall be 100 percent acrylic plastic or water-white, annealed crystal glass, except as otherwise indicated.

#### a. Plastic

High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.



b. Lens Thickness

Minimum 3mm (1/8 inch), except where greater thickness is specified.

5. Finish

Provide manufacturer's standard finish, except where otherwise indicated, applied over corrosion-resistant treatment or primer. Finish shall be free from streaks, runs, holidays, stains, blisters, and other defects.

C. HOUSING

1. Luminaire housings shall be rigidly-formed, light-tight enclosures that will not warp, sag, or deform with use.
2. Luminaire housings shall have one of the following environmental ratings:
  - a. NEMA 3R where not subject to splashing or hose-directed water.
  - b. NEMA 4 where subject to splashing or hose-directed water.
  - c. NEMA 4X where subject to corrosion, or exposed to process.
3. Contractor shall provide all materials required to obtain labeled environmental ratings.

D. FUSED LUMINAIRES

Provide fused luminaires for applications:

1. Installed more than eight feet above the floor,
2. Where required by code.

Install a listed fuse and fuse holder approved for the application by the luminaire manufacturer.

## 2.3 LIGHTING TECHNOLOGIES

Each luminaire shall use the technology specified in the lighting schedule.

### A. LED LUMINAIRES

LED Luminaires shall conform to UL 1598 (Luminaires) and UL 8750 (LED Equipment for Use in Lighting Products). LED luminaires shall have a manufacturer warranty of at least two years.

#### 1. Drivers

LED Drivers shall be manufacturer approved for the specific model of luminaire to be installed. Drivers shall meet the following specifications:

- a. UL 8750 listed.
- b. Certified by NRTL acceptable to the State of Washington.
- c. Compliant with FCC Part 15, Class A.
- d. Power Factor: greater than 0.90.
- e. Supply circuit THD: less than 10%.
- f. Temperature Rating: -20 to +40 degrees Celsius.

#### 2. Lamps

LED Lamps shall be an integral part of the luminaire, and rated to last the entire design lifetime of the luminaire. LED lamps shall have the following specifications:

- a. Color Temperature: 4000K, unless otherwise indicated.
- b. CRI: at least 80 CRI.
- c. Lamp Life: at least 60,000 hours, L80.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

#### **A. COORDINATION WITH OTHER WORK**

1. Coordinate lighting with general electrical work, and with other trades.
2. Locate luminaires outside of classified areas and reserved electrical space, unless explicitly called for by the Plans.
3. Process equipment and piping has priority over lighting. Luminaires shall be placed to avoid conflict with the process and maintenance thereof.
4. Heating, Ventilation, and Air Conditioning (HVAC) equipment and ductwork has priority over lighting. Luminaires shall be placed to avoid conflict with HVAC.
5. Vehicle access has priority over lighting. Luminaires shall be placed to maintain required clearance above right-of-way.
6. Adjust mounting heights to suit field conditions where indicated heights are not feasible.

#### **B. LUMINAIRE SUPPORTS**

1. Install luminaires with supports, brackets, and trim recommended by the luminaire manufacturer.
2. Luminaires shall be secured by manufacturer hardware. Nails shall not be used to secure luminaires.

#### **C. INSTALLATION METHODS**

1. Unless preempted by other work, luminaires shall be installed at the positions and spacings shown on the Lighting Plan(s). Inform the Engineer of all lighting changes in writing. Plan symbols show the required position of the center of each luminaire but may be un-dimensioned.
2. Luminaires in rows or grids shall be installed true to line. Continuous runs of luminaires shall be installed straight and true, with manufacturer's joining hardware.

3. Luminaires located in a common area shall be installed at the same level.

D. ELECTRICAL CONNECTIONS

1. All luminaires and light poles shall be grounded.
2. Each luminaire shall be powered by the circuit and operated by the control device(s) shown on the Plans.
3. All luminaires shall be connected according to manufacturer's wiring diagrams.

**3.2 FIELD QUALITY CONTROL**

A. DAMAGED HARDWARE

During commissioning, Contractor shall inspect each lighting device. Damaged luminaires, supports, and components shall be replaced at no cost to the owner. Contractor shall replace any transmitting or reflecting surface that is scratched, shattered, or otherwise damaged before completion of work at no cost to the owner.

Metal parts that demonstrate corrosion during the project warranty period shall be replaced at no cost to the owner.

Contractor shall provide replacements for any lamps that fail prior to completion of work.

B. TESTING

Contractor shall demonstrate normal operation of each luminaire. Contractor shall interrupt electrical power to demonstrate proper operation of emergency luminaires.

Malfunctioning luminaires and components shall be repaired or replaced, then tested again.

Contractor shall demonstrate each lighting control to show correct operation, and repair or replace malfunctioning controls.

**\*\*\* END OF SECTION \*\*\***

## SECTION 16941

### ASSORTED ELECTRICAL DEVICES

#### PART 1 GENERAL

##### 1.1 SCOPE

The work specified in this Section includes devices which are not part of other systems or large enough to have a dedicated specification.

##### 1.2 RELATED WORKS SPECIFIED ELSEWHERE

<u>Section</u>	<u>Item</u>
01300	Submittals
Division 16	Electrical
16050	Basic Electrical Materials and Methods
16940	Control Panels

##### 1.3 REFERENCES

<u>Reference</u>	<u>Title</u>
NEMA	National Electrical Manufacturers Association
ICS-1	General Standards for Industrial Control and Systems
ICS-6	Enclosures for Industrial Controls and Systems
Publication No. 250	Enclosures for Electrical Equipment (1000 V maximum)
NFPA	National Fire Protection Association
NEC	National Electric Code
JIC-EMP-1	Joint Industrial Council

##### 1.4 SYSTEM DESCRIPTION

###### A. CONTROL PANELS

1. Reference Section 16050, 1.3, Definitions.
2. Reference Section 16940.

##### 1.5 SUBMITTALS

###### A. DEVICES

1. Submit per the requirements of Section 01300 and Section 16050.



C. PHOTO CELLS

Photo cells shall be UL listed, 3 wire, with adjustable light shield, rated for the same voltage as the lighting fixtures shown in the Plans. Photocell shall have stem and swivel mount and be rated for operation between -40 degrees C and 70 degrees C. The output shall be rated at 20 A. Intermatic K4200 series or equal.

D. INTRUSION SWITCHES

Reference electrical Plans and Details.

E. FLOOD SWITCHES

Reference electrical Plans and Details.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

A. Install all components per manufacturer's recommendations or as show on the Plans, whichever is the more stringent.

**3.2 DEMONSTRATION**

Demonstrate to the Owner that the electrical installation is working by operating the electrical component(s). Demonstration may be combined with demonstration of other equipment and systems, such as a control panel with an alarm beacon.

**3.3 CLEANING**

Clean dirt and debris from all surfaces.

**\*\*\* END OF SECTION \*\*\***

# **MEASUREMENT AND PAYMENT**



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# Section 4 - Measurement and Payment

## **Bid Item Introduction**

It is the intent of these Specifications that the performance of all work under the bid items shall result in the complete construction, in proper operating condition, of the facilities described. It is understood that any additional material or work required to place the facilities in operating condition shall be provided by the Contractor as work covered by the listed bid items and shall be considered incidental thereto.

Submittals, shop drawings, calculations, startup, testing, training, warranties, and operation and maintenance manuals as required shall be considered incidental to the various items of work and no additional compensation will be allowed.

## **SCHEDULE A**

### **Mobilization**

The lump sum price bid for MOBILIZATION shall be full compensation for all labor, equipment, tools and materials required for preparatory work and operations, including, but not limited to the following items:

1. The movement of personnel, equipment, supplies and incidentals to the project site as related to project mobilization, demobilization and cleanup.
2. The establishment of field offices and material storage areas.
3. Purchase, delivery and storage of pipe, fittings, appurtenances, and all other materials required for the project.
4. Insurance, bonding, submittals and other work and operations that must be performed or costs incurred before beginning contract work.
5. Mobilization costs for subcontracted work.

Payment for MOBILIZATION shall be as follows:

25% Payment: When Contractor has mobilized on-site and temporary facilities are in place.

25% Payment: When 5 percent of the total pay items are completed (not including payment for materials on hand).

25% Payment: When 50 percent of the total pay items are completed (not including payment for materials on hand).

25% Payment: When Project is completed and recommended for acceptance.

In no event shall the amount bid or allowed for Mobilization exceed 5% of the total Contract Price for all other items listed in the Bid.

### **Minor Change**

Measurement will be negotiated prior to commencing any such work under this pay item and shall be for work to remedy unforeseen conditions, utility conflicts, minor landscaping, minor drainage improvements, or special surface restoration.

Payment or credits for changes amounting to \$50,000 or less may be made under the Bid Item MINOR CHANGE. At the discretion of the Owner, this procedure for Minor Changes may be used in lieu of the more formal procedure as outlined in General Conditions Section 8.23. The Contractor will be provided a copy of the completed order for Minor Changes. The agreement for the Minor Changes will be documented by signature of the Contractor or notation of the verbal agreement. If the Contractor is in disagreement with anything required by the order for Minor Changes, the Contractor may protest the order as provided in General Conditions Section 8.23

Payments or credits will be determined in accordance with General Conditions Section 8.23. All Minor Change work will be within the scope of the Contract Work and will not change Contract Time. For the purpose of providing a common Proposal for all Bidders, the Owner has entered an amount for MINOR CHANGE in the Proposal to become part of the total Bid by the Contractor.

### **Locate Existing Utilities**

The lump sum price bid for LOCATE EXISTING UTILITIES shall constitute full compensation for all labor, equipment, tools, and materials required to locate all existing utilities on the project.

### **Temporary Traffic Control**

Measurement shall be measured by lump sum. The lump sum contract price for TEMPORARY TRAFFIC CONTROL shall include costs for all labor, material, and equipment to provide temporary traffic control for the project as shown on the Plans and as specified in Section 01950.

### **Temporary Erosion and Sedimentation Control**

The lump sum price bid for TEMPORARY EROSION AND SEDIMENT CONTROL shall be full compensation for all labor, materials, tools and equipment necessary and incidental to install, maintain and remove the TESC facilities. This item shall include, but not be limited to, the following: filter fabric fence, filter bags, storm drain inlet protection, straw bales, plastic sheeting, construction entrance mat, and street sweeping.

### **Clearing and Grubbing**

Measurement shall be by lump sum. The unit price bid per cubic yard for CLEARING AND GRUBBING shall include all costs for the labor, material, and equipment associated with clearing and grubbing, including removal of brush and trees, as shown on the Plans and as specified herein.

### **Trench Safety System**

The lump sum price bid for TRENCH SAFETY SYSTEM shall constitute full compensation for all labor, materials, tools and equipment necessary and incidental to providing a safe trench excavation. This item shall include, but not be limited to, the following:

1. Design, installation, proper use and removal of all sheeting, shoring, cribbing, boxes or other trench protection methods.
2. Excavation, backfill, compaction and other work required if extra excavation is used in lieu of trench box, shoring, cribbing or other trench protection. If imported backfill gravel is required for backfilling within the limits of the sewer or water line excavation, it shall also be required as backfill material for the extra excavation and shall be provided at the Contractor's expense.
3. All barricades, warning lights, signs, flaggers or other devices needed to warn and protect the public.

The Contractor shall be solely responsible for the safety of his crew and public, and the District assumes no responsibility. The District will not be responsible for determining the adequacy of any system used by the Contractor and payment for protection systems will not imply District's approval of adequacy.

### **Dewatering**

Measurement shall be by lump sum. The lump sum contract price for DEWATERING shall include costs for all labor, materials, equipment, installing, removing, maintaining, and testing necessary to provide dewatering.

### **Sitework**

Measurement shall be by lump sum. The lump sum contract price for SITEWORK shall include all costs for labor, materials, and equipment to excavate, wastehaul excess native material to an approved disposal site, import materials shall be measured and paid under separate unit price bid items, compact and grade the site as shown on the Plans and as specified herein.

### **Demolition**

Measurement shall be by lump sum. The unit price for DEMOLITION shall include all costs for labor, materials, and equipment to demolish existing equipment as shown on the Plans and described in Section 01900 of these Specifications.

### **Asphalt Planing**

The unit price bid per square yard of ASPHALT PLANING, shall constitute full compensation for all labor, materials, tools and equipment necessary and incidental for planing of asphalt surface in preparation of overlay shown on the Plans and details. This shall include, but not be limited to the following:

1. Lowering of existing utility covers to below the proposed planing depth prior to planing.
2. Surface preparation, including removal and lawful disposal of ground asphalt as necessary.
3. Planing to a depth of 2-inches along a neat and straight line to the limits shown on the Plans where full width planning is required.

Payment will be made based on the actual number of square yard of asphalt removed within the limits shown on the plans. Any other asphalt damaged by the Contractor's operations will be the Contractor's responsibility and will be considered incidental to construction and must be restored by the Contractor to the satisfaction of the District and the governing jurisdiction.

### **Building**

Measurement shall be measured by lump sum. The lump sum contract price for BUILDING shall include all costs for labor, materials, and equipment to construct the operations building including, but not limited to, concrete within the building footprint, foundation, CMU, wood trusses, roofing, trim siding, doors, insulation, hardware, cabinets, finishes, plumbing, bridge crane/hoist, and HVAC as shown on the Plans and as specified herein.

## **Building Piping**

Measurement shall be by lump sum. The lump sum contract price for BUILDING PIPING shall include all costs for labor, materials, and equipment required to install within the building footprint including, but not limited to, pipe, fittings, joint restraint, control valves, pipe supports, flow meter, disinfection, testing, and all other appurtenances within the building footprint as shown in the Plans and as specified in Section 15050 of these Specifications.

## **8-In. DI Water Main and Fittings, Restrained Joint (Incl. Bedding)**

Measurement will be per linear foot as measured along the ground surface. The unit price bid per linear foot for 8-IN. DI WATER MAIN AND FITTINGS, RESTRAINED JOINT (INCL. BEDDING) shall include all costs of labor, material, and equipment required to furnish, install, and test complete all 8-inch restrained joint ductile iron water main, including, but not limited to, fittings, blocking, joint restraint, detectable marking tape, exothermic welds and cathodic bond cables, temporary blowoffs and blocking, removal and wastehaul or existing facilities, excavation, dewatering, bedding, compaction, wastehaul and disposal of excess material, disinfection, and testing of the complete and in place 8-inch ductile iron water main as shown on the Plans and as specified in Section 02500 of these Specifications.

## **8-Inch Gate Valve**

Measurement will be per each. The unit price bid per each for 8-INCH GATE VALVE shall include all costs for labor, materials, and equipment to furnish and install the gate valve including, but not limited to, the valve box and cover, ethafoam pad, valve stem extension as required, excavation, wastehaul and disposal of excess material, dewatering, compaction, disinfection, and appurtenances as shown on the Plans and as specified herein.

## **12-In. DI Water Main and Fittings, Restrained Joint (Incl. Bedding)**

Measurement will be per linear foot as measured along the ground surface. The unit price bid per linear foot for 12-IN. DI WATER MAIN AND FITTINGS, RESTRAINED JOINT (INCL. BEDDING) shall include all costs of labor, material, and equipment required to furnish, install, and test complete all 12-inch restrained joint ductile iron water main, including, but not limited to, fittings, blocking, joint restraint, detectable marking tape, exothermic welds and cathodic bond cables, temporary blowoffs, removal and wastehaul or existing facilities, excavation, dewatering, bedding, compaction, wastehaul and disposal of excess material, disinfection, and testing of the complete and in place 12-inch ductile iron water main as shown on the Plans and as specified in Section 02500 of these Specifications.



### **16-In. DI Water Main and Fittings, Restrained Joint (Incl. Bedding)**

Measurement will be per linear foot as measured along the ground surface. The unit price bid per linear foot for 16-IN. DI WATER MAIN AND FITTINGS, RESTRAINED JOINT (INCL. BEDDING) shall include all costs of labor, material, and equipment required to furnish, install, and test complete all 16-inch restrained joint ductile iron water main, including, but not limited to, fittings, blocking, joint restraint, detectable marking tape, exothermic welds and cathodic bond cables, temporary blowoffs, removal and wastehaul or existing facilities, excavation, dewatering, bedding, compaction, wastehaul and disposal of excess material, disinfection, and testing of the complete and in place 16-inch ductile iron water main as shown on the Plans and as specified in Section 02500 of these Specifications.

### **CPEP Storm Sewer Pipe, 12-In. Diam. (Incl. Bedding)**

Measurement will be per linear foot as measured along the ground surface. The unit price bid per linear foot for CPEP STORM SEWER PIPE, 12-IN. DIAM. (INCL. BEDDING) shall include all costs of labor, material, and equipment required to furnish, install, and test complete all 12-inch CPEP storm sewer pipe, including, but not limited to, fittings, blocking, joint restraint, detectable marking tape, removal and wastehaul or existing facilities, excavation, dewatering, bedding, compaction, wastehaul and disposal of excess material, and testing of the complete and in place 12-inch CPEP storm sewer as shown on the Plans and as specified in Section 02534 of these Specifications.

### **Catch Basin, Type 1**

The unit contract price per each for CATCH BASIN, TYPE 1 shall constitute full compensation for all labor, materials, tools, equipment, transportation, supplies, and incidentals required to complete all work to furnish and install this item to include, but not limited to, lids, frames and grates, slip resistant lids where indicated on the Plans, structure excavation, foundation gravel, backfill with suitable native material, compaction, removal and wastehaul of excess or unsuitable excavated material, pipe connection, dewatering, bypass pumping and maintaining stormwater flows, adjusting to finished grade, and material and compaction testing of suitable native backfill.

### **6-In. PVC Drain Pipe and Fittings (Incl. Bedding)**

Measurement will be per linear foot as measured along the ground surface. The unit price bid per linear foot for 6-IN. PVC DRAIN PIPE AND FITTINGS (INCL. BEDDING) shall include all costs of labor, material, and equipment required to furnish, install, and test complete all 6-inch drain pipe, including, but not limited to, fittings, blocking, joint restraint, detectable marking tape, removal and wastehaul or existing facilities, excavation, dewatering, bedding, compaction, wastehaul and disposal of excess material, and testing of the complete and in place 6-inch drain

pipe as shown on the Plans and as specified in Section 02534 of these Specifications.

#### **8-In. PVC Drain Pipe and Fittings (Incl. Bedding)**

Measurement will be per linear foot as measured along the ground surface. The unit price bid per linear foot for 8-IN. PVC DRAIN PIPE AND FITTINGS (INCL. BEDDING) shall include all costs of labor, material, and equipment required to furnish, install, and test complete all 8-inch drain pipe, including, but not limited to, fittings, blocking, joint restraint, detectable marking tape, removal and wastehaul or existing facilities, excavation, dewatering, bedding, compaction, wastehaul and disposal of excess material, and testing of the complete and in place 8-inch drain pipe as shown on the Plans and as specified in Section 02534 of these Specifications.

#### **4-In. PVC Footing Drain and Fittings-Perforated (Incl. Bedding)**

Measurement will be per linear foot as measured along the ground surface. The unit price bid per linear foot for 4-IN. PVC FOOTING DRAIN AND FITTINGS-PERFORATED (INCL. BEDDING) shall include all costs of labor, material, and equipment required to furnish, install, and test complete all 4-inch drain pipe, including, but not limited to, fittings, blocking, joint restraint, detectable marking tape, removal and wastehaul or existing facilities, excavation, dewatering, bedding, compaction, wastehaul and disposal of excess material, and testing of the complete and in place 4-inch drain pipe as shown on the Plans and as specified in Section 02534 of these Specifications.

#### **Additional Fittings**

Measurement will be per pound based on the actual weight of the additional fittings alone, excluding follower glands, bolts, gaskets, and blocking. The unit price bid per pound for ADDITIONAL FITTINGS shall include all costs for the labor, material, and equipment to furnish and install any fittings required in addition to those specifically reference on the Plans and shall include, where appropriate, all costs for follower glands, bolts, gaskets, thrust blocks, anchor blocks, excavation, wastehaul and disposal of excess material, dewatering, compaction, and any and all other costs of material, equipment, tools, and labor incurred in the installation of the additional fittings.

#### **Connection to Existing Water System**

The unit price bid per each for CONNECTION TO EXISTING WATER SYSTEM shall constitute full compensation for all labor, materials, tools and equipment necessary and incidental to connecting to the District's existing water system as shown on the Plans. This shall include sawcutting, pre-digging the connection location a minimum of one day prior to the scheduled connection in order to verify the connection configuration, steel plates, excavation, cutting and removing existing tees, valves, valve boxes and other fittings, coupling adapters, plugs/caps,

gaskets, bolts and other hardware, flanges, temporary blow-off assemblies, concrete blocking, disinfection and testing, removal of existing plugs, ductile iron reducers and ductile sleeves and plugging and abandonment of existing pipes.

The cut-in and connection to the existing water main at each location shown on the Plans shall be considered one (1) Connect to Existing Water System. All work associated with each tee or cross connection shall be considered one (1) Connect to Existing Water System, including all branch or mainline connections. Connections to sections of new water main installed previously in other phases of the Contract will not be paid for under the Connect to Existing Water System bid item, but shall be considered incidental to the bid item for water main installation.

### **Soldier Piles**

Measurement shall be per linear foot. The unit price bid per linear foot for SOLDIER PILES shall include all costs for the labor, material and equipment necessary to construct soldier piles including, but not limited to excavating, boring, preparing the subgrade, and backfill for a complete installation as shown on the Plans and specified herein.

### **Lagging**

Measurement shall be per square foot of exposed wall. The unit price per square foot price for LAGGING shall include all costs for labor, material and equipment necessary to install timber lagging including, but not limited to the timber lagging, drain board, drain grate, and wall drain as shown on the Plans and as specified herein.

### **Cast-In-Place Retaining Wall**

Measurement shall be by lump sum. The lump sum contract price for CAST-IN-PLACE RETAINING WALL shall include all costs for the labor, material and equipment necessary to construct cast-in-place wall including, but not limited to excavating, preparing the subgrade, furnish and installing leveling pad, backfill for a complete installation as shown on the Plans and as described in Section 03300.

### **Gravity Block Retaining Wall**

Measurement shall be by lump sum. The lump sum contract price for GRAVITY BLOCK RETAINING WALL shall include all costs for the labor, material and equipment necessary to construct block retaining wall including, but not limited to, excavating, preparing the subgrade, furnish and installing leveling pad, modular block unit and cap, backfill for a complete installation as shown on the Plans and as described in Section 02832.

### **Unsuitable Materials**

Measurement shall be by cubic yard, in-place and shall be to the limits as designated by the Engineer. There shall be no payment if the Engineer believes removal of materials is needed because of damage caused by the Contractor's operations.

All quantities will be measured and recorded by the Engineer in their Daily Report and the Contractor shall be responsible for reconciling their quantities with the Engineer on a daily basis.

The unit price per cubic yard for UNSUITABLE MATERIALS shall include all cost for labor, material, and equipment to excavate and wastehaul unsuitable native subgrade materials, including backfilling the resulting excavations with compacted foundation gravel materials.

The Contractor is advised that the excavation of any and all unsuitable material must be authorized by the Engineer in writing prior to the commencement of said excavation by the Contractor.

### **Foundation Gravel** **Imported Backfill Gravel** **Crushed Rock**

The unit price bid per ton for FOUNDATION GRAVEL, IMPORTED BACKFILL GRAVEL, and CRUSHED ROCK shall constitute full compensation for all labor, material, tools and equipment necessary and incidental to furnishing the materials in the trench, under asphalt trench, in the shoulder, asphalt road and under the sidewalk, curb and gutter or elsewhere as required or as directed by the District, and proper disposal of excavated materials. These items shall include, but not be limited to, the following:

1. Over-excavation or extra depth excavation as may be required by the District, or field conditions, which dictate such excavation, as approved by the District.
2. Grading, preparation and compaction of existing subgrade.
3. Proper disposal of excavated materials.

Payment for gravel and rock materials will be made based on the actual number of tons of material furnished and placed. Quantities shall be based on certified weight tickets signed by the driver and collected by the inspector at the time and place of delivery. Loads of material for which a certified weight ticket has not been given to the inspector shall not be paid for.

Gravel and rock materials will be paid for by the ton as substantiated by certified scale tickets, up to the maximum quantity calculated for the volume within the neat lines of the trench as specified in the specifications and standard details. A conversion factor of 1.85 Tons/CY will be used to convert cubic yards of material to tons.

It will be the Contractor's responsibility to see that a ticket is given to the Inspector for each truckload of material delivered. Duplicate tally tickets shall be prepared to accompany each truckload of material delivered on the project. The tickets shall bear at least the following information:

1. Truck number.
2. Quantity delivered in cubic yards and tons.
3. Driver's name and date.
4. Location of delivery - by job name and stationing on each job.
5. Place for receipting by the inspector.

#### **HMA CL. 1/2" PG 64-22**

Measurement shall be per ton, in-place, based on truck tickets and shall be to the limits designated and approved by the Engineer. The unit price bid per ton for HMA CL. 1/2" PG 64-22 shall include all costs for the labor, material, and equipment to furnish, install, and test hot mix asphalt, including, but not limited to, tack coat, cleaning and sealing joints, compaction, pavement markings, and adjusting castings to grade, as shown on the Plans and as described in Section 02740.

#### **Fencing and Gates**

Measurement shall be by linear foot in place to the limits shown on the plans and approved by the Engineer. The linear foot contract price for FENCING AND GATES shall include all labor, materials and equipment necessary to furnish and install fencing and gates.

#### **Sidewalk**

Measurement shall be by square yard, in place, to the limits shown on the plans and approved by the Engineer. The square yard contract price for SIDEWALK shall include all labor, materials and equipment necessary and incidental to furnish, install, and test concrete.

### **Concrete Curb and Gutter**

Measurement shall be by linear foot, in place, to the limits shown on the plans and approved by the Engineer. The linear foot contract price for CONCRETE CURB AND GUTTER shall include all labor, materials and equipment necessary and incidental to furnish, install, and test concrete.

### **Electrical, Cameras, and Door Access System**

Measurement shall be by lump sum. The lump sum contract price for ELECTRICAL, CAMERAS, AND DOOR ACCESS SYSTEM shall include all labor, materials, and equipment to furnish and install camera system, door access system, conduit, wiring, panel boards, receptacles, lighting, fixtures, and demolition or abandonment of electrical components as shown on the Plans and specified herein. Costs also include the installation of items described in Appendix C, which will be purchased and supplied by the Owner.

### **Electrical Service**

Measurement shall be by lump sum. The lump sum contract price for ELECTRICAL SERVICE shall include all costs associated with the modifications to the electrical service. For bidding purposes, an amount of \$30,000 will be included in the proposal for ELECTRICAL SERVICE line item. The Owner will pay the actual invoice cost of service modifications completed by Puget Sound Energy. All other costs of coordination with the Puget Sound Energy shall be included in the lump sum cost of ELECTRICAL.

### **General Restoration**

The lump sum price bid for GENERAL RESTORATION shall constitute full compensation for all labor, material, tools and equipment necessary and incidental to restore disturbed ground surfaces and existing improvements to their pre-construction condition or better, not including work covered by other bid items. This item shall include, but not be limited to, the following:

1. Furnishing and placing of new topsoil, sod, bark, decorative rock or other surface treatment consistent with the adjacent undisturbed ground surface.
2. Excavation, grading and preparation of the areas to be restored.
3. Removal, storage and replacement of any existing decorative shrubs, hedges or trees.
4. Restoration of fences, rockeries, utilities or other structures.
5. Protection or replacement of existing culverts and asphalt lined ditches.

6. Protection of existing trees and improvements not to be removed.
7. Hydroseeding, seeding, mulching, plantings or other erosion control measures as required in rights-of-way, easement, or landscaped areas.
8. Asphalt or concrete pavement required beyond the limits allowed for payment described herein.
9. Removal and replacement of existing landscaping or irrigation system as required.
10. Installation of new landscaping and hydroseeding for frontage improvement planter strip.

Payment shall be based on completion of the restoration satisfactory to the individual property owners or agency having jurisdiction over the affected property.

#### **Apprenticeship Incentive**

Measurement shall be by calculation. For the purpose of providing a common Proposal for all bidders, the Contracting Agency has entered an amount in the Proposal to become a part of the total bid by the Contractor. An incentive of \$2,000 will be assessed with the Final Payment for Contractors who meet the Apprentice Utilization Requirement without a reduction by Good Faith Effort, as described in the General Conditions.

#### **Apprenticeship Penalty**

Measurement shall be by calculation. Apprenticeship Hours will be measured for each hour of work performed by an apprentice as shown on the Monthly Apprentice Utilization Report, based on certified payrolls or the affidavits of wages paid, whichever is least. The percentage is not rounded up.

For the purpose of providing a common Proposal for all bidders, the Contracting Agency has entered an amount in the Proposal to become a part of the total bid by the Contractor, as described in the General Conditions. When the Contractor fails to meet the Apprenticeship goal of 15 percent, a penalty will be assessed for each hour that is not achieved, unless a Good Faith Effort is approved by the Contracting Agency.

Apprenticeship Utilization Penalty will be calculated as described below:

<b>Percent of Goal Met</b>	<b>Penalty</b>
>90% to <100%	\$1,000
>75% to 90%	\$2,000
>50% to 75%	\$3,000
>1% to 50%	\$4,000
0%	\$5,000

The Contractor shall include all related costs in the unit Bid prices of the Contract, included but not limited to implementing, developing, documenting, and administering an apprenticeship utilization program, recording and reporting hours and all other costs to comply with this provision.

## **SCHEDULE B**

### **Mobilization**

The lump sum price bid for MOBILIZATION shall be full compensation for all labor, equipment, tools and materials required for preparatory work and operations, including, but not limited to the following items:

1. The movement of personnel, equipment, supplies and incidentals to the project site as related to project mobilization, demobilization and cleanup.
2. The establishment of field offices and material storage areas.
3. Purchase, delivery and storage of pipe, fittings, appurtenances, and all other materials required for the project.
4. Insurance, bonding, submittals and other work and operations that must be performed or costs incurred before beginning contract work.
5. Mobilization costs for subcontracted work.

Payment for MOBILIZATION shall be as follows:

25% Payment: When Contractor has mobilized on-site and temporary facilities are in place.

25% Payment: When 5 percent of the total pay items are completed (not including payment for materials on hand).

25% Payment: When 50 percent of the total pay items are completed (not



including payment for materials on hand).

25% Payment: When Project is completed and recommended for acceptance.

In no event shall the amount bid or allowed for Mobilization exceed 5% of the total Contract Price for all other items listed in the Bid.

### **Minor Change**

Measurement will be negotiated prior to commencing any such work under this pay item and shall be for work to remedy unforeseen conditions, utility conflicts, minor landscaping, minor drainage improvements, or special surface restoration.

Payment or credits for changes amounting to \$20,000 or less may be made under the Bid Item MINOR CHANGE. At the discretion of the Owner, this procedure for Minor Changes may be used in lieu of the more formal procedure as outlined in General Conditions Section 8.23. The Contractor will be provided a copy of the completed order for Minor Changes. The agreement for the Minor Changes will be documented by signature of the Contractor or notation of the verbal agreement. If the Contractor is in disagreement with anything required by the order for Minor Changes, the Contractor may protest the order as provided in General Conditions Section 8.23.

Payments or credits will be determined in accordance with General Conditions Section 8.23. All Minor Change work will be within the scope of the Contract Work and will not change Contract Time. For the purpose of providing a common Proposal for all Bidders, the Owner has entered an amount for MINOR CHANGE in the Proposal to become part of the total Bid by the Contractor.

### **Locate Existing Utilities**

The lump sum price bid for LOCATE EXISTING UTILITIES shall constitute full compensation for all labor, equipment, tools, and materials required to locate all existing utilities on the project.

### **Temporary Traffic Control**

Measurement shall be by lump sum. The lump sum contract price for TEMPORARY TRAFFIC CONTROL shall include costs for all labor, material, and equipment to provide temporary traffic control for the project as shown on the Plans and as specified in Section 01950.

### **Temporary Erosion and Sedimentation Control**

The lump sum price bid for TEMPORARY EROSION AND SEDIMENT CONTROL shall be full compensation for all labor, materials, tools and equipment necessary and incidental to install, maintain and remove the TESC facilities. This item shall include, but not be limited to, the following: filter fabric fence, filter bags, storm drain inlet protection, straw bales, plastic sheeting, construction entrance mat, and street sweeping.

### **Trench Safety System**

The lump sum price bid for TRENCH SAFETY SYSTEM shall constitute full compensation for all labor, materials, tools and equipment necessary and incidental to providing a safe trench excavation. This item shall include, but not be limited to, the following:

1. Design, installation, proper use and removal of all sheeting, shoring, cribbing, boxes or other trench protection methods.
2. Excavation, backfill, compaction and other work required if extra excavation is used in lieu of trench box, shoring, cribbing or other trench protection. If imported backfill gravel is required for backfilling within the limits of the sewer or water line excavation, it shall also be required as backfill material for the extra excavation and shall be provided at the Contractor's expense.

The Contractor shall be solely responsible for the safety of his crew and public, and the District assumes no responsibility. The District will not be responsible for determining the adequacy of any system used by the Contractor and payment for protection systems will not imply District's approval of adequacy.

### **Precast Vault**

Measurement shall be by lump sum. The lump sum contract price for PRECAST VAULT shall include all costs for the labor, materials, and equipment to install precast vaults and appurtenances as shown on the Plans and as specified herein.

### **Precast Vault Piping**

Measurement shall be by lump sum. The lump sum contract price for PRECAST VAULT PIPING shall include all costs for the labor, materials, and equipment to install vault piping, valves, and appurtenances as shown on the Plans and as specified herein.

### **Site Piping**

Measurement shall be by lump sum. The lump sum contract price for SITE PIPING shall include all costs for labor, materials, and equipment required to install site piping including, but not limited to, fittings, blocking, joint restraint, excavation, dewatering, bedding, backfill, compaction, disinfection, testing, and all other appurtenances as shown in the Plans and as specified in Section 02500 of these Specifications.

### **Fire Hydrant Assembly**

Measurement shall be per each. The unit price per each for FIRE HYDRANT ASSEMBLY shall include all costs for labor, materials, and equipment to furnish and install the fire hydrant, valve, and appurtenances as shown on the Plans and described in Section 02500 of these Specifications.

### **Connection to Existing Water System**

The unit price bid per each for CONNECTION TO EXISTING WATER SYSTEM shall constitute full compensation for all labor, materials, tools and equipment necessary and incidental to connecting to the District's existing water system as shown on the Plans. This shall include sawcutting, pre-digging the connection location a minimum of one day prior to the scheduled connection in order to verify the connection configuration, steel plates, excavation, cutting and removing existing tees, valves, valve boxes and other fittings, cutting carrier pipe and furnishing and installing casing end seals, coupling adapters, plugs/caps, gaskets, bolts and other hardware, flanges, temporary blow-off assemblies, concrete blocking, disinfection and testing, removal of existing plugs, ductile iron reducers and ductile sleeves and plugging and abandonment of existing pipes.

The cut-in and connection to the existing water main at each location shown on the Plans shall be considered one (1) Connect to Existing Water System. All work associated with each tee or cross connection shall be considered one (1) Connect to Existing Water System, including all branch or mainline connections. Connections to sections of new water main installed previously in other phases of the Contract will not be paid for under the Connect to Existing Water System bid item, but shall be considered incidental to the bid item for water main installation.

### **Unsuitable Materials**

Measurement shall be by the cubic yard, in-place and shall be to the limits as designated by the Engineer. There shall be no payment if the Engineer believes removal of materials is needed because of damage caused by the Contractor's operations.

All quantities will be measured and recorded by the Engineer in their Daily Report and the Contractor shall be responsible for reconciling their quantities with the Engineer on a daily basis.

The unit price per cubic yard for UNSUITABLE MATERIALS shall include all cost for labor, material, and equipment to excavate and wastehaul unsuitable native subgrade materials, including backfilling the resulting excavations with compacted foundation gravel materials.

The Contractor is advised that the excavation of any and all unsuitable material must be authorized by the Engineer in writing prior to the commencement of said excavation by the Contractor.

**Foundation Gravel**  
**Imported Backfill Gravel**  
**Crushed Rock**

The unit price bid per ton for FOUNDATION GRAVEL, IMPORTED BACKFILL GRAVEL, and CRUSHED ROCK shall constitute full compensation for all labor, material, tools and equipment necessary and incidental to furnishing the materials in the trench, under asphalt trench, in the shoulder, asphalt road and under the sidewalk, curb and gutter or elsewhere as required or as directed by the District, and proper disposal of excavated materials. These items shall include, but not be limited to, the following:

1. Over-excavation or extra depth excavation as may be required by the District, or field conditions, which dictate such excavation, as approved by the District.
2. Grading, preparation and compaction of existing subgrade.
3. Proper disposal of excavated materials.

Payment for gravel and rock materials will be made based on the actual number of tons of material furnished and placed. Quantities shall be based on certified weight tickets signed by the driver and collected by the inspector at the time and place of delivery. Loads of material for which a certified weight ticket has not been given to the inspector shall not be paid for.

Gravel and rock materials will be paid for by the ton as substantiated by certified scale tickets, up to the maximum quantity calculated for the volume within the neat lines of the trench as specified in the specifications and standard details. A conversion factor of 1.85 Tons/CY will be used to convert cubic yards of material to tons.

It will be the Contractor's responsibility to see that a ticket is given to the Inspector for each truckload of material delivered. Duplicate tally tickets shall be prepared to accompany each truckload of material delivered on the project. The tickets shall bear at least the following information:

1. Truck number.
2. Quantity delivered in cubic yards and tons.
3. Driver's name and date.
4. Location of delivery - by job name and stationing on each job.
5. Place for receipting by the inspector.

### **Electrical**

Measurement shall be by lump sum. The lump sum contract price for ELECTRICAL shall include all labor, materials, and equipment to furnish and install conduit, wiring, receptacles, fixtures as shown on the Plans and specified herein. Costs also include the installation of items described in Appendix C, which will be purchased and supplied by the Owner.

### **Electrical Service**

Measurement shall be by lump sum. The lump sum contract price for ELECTRICAL SERVICE shall include all costs associated with the modifications to the electrical service. For bidding purposes, an amount of \$10,000 will be included in the proposal for ELECTRICAL SERVICE line item. The Owner will pay the actual invoice cost of service modifications completed by Puget Sound Energy. All other costs of coordination with the Puget Sound Energy shall be included in the lump sum cost of ELECTRICAL.

### **General Restoration**

The lump sum price bid for GENERAL RESTORATION shall constitute full compensation for all labor, material, tools and equipment necessary and incidental to restore disturbed ground surfaces and existing improvements to their pre-construction condition or better, not including work covered by other bid items. This item shall include, but not be limited to, the following:

1. Furnishing and placing of new topsoil, sod, bark, decorative rock or other surface treatment consistent with the adjacent undisturbed ground surface.
2. Excavation, grading and preparation of the areas to be restored.

3. Removal, storage and replacement of any existing decorative shrubs, hedges or trees.
4. Restoration of fences, rockeries, utilities or other structures.
5. Protection or replacement of existing culverts and asphalt lined ditches.
6. Protection of existing trees and improvements not to be removed.
7. Hydroseeding, seeding, mulching, plantings or other erosion control measures as required in rights-of-way, easement, or landscaped areas.
8. Asphalt or concrete pavement required beyond the limits allowed for payment described herein.
9. Removal and replacement of existing landscaping or irrigation system as required.

Payment shall be based on completion of the restoration satisfactory to the individual property owners or agency having jurisdiction over the affected property.

### **Apprenticeship Incentive**

Measurement shall be by calculation. For the purpose of providing a common Proposal for all bidders, the Contracting Agency has entered an amount in the Proposal to become a part of the total bid by the Contractor. An incentive of \$2,000 will be assessed with the Final Payment for Contractors who meet the Apprentice Utilization Requirement without a reduction by Good Faith Effort, as described in the General Conditions.

### **Apprenticeship Penalty**

Measurement shall be by calculation. Apprenticeship Hours will be measured for each hour of work performed by an apprentice as shown on the Monthly Apprentice Utilization Report, based on certified payrolls or the affidavits of wages paid, whichever is least. The percentage is not rounded up.

For the purpose of providing a common Proposal for all bidders, the Contracting Agency has entered an amount in the Proposal to become a part of the total bid by the Contractor, as described in the General Conditions. When the Contractor fails to meet the Apprenticeship goal of 15 percent, a penalty will be assessed for each hour that is not achieved, unless a Good Faith Effort is approved by the Contracting Agency.

Apprenticeship Utilization Penalty will be calculated as described below:

<b>Percent of Goal Met</b>	<b>Penalty</b>
>90% to <100%	\$500
>75% to 90%	\$1,000
>50% to 75%	\$1,500
>1% to 50%	\$2,000
0%	\$2,500

The Contractor shall include all related costs in the unit Bid prices of the Contract, included but not limited to implementing, developing, documenting, and administering an apprenticeship utilization program, recording and reporting hours and all other costs to comply with this provision.

# **PROPOSAL**



# SECTION 5

## Proposal

Honorable Commissioners  
Northshore Utility District  
King County, Washington

Dear Members of the Board:

The undersigned has examined the site, specifications, plans, laws and ordinances covering the improvements contemplated. In accordance with the terms, provisions and requirements of the foregoing, the following lump sums and unit prices are tendered as an offer to perform the work and furnish the equipment, materials, appurtenances and guarantees, where required, complete in place, in good working order.

As evidence of good faith, cash, bid bond, cashier's check, certified check, or postal money order made payable to the King County Treasurer is attached hereto. The undersigned understands and here agrees that, should this offer be accepted and the undersigned fail or refuse to enter into a contract and furnish the required construction performance bond and necessary liability insurance, the undersigned will forfeit to the District an amount from the "good faith token", equal to five percent (5%) of the amount bid as liquidated damages, all as provided for in the specifications.

The undersigned hereby proposes to undertake and complete the work embraced in this improvement, in accordance with the terms of the specifications and contract documents, at the following lump sum and unit prices.

Please find attached the itemized listing for said lump sum and unit prices, receipt of addenda, non-collusion declaration, the bidder responsibility checklist, the subcontractor responsibility checklist, the statement of bidder's qualifications, and the proposed subcontractors list for Contract C0928; 451 Zone Control Valve Facility and Control Valve Vault.

## ATTACHMENTS

### C0928; 451 ZONE CONTROL VALVE FACILITY AND CONTROL VALVE VAULT

#### SCHEDULE A – SITE 46 – 112<sup>TH</sup> AVENUE NE FCV

Item	Item Description	Units	Quantity	Unit Price	Amount
1.	Mobilization	LS	1		
2.	Minor Change	CALC	1	\$50,000.00	\$50,000.00
3.	Locate Existing Utilities	LS	1		
4.	Temporary Traffic Control	LS	1		
5.	Temporary Erosion and Sedimentation Control	LS	1		
6.	Clearing and Grubbing	LS	1		
7.	Trench Safety System	LS	1		
8.	Dewatering	LS	1		
9.	Sitework	LS	1		
10.	Demolition	LS	1		
11.	Asphalt Planing	SY	400		
12.	Building	LS	1		
13.	Building Piping	LS	1		
14.	8-In. Diam. Water Main and Fittings, Restrained Joint (Incl. Bedding)	LF	200		
15.	8-Inch Gate Valve	EA	3		
16.	12-In. Diam. Water Main and Fittings, Restrained Joint (Incl. Bedding)	LF	5		
17.	16-In. Diam. Water Main and Fittings, Restrained Joint (Incl. Bedding)	LF	300		
18.	CPEP Storm Sewer Pipe, 12 In. Diam. (Incl. Bedding)	LF	270		
19.	Catch Basin, Type 1	EA	5		
20.	6-In. PVC Drain Pipe and Fittings (Incl. Bedding)	LF	45		
21.	8-In. PVC Drain Pipe and Fittings (Incl. Bedding)	LF	75		
22.	4-In. PVC Footing Drain and Fittings-Perforated (Incl. Bedding)	LF	140		
23.	Additional Fittings	LB	1,000		
24.	Connection to Existing Water System	EA	3		
25.	Soldier Piles	LF	450		
26.	Lagging	SF	1,200		
27.	Cast-In-Place Retaining Wall	LS	1		

<b>Item</b>	<b>Item Description</b>	<b>Units</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Amount</b>
28.	Gravity Block Retaining Wall	LS	1		
29.	Unsuitable Materials	CY	20		
30.	Foundation Gravel	TN	70		
31.	Imported Backfill Gravel	TN	1,300		
32.	Crushed Rock	TN	80		
33.	HMA Cl. 1/2" PG 64-22	TN	120		
34.	Sidewalk	SY	50		
35.	Concrete Curb and Gutter	LF	100		
36.	Electrical, Cameras, and Door Access System	LS	1		
37.	Electrical Service	CALC	1	\$30,000.00	\$30,000.00
38.	General Restoration	LS	1		
39.	Apprenticeship Incentive	CALC	1	\$3,000.00	\$3,000.00
40.	Apprenticeship Penalty	CALC	1	\$0.00	\$0.00
<b>Subtotal, Schedule A</b>					<b>\$</b>
<b>10.2% Sales Tax</b>					
<b>Total, Schedule A</b>					

**SCHEDULE B – SITE 69 – 451/446 ZONE SEPARATION VALVE**

<b>Item</b>	<b>Item Description</b>	<b>Units</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Amount</b>
1.	Mobilization	LS	1		
2.	Minor Change	CALC	1	\$20,000.00	\$20,000.00
3.	Locate Existing Utilities	LS	1		
4.	Temporary Traffic Control	LS	1		
5.	Temporary Erosion and Sedimentation Control	LS	1		
6.	Trench Safety System	LS	1		
7.	Precast Vault	LS	1		
8.	Precast Vault Piping	LS	1		
9.	Site Piping	LS	1		
10.	Fire Hydrant Assembly	EA	1		
11.	Connection to Existing Water System	EA	2		
12.	Unsuitable Materials	CY	10		
13.	Foundation Gravel	TN	10		
14.	Imported Backfill Gravel	TN	70		
15.	Crushed Rock	TN	30		
16.	Electrical	LS	1		
17.	Electrical Service	CALC	1	\$10,000.00	\$10,000.00
18.	General Restoration	LS	1		
19.	Apprenticeship Incentive	CALC	1	\$1,000.00	\$1,000.00
20.	Apprenticeship Penalty	CALC	1	\$0.00	\$0.00
<b>Subtotal, Schedule B</b>					<b>\$</b>
<b>10.3% Sales Tax</b>					
<b>Total, Schedule B</b>					

**C0928; 451 ZONE CONTROL VALVE FACILITY AND CONTROL VALVE VAULT**

Total, Schedule A	\$
Total, Schedule B	\$
Total Bid, Schedules A and B	\$

**Extra Depth Asphalt or Concrete Removal and Disposal**

In the event the Contractor encounters asphalt or concrete pavement exceeding 6" thickness, the Contractor will be compensated for the saw cutting, removal and disposal of the excess asphalt or concrete according to the following schedule:

<u>ASPHALT DEPTH</u>	<u>PRICE PER LF</u>
6"	\$0
7"	\$2.00
8"	\$4.00
9"	\$6.00
10"	\$8.00
11"	\$10.00
12"	\$12.00

Add \$2.00 per inch at depth per lineal foot for all depths that exceed 12 inches.

Prices shown are per foot of trench length.  
Payment will not be cumulative.

**Receipt of Addenda**

Receipt of Addenda No(s). \_\_\_\_\_ to the Contract Documents is hereby acknowledged:

*Note: Failure to acknowledge receipt of the addenda will be considered an irregularity in the proposal.*

## BIDDER RESPONSIBILITY CHECKLIST

The following checklist is used in documenting that a bidder meets the mandatory Bidder Responsibility Criteria. Please print a copy of documentation from the appropriate website to be included with the submittal.

<b>General Information</b>	
Project Name: Contract C0928; 451 Zone Control Valve Facility and Control Valve Vault.	Project Number: 0
Bidder's Business Name:	Bid Submittal Deadline:
<b>Contractor Registration</b>	
License Number:	Status: Active: Yes <input type="checkbox"/> No <input type="checkbox"/>
Effective Date (must be effective on or before Bid Submittal Deadline):	Expiration Date:
<b>Contractor and Plumber Infraction List</b>	
Is Bidder on Infraction List?	Yes <input type="checkbox"/> No <input type="checkbox"/>
<b>Current UBI Number</b>	
UBI Number:	Account Closed: Open <input type="checkbox"/> Closed <input type="checkbox"/>
<b>Industrial Insurance Coverage</b>	
Account Number:	Account Current: Yes <input type="checkbox"/> No <input type="checkbox"/>
<b>Employment Security Department Number</b>	
Employment Security Department Number:	
Please provide a copy of your latest correspondence, containing your account number, with Employment Security Department. Please do not provide document containing personal information such as social security numbers.	
<b>State Excise Tax Registration Number</b>	
Tax Registration Number:	Account Closed: Open <input type="checkbox"/> Closed <input type="checkbox"/>
<b>Not Disqualified from Bidding</b>	
Is the Bidder listed on the "Contractors Not Allowed to Bid" list of the Department of Labor and Industries? Yes <input type="checkbox"/> No <input type="checkbox"/>	
<b>Contractor Public Works Training (RCW 39.04.350 &amp; RCW 39.06.020)</b>	
Has the Bidder satisfied the PW training requirements? Yes <input type="checkbox"/> No <input type="checkbox"/>	
<b>Information Supplied by:</b>	
Print Name of Bidder Representative:	Date:
<b>Verified by:</b>	
Signature of District Employee:	Date:

## SUBCONTRACTOR RESPONSIBILITY CHECKLIST

The following checklist is used in documenting that a subcontractor of any tier meets the subcontractor responsibility Criteria. Bidder must complete one of these forms for each of the first-tier subcontractor. Please print a copy of the documentation from the appropriate website to be included with the submittal.

<b>General Information</b>	
Project Name: Contract C0928; 451 Zone Control Valve Facility and Control Valve Vault.	Project Number: 0
Subcontractor's Business Name:	Subcontract Execution Date:
<b>Contractor Registration</b>	
License Number:	Status: Active: Yes <input type="checkbox"/> No <input type="checkbox"/>
Effective Date (must be effective on or before Subcontract Bid Submittal Deadline):	Expiration Date:
<b>Contractor and Plumber Infraction List</b>	
Is Subcontractor on Infraction List? <span style="float: right;">Yes <input type="checkbox"/> No <input type="checkbox"/></span>	
<b>Current UBI Number</b>	
UBI Number:	Account Closed: Open <input type="checkbox"/> Closed <input type="checkbox"/>
<b>Industrial Insurance Coverage</b>	
Account Number:	Account Current: Yes <input type="checkbox"/> No <input type="checkbox"/>
<b>Employment Security Department Number</b>	
Employment Security Department Number:	
<ul style="list-style-type: none"> <li>• Has Subcontractor provided account number on the Bid Form? <span style="float: right;">Yes <input type="checkbox"/> No <input type="checkbox"/></span></li> <li>• And/or have you asked the Subcontractor for documentation from Employment Security Department on account number? <span style="float: right;">Yes <input type="checkbox"/> No <input type="checkbox"/></span></li> </ul>	
<b>State Excise Tax Registration Number</b>	
Tax Registration Number:	Account Closed: Open <input type="checkbox"/> Closed <input type="checkbox"/>
<b>Not Disqualified from Bidding</b>	
Is the Subcontractor listed on the "Contractors Not Allowed to Bid" list of the Department of Labor and Industries? <span style="float: right;">Yes <input type="checkbox"/> No <input type="checkbox"/></span>	
<b>Contractor Licenses</b>	
<u>Electrical</u> : If required by Chapter 19.28 RCW, does the Subcontractor have an Electrical Contractor's License? <span style="float: right;">Yes <input type="checkbox"/> No <input type="checkbox"/></span>	<u>Elevator</u> : If required by Chapter 70.87 RCW, does the Subcontractor have an Elevator Contractor's License? <span style="float: right;">Yes <input type="checkbox"/> No <input type="checkbox"/></span>
<b>Contractor Public Works Training (RCW 39.04.350 &amp; RCW 39.06.020)</b>	
Has the Subcontractor satisfied the PW training requirements? <span style="float: right;">Yes <input type="checkbox"/> No <input type="checkbox"/></span>	
<b>Information Supplied by:</b>	
Print Name of <input type="checkbox"/> Contractor <input type="checkbox"/> Subcontractor Representative:	Date:
<b>Verified by:</b>	
Signature of District Employee:	Date:

## STATEMENT OF BIDDER'S QUALIFICATIONS

Contracting Firm Name:
Number of years Contractor has been in the construction business under the present firm name:
Present gross dollar amount of work under contract: \$
Present gross dollar amount of contracts not yet completed: \$
General type of work performed by firm:

List the five major pieces of equipment to be used on this project:	Owned	Leased	Rented
1.			
2.			
3.			
4.			
5.			

List the general superintendents or other supervisory employees at your firm:	# of Years at Firm
Employee 1:	
Employee 2.:	
Employee 3:	

Bank Reference:
Have you changed bonding companies within the last three years?
If so, why? (optional)



## PROPOSED SUBCONTRACTORS

Consistent with RCW 39.30.060, each Bidder on a project in excess of \$1,000,000 is required to submit the completed Subcontractors list included in the proposal section with the bid. The completed list must identify each subcontractor who will perform heating, ventilation and air-conditioning (HVAC), or plumbing work as described in Chapter 18.106 RCW, electrical work as described in Chapter 19.28 RCW, or the contractor must name itself for the work. The requirement to name the Bidder's proposed HVAC, plumbing and electrical subcontractor applies only to those subcontractors who will contract directly with the Bidder (i.e. first-tier subcontractors only, even if that first-tier subcontractor intends to hire a sub-tier contractor to perform all or part of the HVAC, plumbing or electrical work

The Bidder shall not list more than one subcontractor for each category of work identified, unless subcontractors vary with bid alternates, in which case the Bidder must indicate which subcontractor will be used for which alternates.

Failure of the Bidder to submit as part of the bid the names of such subcontractors, or name itself to perform such work, or the naming of two or more subcontractors to perform the work, shall render the Bidder's bid it nonresponsive and therefore void.

In completing the form, Bidders are advised that: 1) Ventilation is typically required to meet safety requirements for enclosed spaces and tunnels or certain shafts, but it may be incidental to other parts of the work, and may be required for the temporary construction facilities; 2) No plumbing work within buildings (as described in Chapter 18.106 RCW) has been specified in the contract, however plumbing work may be required for the temporary construction facilities and elsewhere in the contract documents; 3) Electrical work may be incidental to the work such as encountered with traffic control systems, electrical service to buildings and street lights, distribution wiring, conduit and junction box installation, generators, temporary electrical service and wiring for construction equipment and dewatering systems. In each instance above, the Bidder should list the work in the table(s) above. Other areas may be identified by the Bidder in the contract documents as well.

The subcontractors list may be submitted with the Bid, or 1) HVAC, Plumbing, or Electrical may be submitted separately within one hour of the time and date for Bid submittal stated in the Call for Bids or by addendum; 2) Structural Steel Installation and Rebar Installation may be submitted within 48 hours of the time and date for Bid submittal stated in the Call for Bids or by addendum. The form may be submitted in person or by facsimile (FAX number (425) 398-4430) to:

Northshore Utility District  
Attention: George Matote, P.E.  
6830 NE 185<sup>th</sup> St  
Kenmore, WA 98028

<b>STRUCTURAL STEEL INSTALLATION</b>	
Firm Name:	% of Project:
Contact Person:	
Address:	
City, State, Zip Code:	
Phone #:	Fax #:
E-mail Address:	

<b>REBAR INSTALLATION</b>	
Firm Name:	% of Project:
Contact Person:	
Address:	
City, State, Zip Code:	
Phone #:	Fax #:
E-mail Address:	

<b>HVAC SUBCONTRACTOR</b>	
Firm Name:	% of Project:
Contact Person:	
Address:	
City, State, Zip Code:	
Phone #:	Fax #:
E-mail Address:	

<b>PLUMBING SUBCONTRACTOR</b>	
Firm Name:	% of Project:
Contact Person:	
Address:	
City, State, Zip Code:	
Phone #:	Fax #:
E-mail Address:	

<b>ELECTRICAL SUBCONTRACTOR</b>	
Firm Name:	% of Project:
Contact Person:	
Address:	
City, State, Zip Code:	
Phone #:	Fax #:
E-mail Address:	

Subject to the time lost due to inclement weather and delay in delivery of materials, should such delay not be the result of the undersigned's actions, the undersigned agrees to complete all of the work embraced in this contract in 120 working days, all beginning with the date of written Notice to Proceed with the work.

The undersigned fully understands and agrees to the provisions of the Information for Bidders and herewith further agrees that the liquidated damages shall be \$1,400.00 per day for each and every working day required beyond the construction time allowed above to complete this project.

Contractor Name:	
Contact Name:	
Mailing Address:	
Office Phone #:	
Cell Phone #:	
E-mail:	

**NON-COLLUSION DECLARATION**

**I, by signing the proposal, hereby declare, under penalty of perjury under the laws of the United States that the following statements are true and correct:**

1. That the undersigned person(s), firm, association or corporation has (have) not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the project for which this proposal is submitted.
2. That by signing the signature page of this proposal, I am deemed to have signed and to have agreed to the provisions of this declaration.

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date Signed: \_\_\_\_\_

**BID BOND FORM**

Herewith find deposit in the form of a certified check, cashier's check, cash, or bid bond in amount of \$ \_\_\_\_\_, which amount is not less than five percent (5%) of the total bid.

**SIGN HERE** \_\_\_\_\_

**BID BOND for Contract: Contract C0928; 451 Zone Control Valve Facility and Control Valve Vault.**

**KNOW ALL MEN BY THESE PRESENTS:** That we, \_\_\_\_\_, as Principal, and \_\_\_\_\_,

as Surety are held and firmly bound unto the King County Treasurer, King County, Washington, as Obligee in the penal sum of \_\_\_\_\_ for the payment of which the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by these presents.

The conditions of the obligation are such that, if the Obligee shall make any award to the Principal for \_\_\_\_\_, according to the terms of said proposal or bid and award and shall give bond for the faithful performance thereof, with Surety or Sureties approved by the Obligee; or if the Principal shall, in case of failure so to do, pay and forfeit to the Obligee the penal amount of the deposit specified in the Call for Bids, then this obligation shall be null and void; otherwise, it shall be and remain in full force and effect and the surety shall forthwith pay and forfeit to the Obligee, as penalty and liquidated damages, the amount of this bond.

**SIGNED, SEALED AND DATED** this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

By \_\_\_\_\_  
*Principal*

By \_\_\_\_\_  
*Surety*

Received return of deposit in the sum of \$ \_\_\_\_\_,  
on \_\_\_\_\_, 20\_\_\_\_.

## BIDDER'S CHECKLIST

This checklist is intended to assist the Bidder in completing the Proposal. The Bidder should carefully review the Proposal form and Contract Documents to ensure a responsive bid is submitted.

- Bidders must bid on all items contained in the Proposal. Fill in the bid proposal form(s) included in this section, entering the unit price and total amount for each bid item. Verify all math.
- Only use the bid proposal form(s) included in this document or those issued with an addenda.
- Acknowledge receipt of any addenda.
- Read the *Non-Collusion Declaration* and include the form with the proposal.
- Fill out the *Bidder Responsibility Checklist*.
- Fill out the *Subcontractor Responsibility Checklist*.
- Fill out the *Statement of Bidder's Qualifications*.
- Fill out the *Proposed Subcontractors* list.
- Sign and date the proposal on the final page of the proposal and include all of the contact information as indicated.
- Submit the bid security (in the form of a certified check, cashier's check, cash or bid bond, with amount is not less than 5% of the bid total) with the proposal and fill out the Bid Bond Form.
- Submit the entire Proposal section from the contract documents as your bid documents.
- Within 2 business days, provide Supplemental Bidder Criteria Checklist as included in Appendix D.

# **CONTRACT**



## SECTION 6

### Contract

THIS CONTRACT is dated this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between Northshore Utility District, ("District"), a Washington municipal corporation, and \_\_\_\_\_ ("Contractor"), a \_\_\_\_\_.

In consideration of the mutual covenants hereinafter set forth, District and Contractor agree as follows:

#### **ARTICLE 1. DESCRIPTION OF WORK.**

The Contractor shall complete the work as specified under the Bid Schedule(s) of Section 5 – Proposal & Bid Bond of the District's Contract Documents entitled Contract C0928; 451 Zone Control Valve Facility and Control Valve Vault. The work is generally described as follows:

#### **Project Description**

#### **Contract C0928; 451 Zone Control Valve Facility and Control Valve Vault**

#### **The project consists of the following work:**

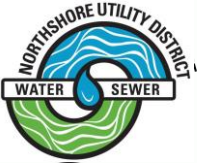
Schedule A consists of the following work:

Schedule A - Site 46 - 112th Avenue NE FCV consists of constructing a new partially buried 930± square foot concrete and CMU building whose main function is to house hydraulic control valves, flow meter, and piping that connects to the Seattle Public Utilities Tolt pipeline and directs flows to different pressure zones within the Northshore Utility District water service area. The project also includes a significant amount of site excavation, a soldier pile wall, a new driveway with new connection to existing road, frontage improvements, site piping, right-of-way piping, existing vaults demolition, and both site and right-of-way restoration.

Schedule B consists of the following work:

Schedule B - Site 69 - 451/446 Zone Separation Valve Vault consists of a new underground vault, site piping, and a standalone above ground electrical enclosure with a control panel. The vault will house a electronic control valve and site piping will connect to existing site piping at two locations. Site electrical will connect to an existing transformer nearby in the right-of-way.



**ARTICLE 2. WORK COMPLETION TIME.**

The work shall be completed within 120 working days from the commencement date stated in the "Notice to Proceed" as described in Section 7 – Definitions and Abbreviations.

**ARTICLE 3. LIQUIDATED DAMAGES.**

District and the Contractor recognize that time is of the essence of this Contract and that the District will suffer financial loss if the work is not completed within the time period specified in Article 2 herein, plus any Extension thereof allowed in accordance with Section 8 – General Conditions. They also recognize the delays, expense, and difficulties involved in proving in a legal proceeding, the actual loss suffered by the District if the work is not completed on time. Accordingly, instead of requiring any such proof, the District and the Contractor agree that as liquidated damages for delay (but not as a penalty), the Contractor shall pay the District \$1,400.00 for each day that expires after the work completion time specified in Article 2 herein.

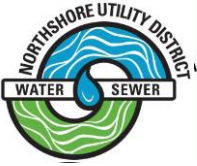
**ARTICLE 4. CONTRACT PRICE**

District shall pay Contractor for completion of the work in accordance with the Contract Documents in current funds the amount set forth in the Bid Schedule(s) of Section 5 – Proposal & Bid Bond.

**ARTICLE 5. CONTRACT DOCUMENTS.**

The Contract Documents which comprise the entire agreement between District and Contractor concerning the work consist of this Contract and the following attachments to this Contract:

- Section 1 Instructions to Bidders
- Section 2 Special Provisions
- Section 3 Engineering Specifications
- Section 4 Measurement and Payment
- Section 5 Proposal
- Section 6 Contract
- Section 7 Definitions and Abbreviations
- Section 8 General Conditions
- Section 9 Supplementary General Conditions
- Plans consisting of \_\_\_ sheets, as listed in the Special Provisions.
- Addenda numbers \_\_\_\_\_ inclusive.



- Change Orders, which may be delivered or issued after the date of this Contract, are not attached hereto.
- Permit and easement stipulations.

There are no Contract Documents other than those listed in this Article.

**ARTICLE 6. MISCELLANEOUS.**

An assignment by a party hereto of any rights under or interests in the Contract Documents will not be binding on the other party hereto without the written consent of the party sought to be bound; and specifically but without limitation monies that may become due and monies that are due may not be assigned without such consent, and unless specifically stated to the contrary in any written consent to an assignment, an assignment will not release or discharge the assignor from any duty or responsibility under the Contract Documents.

District and Contractor each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents.

IN WITNESS WHEREOF, District and Contractor have caused this Contract to be executed the day and year first above written.

DISTRICT

CONTRACTOR

---

By Alan G. Nelson,  
its General Manager

---

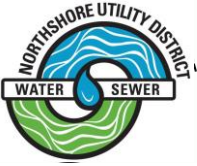
By \_\_\_\_\_  
its: \_\_\_\_\_

Address for giving notices:  
  
6830 NE 185<sup>th</sup> Street,  
Kenmore, WA 98028

Address for giving notices:

---

License No.:



IN WITNESS WHEREOF, District and Contractor have caused this Contract to be executed the day and year first above written.

DISTRICT

CONTRACTOR

---

By Alan G. Nelson,  
its General Manager

---

By \_\_\_\_\_  
its: \_\_\_\_\_

Address for giving notices:

6830 NE 185<sup>th</sup> Street,  
Kenmore, WA 98028

Address for giving notices:

---

License No.:



## MANAGEMENT OF RETAINED PERCENTAGE

The Contractor shall declare an option for management of statutory retained percentage of this Contract by initialing and dating the applicable box below:

**Option 1**

The Contractor hereby elects to have the retained percentage of this Contract held in a non-interest bearing fund by Northshore Utility District until sixty (60) days (minimum) following formal Acceptance of the work. The time of release of the retained percentage shall depend upon final receipt by the District of all required releases from the State of Washington.

**Option 2**

The Contractor hereby elects to have Northshore Utility District place the retained percentage of the Contract in escrow from time to time as such retained percentage accrues. Contractor hereby designates the following bank or trust company as the repository for said funds:

Name of Financial Institution: \_\_\_\_\_

Address of Financial Institution: \_\_\_\_\_

Escrow Account Number: \_\_\_\_\_

The Contractor understands that the District will issue a check or checks representing the retained percentage payable to the financial institutions and the Contractor jointly. This check shall be converted into bonds and securities chosen by the Contractor and approved by the District and the bonds and securities shall be held in escrow. Interest on the bonds and securities shall be paid to the Contractor as the interest accrues. Contractor agrees to be fully responsible for payment of all costs or fees incurred as a result of placing said retained percentage in escrow and investing it as authorized by statute. Northshore Utility District shall not be responsible for any cost, fees or loss in connection therewith.

**Option 3**

The Contractor hereby elects to have Northshore Utility District place the retained percentage of the Contract in an interest bearing account in a bank, mutual savings bank or savings and loan association. Contractor hereby designates the following bank or trust company as the repository for said funds:

Name of Financial Institution: \_\_\_\_\_

Address of Financial Institution: \_\_\_\_\_

Escrow Account Number: \_\_\_\_\_

Interest on moneys deposited into said fund by the District shall be paid to the Contractor. Contractor agrees to be fully responsible for payment of all costs or fees incurred as a result of placing said retained percentage in said account. Northshore Utility District shall not be responsible for any cost, fees or loss in connection therewith.



**Option 4**

Contractor hereby elects to post a retainage bond in the amount of 5% of the total bid, not including tax, in lieu of Northshore Utility District withholding the retained percentage from the monies earned by the Contractor. Contractor hereby designates the following surety company as bondholder (a copy of the bond must be attached to this form):

Name of Financial Institution: \_\_\_\_\_

Contact Name and Phone No.: \_\_\_\_\_

Address of Financial Institution: \_\_\_\_\_

\_\_\_\_\_

Contractor's Signature

\_\_\_\_\_

Date



## PERFORMANCE, PAYMENT & GUARANTY BOND

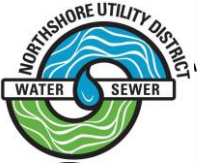
**KNOW ALL MEN BY THESE PRESENTS:** That we,  
\_\_\_\_\_, the Contractor named in the contract  
hereinafter referred to as Principal, and  
\_\_\_\_\_, as  
SURETY, are held and firmly bound unto the NORTHSHORE UTILITY  
DISTRICT, hereinafter called and also being the DISTRICT named in said  
contract,

**Contract C0928; 451 Zone Control Valve Facility and Control Valve Vault.** in  
the full sum of \_\_\_\_\_ Dollars,  
(\$\_\_\_\_\_) lawful money of the United States of America, for the  
payment of which sum well and truly to be made, we bond ourselves, our heirs,  
executors, assigns, administrators and successors jointly and severally, firmly by  
these presents.

**THE CONDITION OF THIS OBLIGATION IS SUCH**, that, **WHEREAS**, the  
Principal entered into a certain contract with the District, dated  
\_\_\_\_\_, 20\_\_\_\_ for construction of sanitary sewers and  
appurtenances including restoration, in connection with the District's construction  
of **Contract C0928; 451 Zone Control Valve Facility and Control Valve Vault**  
in the County of King, State of Washington.

**NOW, THEREFORE**, if the Principal shall well and truly and faithfully perform all  
of the provisions and fulfill all of the undertakings, covenants, terms, conditions  
and agreements of said contract during the period of the original contract and  
any Extension thereof that may be granted by the District, with or without notice  
to the Surety; and during the life of any guaranty required under the contract; and  
shall also well and truly perform and fulfill all of the undertakings, covenants,  
terms, conditions and agreements of any and all duly authorized modifications of  
said contract that may hereafter be made; notice of which modifications to the  
Surety being hereby waived; and furthermore shall pay all laborers, mechanics  
and subcontractors and material men and all persons who shall supply such  
person or persons and such Principal or subcontractors with provisions and  
supplies for the carrying on of such work, shall indemnify and save harmless  
District from all cost and damage by reason of the Principal's default or failure to  
do so, and shall pay the State of Washington sales and use taxes, and amounts  
due said State pursuant to Titles 50 and 51 of the Revised Code of Washington,  
then this obligation to be void; otherwise to remain in full force and effect.

**THIS BOND** shall be continued in force for a period of two (2) years after  
completion of the contract and acceptance by the District, and thereafter for such



additional period as shall be required for the performance by the Contractor under this guaranty provision, or otherwise, of the contract.

**IN WITNESS WHEREOF**, the above bounded parties have executed this instrument under their separate seals this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, the name and corporate seal of each corporate party hereto affixed, and these presents duly signed by its undersigned representatives pursuant to authority of its governing body.

\_\_\_\_\_  
Principal

\_\_\_\_\_  
Surety

\_\_\_\_\_  
By

\_\_\_\_\_  
By

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

Attest: (If Corporation)

Address:

\_\_\_\_\_  
By

\_\_\_\_\_

\_\_\_\_\_  
Title

\_\_\_\_\_

Corporate Seal:

Witness

1:

\_\_\_\_\_

Witness

2:

\_\_\_\_\_



## Certificate as to Corporate Seal

I hereby certify that I am the (Assistant) Secretary of the Corporation named as Principal in the within Bond; that

\_\_\_\_\_, who signed the said Bond on behalf of the Principal, was \_\_\_\_\_ (title) of said Corporation; that I know its signature thereto is genuine and that said Bond was duly signed, sealed, and attested for and in behalf of said Corporation by authority of its governing body.

\_\_\_\_\_  
Secretary or Assistant Secretary



## **DEFINITIONS AND ABBREVIATIONS**



## SECTION 7

# Definitions and Abbreviations

### DEFINITIONS

The following terms as used in this Contract shall be defined and interpreted as follows:

**Acceptance** - The District's formal, written notice acknowledging completion and acceptance of the Work. Acceptance commences the time for submission of any third-party claims against performance or payment bonds under Chapter 39.08 RCW and statutory retention under Chapter 60.28 RCW.

**Addendum** - A written or graphic document issued by the District prior to the Proposal opening date that clarifies, corrects, or changes a document contained or referenced within the Bid Documents.

**Adjusted Contract Work** - The Contract Work as adjusted by any additive or deductive Change Orders executed prior to the District's termination of the Work or any portion thereof for convenience in accordance with Section 8.31 of the General Conditions.

**As-Built Plans** - A neatly and legibly marked set of Plans that reflect the manner in which the Work has been performed in the field. The requirements for the As-Built Plans are separately set forth in the Specifications.

**Bidder** - An entity that submits a Proposal for potential award of the Contract.

**Bid Documents** - All Contract Documents, excluding Change Orders, but including the Call for Bids.

**Change Order** - A document which is signed by Contractor and District and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Time, issued on or after the effective date of the Contract.

**Claim** - A written demand or assertion by the Contractor in accordance with Section 8.23 of the General Conditions after denial of a Request for Change Order seeking, as a matter of right, adjustment of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract.



**Contract Documents** - The Contract Documents shall consist of the following and, in case of conflicting provisions, the first mentioned shall have precedence:

- Change Orders
- Addenda
- Contract
- Measurement and Payment
- Special Provisions
- General Conditions
- Detail Specifications
- Engineering Specifications – Materials of Construction
- Engineering Specifications – Methods of Construction
- Reference Specifications
- Plans
- Instructions To Bidders
- Bid Proposal
- Permit and easement stipulations
- Performance, Payment, and Guaranty Bond

**Contractor** - The entity contracting to do the Work under these Contract Documents.

**Contractor's Equipment** - All equipment remaining in the Contractor's ownership and removed from the Site upon completion of the Project.

**Contract** - The written form executed by the District and Contractor that binds the Contractor to perform the Work in accordance with the Contract Documents.

**Contract Price** - The total amount payable by the District to the Contractor for performance of the Work in accordance with the Contract Documents.

**Contract Time** - The time allotted in the Contract for the Substantial Completion of the Work. The Contract Time begins upon Notice to Proceed and ends on the date of Substantial Completion of the Work by the Contractor.

**Day** - The term Day shall mean a calendar day unless otherwise specifically designated.

**District** - The entity that is a party to the Contract, contracting under the official name Northshore Utility District.

**Engineer** - The person identified in the Invitation to Bid responsible for administration of the Contract for the benefit of the District in accordance with the Contract Documents.



**Equipment** - The machinery, accessories, appurtenances, and manufactured articles to be furnished and/or installed under the Contract.

**Inspector** - A representative of the Engineer that is assigned to make inspections and record the progress of Contractor's performance of the Work. The Inspector has no authority to bind the District to any modification of the Contract Documents or liabilities of any kind.

**Materials** - Manufactured articles, materials of construction (fabricated or otherwise) and any other classes of material to be furnished in connection with the Contract.

**Notice of Award** - The official notice from the District that it intends to execute the Contract with the selected responsible, responsive Bidder.

**Notice to Proceed** - Written notice issued by the District that indicates that the Contractor can mobilize on the Site and begin all, or a designated part, of the Work. Notice to Proceed starts the running of the Contract Time.

**Or Equal** - Equal or better function, quality and performance to that specified in the Contract Documents. An item is not Or Equal if it is materially different, with respect to other constraints or requirements in the Contract Documents, in size, weight or other aspect from the item specified in the Contract Documents. Similarly, an item is not Or Equal if it is expected to have significantly higher total cost of ownership over the life of the completed Work.

**Permit** - Any and all permits required to comply with local, State, and Federal laws and regulations in performance of the Work.

**Physical Completion** - The time at which all of the Work has progressed to the point where (a) Contractor has achieved Substantial Completion, (b) the Contractor has completed all items identified on the Punch List to the District's satisfaction and (c) the Contractor has submitted and the District has accepted all required As-Built Plans.

**Plans** - All official drawings or reproductions of drawings made or to be made pertaining to the Work provided for in the Contract.

**Project** - The Work to be constructed in whole or in part through the performance of the Contract.

**Project Records** - All records that document the performance and/or cost of the Work as well as any materials as more fully defined in Section 8.7 of the General Conditions.

**Proposal** - The offer of a Bidder, on the prescribed bid form, properly executed, setting forth the price or prices for the Work to be performed.



**Punch List** - A list(s) of the physical construction that remains to be completed after the achievement of Substantial Completion of the Work, which must be satisfactorily completed in order to attain Physical Completion.

**Reference Specifications** - The technical specifications of other agencies incorporated or referred to herein.

**Request for Information (RFI)** - The written document by which the Contractor requests clarification, verification or information concerning a portion of the Work.

**Responsible** - A responsible Contractor or Subcontractor who complies with the requirements of RCW 39.04.010, 39.04.350, and 39.06.020 and any requirements of any applicable supplemental bidder responsibility criteria and who is determined to have: adequate financial resources to perform the Contract; the ability to comply with the required delivery or performance schedule; a satisfactory performance record; a satisfactory record of integrity; the necessary organization, experience, accounting and operational controls, and technical skills; the necessary construction equipment and facilities; and be otherwise qualified and eligible to be awarded the Contract under applicable laws and regulations.

**Schedule** - The plan prepared by the Contractor in accordance with the requirements of the Contract and reviewed by the Engineer setting forth the logical sequence of activities required for the Contractor's orderly performance and completion of the Work in accordance with the Contract. The Schedule includes updates – whether by progress schedule(s), recovery schedule(s) or otherwise – required by the Contract.

**Shop Drawing** - All shop details of structural steel, pipe, machinery, equipment, schedules and bending diagrams of reinforcing steel, and other detail drawings furnished by the Contractor as required and provided for in the Submittal requirements of the Contract Documents.

**Site** - The location(s) where the Work will be performed or constructed by the Contractor as set forth in the Plans and Specifications. The Site may at the District's option include areas identified by the District for Contractor's logistics or staging but does not include any areas separately secured by the Contractor, a Subcontractor of any tier, or supplier for use in connection with the Work (e.g. Contractor's home office, an off-site fabrication plant, etc.).

**Specifications** - The written requirements for contract administration, Materials, Equipment, systems, standards, and workmanship for the Work and for the performance of any related services.

**Subcontractor** - A business entity that has a direct contract with the Contractor to perform a portion of the Work. Unless the context clearly requires otherwise, the term Subcontractor includes all of the Subcontractor's authorized representatives.



**Submittal** - Written or graphic document (including electronic) or sample that is required by the Contract Documents and is prepared for the Work by the Contractor or a Subcontractor or supplier at any tier, and submitted to the District by the Contractor, including Shop Drawings, product data, samples, certificates, schedules of material or other data. Submittals are not Contract Documents.

**Substantial Completion** - The stage in the progress of the Work where:

1. The District has full and unrestricted use and benefit of the facilities for the purpose intended;
2. All the systems and parts of the Work are functional;
3. Utilities are connected and operate normally;
4. Only minor incidental Work or correction or repair remains to complete all applicable Contract requirements; and,
5. At the District's option, the Contractor has provided all applicable occupancy Permits and easement releases.

As provided in the Contract, the District at its sole option may also require or grant Substantial Completion to specific Schedules, milestones or subsystems or portions of the Work. The date(s) of Substantial Completion shall be determined, in writing, by the District.

**Surety** - Any firm or corporation executing a surety bond or bonds payable to the District, securing the performance of the Contract, either in whole or in part.

**Work** - The construction to be completed under the terms of this Contract as detailed more fully in the Plans and Specifications. Work specifically includes the furnishing of all labor, Materials, Equipment, and all incidentals necessary to the successful completion of the construction, whether expressly required by or reasonably inferable from the Contract Documents, whether they are temporary or permanent, and whether they are incorporated into the finished Work or not. Work also includes all other obligations imposed on the Contractor by the Contract. The Work is sometimes generally referred to as the "Project."

**Usage of Certain Words and Phrases** - Whenever the words, "as directed", "as required", "as permitted", or words of like effect are used, it shall be understood that the direction, requirement or permission of the District and Engineer is intended. The words, "sufficient", "necessary", "proper", and the like shall mean sufficient, necessary or proper in the judgment of the District and Engineer. The words, "approved", "acceptable", "satisfactory", or words of like import shall mean approved by or acceptable to the District and Engineer.



## ABBREVIATIONS

Whenever the following abbreviations are used on the Plans, Specifications, Proposal and Contract, they shall be construed to mean the words and terms as listed below:

A	Acre
AC	Asbestos Cement
AF	Acre-Feet
Adj	Adjust
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AITC	American Institute of Timber Construction
APWA	American Public Works Association
Asp. Pav.	Asphalt Pavement
Asp.Conc.Pav.	Asphalt Concrete Pavement
ASTM	American Society of Testing and Material
ATB	Asphalt Treated Base
AVE	Avenue
AWS	American Welding Society
AWWA	American Water Works Association
Bld	Boulevard
BO	Blow Off
BTU	British Thermal Unit
CB	Catch Basin
CB Inlet	Curb Inlet
CFS	Cubic Feet per Second
CI	Cast Iron
CIP	Cast Iron Pipe
CL	Centerline
CMP	Corrugated Metal Pipe
CMU	Concrete Mason Unit
Conc	Concrete
Conc. Cb.	Concrete Curb
Conc. Pav.	Concrete Pavement
Conc.Ret.Wall	Concrete Retaining Wall
Conc. Swr	Concrete Sewer
Cond.	Conduit
Conn	Connect
Cr	Cross
CTB	Cement Treated Base
Cu	Cubic



## ABBREVIATIONS

Continued

DFPA	Douglas Fir Plywood Association
DI	Ductile Iron
Dr	Drive or Driveway
E	East
Elev.	Elevation
Exist.	Existing
Exc	Excavation
FBM	Foot Board Measure
FH	Fire Hydrant
FL	Flange
FT, FT <sup>2</sup> , FT <sup>3</sup>	Foot, Square Feet, Cubic Feet
GIP	Galvanized Iron Pipe
GPAD	Gallons Per Acre Day
GPH	Gallons Per Hour
GPM	Gallons per Minute
G Stl P	Galvanized Steel Pipe
GV	Gate Valve
Hyd	Hydrant
Hyd Ext	Hydrant Extension
ID	Inside Diameter
In, In <sup>2</sup> , In <sup>3</sup>	Inch, Square Inch, Cubic Inch
L	Length
Lbs	Pounds
LF	Lineal Feet
Max	Maximum
Mon	Monument Case
Min	Minimum
MG	Million Gallons
MGD	Million Gallons per Day
MH	Manhole
MJ	Mechanical Joint
N	North
NIC	Not in Contract
No.	Number
NRS	Non Rising Stem
OD	Outside Diameter
Pav	Pavement
PC	Point of Curvature
PJM	Premolded Expansion Joint Material





## ABBREVIATIONS

Continued

PL	Property Line
Pl	Place
Plk	Planking
Pos	Position
PP	Power Pole
Pri	Primary
Prop	Proposed
PS	Permastran
PSF	Pounds per Square Foot
PSI	Pounds per Square Inch
PT	Point of Tangency
PVC	Polyvinyl chloride
R	Radius
RC	Reinforced Concrete
RCP	Reinforced Concrete Pipe
Rem	Remove
Repl	Replace
RS	Rising Stem
S	South
Sec	Secondary
Swr	Sewer
Sp	Special
Sq	Square
SS	Side Sewer
SSPC	Steel Structure Painting Council
Std	Standard
Stl	Steel
Temp	Temporary
Trans	Transformer
VC	Vertical Curve
W	West
WM	Water Main
Yd	Yard

# **GENERAL CONDITIONS**



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## **Section 8 – General Conditions**

### **8.1 EXECUTION, CORRELATION AND INTENT OF CONTRACT DOCUMENTS**

The Contract Documents are complementary and what is called for by any one shall be as binding as if called for by all. The intent of the Contract Documents is to prescribe the complete Work. The Contractor shall furnish all labor, Materials, Equipment and incidentals necessary to complete all parts of the Work. Where the Contractor is directed to provide something as part of the Work, that term specifically includes everything necessary to furnish, install, connect, adjust, test and make ready for use or occupancy. Compensation for the cost of the complete Work and for full performance of the Contract is included in the Contract Price. Materials, Equipment, or Work described in words which so applied have a well-known technical or trade meaning shall be held to refer to such recognized standards.

It is intended that Work not covered under any heading, section, branch, class or trade of the Specifications shall be supplied if it is shown on Plans or is reasonably inferable as being necessary to produce the intended results. Minor items of Work, Materials, or Equipment omitted from the original Plans or Specifications, but clearly inferable from the information presented and which are called for by accepted good practice shall be provided and/or performed by the Contractor as part of its original cost.

Where the Contract Documents refer to Reference Specifications, such specifications shall be applicable to technical provisions only, unless otherwise designated.

The Contract represents the entire and integrated agreement between the District and the Contractor. It supersedes all prior discussions, negotiations, representations or agreements pertaining to the Work, whether written or oral.

### **8.2 PLANS AND SPECIFICATIONS - OMISSIONS AND DISCREPANCIES**

Upon receipt of Notice of Award of the Contract, the Contractor shall carefully study and compare all Plans, Specifications and other instructions and shall, prior to ordering Materials or performing Work, report in writing to the Engineer any error, inconsistency or omission in respect to design, mode of construction or cost which the Contractor may discover. If the Contractor, in the course of this study or in the accomplishment of the Work, finds any discrepancy between the Plans and the physical condition of the locality as represented in the Plans, or any such errors or omissions in respect to design, mode of construction or cost in Plans or in the layout as given by points and instructions, it shall be its duty to provide timely notice thereof in accordance with Section 8.23 below. The Contractor shall



make all reasonable efforts to mitigate any impact resulting from such error, inconsistency, omission or variance. Any Work done after such discovery, until correction of Plans or authorization of extra Work is given, if the Engineer finds that extra Work is involved, will be done at the Contractor's risk. If extra Work is involved, the procedure shall be as provided in Section 8.23 below.

### **8.3 EXAMINATION OF SITE OF WORK**

Before submitting its bid, the Contractor shall examine the Site of the Work and ascertain for itself all the physical conditions in relation thereto. In making a Proposal under these Contract Documents, the Contractor represents and warrants that it has satisfied itself as to construction conditions by personal examination of the Plans, Specifications and Site of the proposed Work, and by appropriate examination and investigation as to the nature of the soil and construction problems which may be encountered by reason thereof. Contractor also warrants and represents itself to be experienced and an expert in the construction contemplated. Contractor further understands that, in making the Contract award, District is relying upon the representations and warranties of Contractor herein contained.

Contractor's failure to examine the Plans, Specifications, and Site shall not relieve the Contractor from entering into a Contract nor excuse it from performing the Work in strict accordance with the terms of the Contract and Specifications. The Contractor will not be entitled to additional compensation if it subsequently finds the conditions to require other methods or equipment that it did not anticipate in making its Proposal. Any statement or representation (whether written or oral) made by an officer, agent or employee of the District (or by any third party consultant of the District) with respect to the physical or geotechnical conditions at the Site of the Work shall not be binding upon the District.

### **8.4 STATUS OF ENGINEER**

- (a) The Engineer shall act as advisor and consultant to the District in engineering matters relating to the Contract; provided, however, nothing contained herein or elsewhere in the Contract Documents shall be construed as requiring or authorizing the Engineer to direct the method or manner of performing any Work by the Contractor under this Contract. The Engineer has authority to stop the Work whenever, in its opinion, such stoppage may be necessary to ensure the proper execution of the Contract. The Engineer may reject all Work, Materials, or Equipment which, in its opinion, do not conform to the Contract.
- (b) It is understood and agreed by and between the parties hereto that the Work included in the Contract is to be done to the complete satisfaction of the Engineer, and that the decision of the Engineer as to the true construction and meaning of the Contract, Plans, Specifications and estimates, and as to all questions arising as to proper performance of the



Work shall be final. The Engineer shall determine the unit quantities and the classification of all Work done and Materials and Equipment furnished under the provisions of this Contract and its determination thereof shall be final and conclusive and binding upon the Contractor.

- (c) The Engineer shall decide any and all questions which may arise as to the quality or acceptability of Materials and Equipment furnished and Work performed and as to the rate of progress of the Work, and all questions as to acceptable fulfillment and performance of the Contract on the part of the Contractor and as to compensation. The decision of the Engineer in such matters shall be final.
- (d) The Engineer shall have authority to make changes in the Work, not inconsistent with the purpose of the Work. Except in any emergency endangering life or property, no extra Work or change shall be made unless pursuant to a Change Order executed by the Engineer. If the District or Contractor believes that a Change Order justifies an adjustment in the Contract Price and/or Contract Time, the value of any such extra Work shall be determined as set forth in Sections 8.22 and 8.23.
- (e) The Engineer has no authority to waive the obligation of the Contractor to perform the Work in accordance with the Contract Documents. Failure or omission on the part of the Engineer to reject unsuitable, inferior or defective Work and/or labor or Materials or Equipment furnished under the Contract shall not release the Contractor or its bond from performing the Work in accordance with the Contract Documents.

## **8.5 INSPECTION AND TESTS**

- (a) All Work and all Materials and Equipment furnished shall be subject to inspection by the Engineer and/or Inspector. The Engineer and/or Inspector shall, at all times, have access to the Work to observe the progress and quality wherever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and for necessary inspection and testing. If any Work should be covered up without approval or consent of the Engineer or Inspector, it must, if required by the Engineer, be uncovered for inspection at the Contractor's expense.
- (b) The Contractor shall make reasonable tests of the Work at the Contractor's expense upon Engineer's request and shall maintain a record of such tests. Prior to the time scheduled for a performance test to be observed by the Engineer, the Contractor shall make whatever preliminary tests are necessary to assure that the Work is in accordance with the Specifications. If, for any reason, the test observed by the Engineer is unsatisfactory, the Contractor shall pay all costs incurred by the Engineer for the inspection of the unsatisfactory test.



- (c) Inspections, tests, measurements, or other acts or functions performed for or by the District are recognized as being solely to assist the Engineer in determining that the Work complies with the Contract requirements. Such activities shall in no manner whatsoever be construed to relieve the Contractor from the responsibility for performing its own inspections and tests as necessary to ensure compliance with the Contract. In addition, any inspection, test or measurement by or for the District does not constitute or imply acceptance of the Work by the District or waive any rights of the District to require the Work be completed in strict accordance with the Contract and does not impair the District's authority to reject non-conforming Work or evoke any remedy to which it may be entitled.
- (d) The Work may be subject to inspection by various governmental agencies or utility owners. The Contractor shall cooperate and make the Site available for all such persons or agencies with regard to their inspections, including providing access for inspection by way of safe and proper facilities. Such inspection shall in no way make such agencies or persons parties to this Contract and shall not constitute an interference with the Work or the rights of either the District or the Contractor. In its scheduling and planning the Contractor shall allow sufficient time for such inspections. Required certificates of inspection by any authority other than the Engineer shall be secured by the Contractor.
- (e) Except as provided herein, the District will at its cost observe performance of the Work during normal working days or hours during the Contract Time and any modification or extension of the Contract Time authorized by the District in approved Change Orders. If the Contractor is authorized by the District to work more than 8 hours per Day, or more than 5 Days per week, or on holidays, during the course of the Contract Time, then Section 2.1 of the Special Provisions governs.

## **8.6 PLANS, SPECIFICATIONS, SUBMITTALS, AND SHOP DRAWINGS ACCESSIBLE; RFIs**

The Contractor shall keep at least one copy of the Plans, Specifications, Submittals, and Shop Drawings constantly accessible at the construction Site.

If the Contractor discovers, or in the exercise of reasonable diligence should have discovered, that the Work to be performed is not sufficiently detailed or explained in the Contract Documents, or that there is a conflict or inconsistency between any part of the Contract Documents, the Contractor shall promptly apply to the Engineer for such further written explanation(s) as may be necessary using a Request for Information (RFI) form to be provided or approved by the Engineer. The Engineer will address the RFI in writing. Before submitting a RFI, the Contractor shall diligently and thoroughly examine the Contract Documents. The Contractor shall also plan its Work in an efficient manner so as to allow for timely





responses to RFIs. If requested by the Engineer, the Contractor shall prioritize its RFIs and explain the reasons for such priority. District will reply to the RFI with reasonable promptness which on average is defined to mean twenty (20) Days. If Contractor submits an RFI on an activity and reasonably believes that a response from District within up to twenty (20) Days will cause a delay to the Work, Contractor shall denominate such particular RFI as "Priority" and indicate Contractor's preferred reasonable response date. Responses by the District to RFIs are not changes to the Contract. If Contractor believes a response to an RFI constitutes changed Work or causes an adverse impact to performance of the Work or construction schedule, the Contractor is required to submit a request for change in accordance with the requirements of the Contract.

## 8.7 AUDIT RECORDS

- a) The Contractor and all Subcontractors shall keep and maintain comprehensive records and documentation relating to the Work under this Contract, as well as documents related to the Contractor's Proposal and Project cost accounting records for this Contract, for an audit period of six (6) years. The Project Records shall include, but are not limited to, Contract Documents, subcontracts, purchase orders, employment records, payrolls, Project cost accounting records, prevailing wage records, Plans, Specifications, Addenda, Submittals, Shop Drawings, Change Orders and all working documents leading to Change Orders, field test records, quality control documents, daily construction logs by all field supervisors and Project management personnel, correspondence relating to the Contract, and As-Built Plans.
- b) Contractor and its Subcontractors shall segregate and separately record at the time incurred all costs resulting in any way from any event, act, omission or condition for which Contractor or its Subcontractors seek an adjustment to the Contract Price, Contract Time and/or monetary compensation of any kind. Any costs claimed to be delay or impact costs, acceleration costs, loss of productivity or inefficiency costs, increased costs of onsite or home office overhead or any similar costs shall be separately recorded at the time and shall be fairly and accurately allocated to each such event, act, omission or condition and to other causes of such costs. The Contractor shall be entitled to make a Claim or obtain extra compensation for any such event, act, omission or condition only to the extent the Project Records are kept in full compliance with all Contract requirements and the cost allocations support entitlement to such compensation.
- c) The Contractor and Subcontractors shall permit the District to audit, inspect, examine, and copy the Project Records and/or other documents related to any Claim or issue related to performance of the Work maintained by Contractor (including all Proposal documentation) or any affiliated company involved in the project (collectively, "Audit Records") at any reasonable time



and shall provide such assistance as may be reasonably required in the course of such inspection, including the right to interview personnel. The Contractor shall in no event dispose of, destroy, alter, or mutilate said Audit Records in any manner whatsoever for six (6) years after final payment and until all pending matters are closed. No additional compensation will be provided to the Contractor for compliance with the requirements of this subsection.

## **8.8 OWNERSHIP OF DOCUMENTS; NO WARRANTIES BY THE DISTRICT**

All Plans, Specifications and copies thereof prepared or furnished by the District are its property. They are not to be used on other work.

The Reference Documents and any other information, records, or reports that may be made available by the District to the Contractor are provided solely for the convenience of the Contractor. The District makes no representations or warranties, express or implied, regarding the content of the Reference Documents or any other information, records, or reports. No information derived from inspection of Reference Documents or other information, records, or reports will in any way relieve the Contractor from its responsibility to properly perform its obligations under the Contract. The Contractor shall make its own conclusions and interpretations from the data supplied, information available from other sources, and the Contractor's own observations.

## **8.9 INSURANCE**

The Contractor shall obtain and keep in force during the term of the Contract, Commercial General Liability insurance policies with insurance companies which have an A.M. Best's rating of A VII or better and who are approved by the Insurance Commissioner of the State of Washington pursuant to Title 48 RCW.

Prior to the execution of the Contract, the Contractor shall purchase and maintain during the term of this project a Commercial General Liability insurance policy meeting the requirements set forth herein. The Contractor shall file with the District either a certified copy of all policies with endorsements attached, or a certificate of insurance with endorsements attached as are necessary to comply with these specifications. Failure of the Contractor to fully comply with the requirements regarding insurance will be considered a material breach of Contract.

The Contractor shall not begin Work under the Contract or under any special condition until all required insurances have been obtained and until such insurances have been approved by the District. Said insurance shall provide coverage for the Contractor, its Subcontractors and the District. The coverage so provided shall protect against claims from bodily injuries, including accidental death, as well as claims for property damage which may arise from any act or



omission of the Contractor, its Subcontractors, or by anyone directly or indirectly employed by either of them.

The insurance policies shall specifically name the District, its elected or appointed officials, officers, employees, volunteers and King County (or as needed – City of Kenmore, Bothell, Kirkland, Lake Forest Park, etc.), as insured(s) with regard to damages and defense of claims arising from:

- Activities performed by or on behalf of the Contractor; and
- Products and completed operations of the Contractor; and
- Premises owned leased or used by the Contractor.

It is hereby understood and agreed that Northshore Utility District, its commissioners, officers, and employees, while acting within the scope of their duties as such, are named as additional insured. The insurance shall be maintained in full force and effect at the Contractor's expense throughout the term of the Contract and for any extended period after Acceptance as may be required hereunder.

The District shall be given at least 45 Days' written notice of cancellation, non-renewal, material reduction or modification of coverage. Such notice shall be by certified mail to the District.

The coverages provided by the Contractor's insurance policies are to be primary to any insurance maintained by the District. Any insurance that might cover this Contract which is maintained by the District shall be in excess of the Contractor's insurance and shall not contribute with the Contractor's insurances.

The Contractor's insurance policies shall protect each insured in the same manner as though a separate policy had been issued to each. The inclusion of more than one insured shall not affect the rights of any insured as respects any claim, suit or judgment made or brought by or for any other insured or by or for any employee of any other insured. However, this provision shall not increase the limits of the insurer's liability.

The General Aggregate provision of the Contractor's insurance policies shall be amended to show that the General Aggregate Limit of the policies applies separately to this Project.

The Contractor's insurance policies shall not contain deductibles or self-insured retentions in excess of \$10,000 (unless approved by the District) and Contractor shall be responsible for any such deductible or SIR if the loss arises from its operations or those of its Subcontractors or suppliers at any tier.



The Contractor's insurance policies shall contain a provision that the District has no obligation to report events which might rise to a claim until a claim has been filed with the District's Board of Commissioners.

Types and Limits of Insurance Required:

### **Commercial General Liability**

- \$1,000,000 each occurrence Bodily Injury and Property Damage Liability.
- \$2,000,000 annual aggregate
- Employees and volunteers as Additional Insured(s)
- Premises and operations
- Broad form property damage including:
  - Underground
  - Explosion
  - Collapse Hazards (XCU)
  - Products completed operations
  - Blanket contractual
  - Subcontractors
- Personal injury with employee exclusion deleted
- Employers liability (Stop gap)

### **Automobile Liability**

- \$1,000,000 per accident bodily injury and property damage liability, including:
  - any owned automobiles,
  - hired automobiles,
  - non-owned automobile.

### **Umbrella Liability**

- \$2,000,000 per occurrence
- \$2,000,000 aggregate

Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" policy form in the amount of the Contract Price, as adjusted by Change Orders. This insurance shall include interests of the District, the Contractor and Subcontractors on the Project. Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage,



theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements. Maximum deductible shall be \$10,000 and Contractor shall be responsible for such deductible if the loss arises from its operations of those of any Subcontractor.

District, Contractor and Subcontractors waive all rights against each other for damages caused by fire or other causes of loss to the extent of proceeds actually paid by property insurance obtained pursuant to this Section 8.9 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the District as fiduciary. The District or Contractor, as appropriate, shall require Subcontractors, by appropriate agreements, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

As an alternative to the above indicated Commercial General Liability and Umbrella Liability insurance policies the Contractor may provide the District with an Owners and Contractors Protective (OCP) policy with a limit of coverage of \$5,000,000 on terms and conditions acceptable to the District.

The Contractor shall additionally provide the District with evidence that the District has been named as additional insured on the Contractor's Commercial General Liability Policy through Acceptance plus six (6) additional years (inclusive of completed operations coverage).

Providing of coverage on the stated amounts shall not be construed to relieve the Contractor from liability in excess of such limits.

In addition, the Contractor shall have its insurance agent/representative complete the Insurance Coverage Questionnaire contained in the Special Provisions and attach it to the Certificate of Insurance for District's approval. The Contractor shall maintain Workers Compensation insurance and/or Longshore and Harbor Workers insurance as required by State or Federal statute for all of its employees to be engaged in Work on the Project under this Contract and, in case any such Work is sublet, the Contractor shall require the Subcontractor similarly to provide Workers Compensation insurance and/or Longshore and Harbor Workers Insurance for all of the latter's employees to be engaged in such Work. The Contractor's Department of Labor & Industries account number shall be noted on the certificate of insurance.

In the event any class of employees engaged in the Work under this Contract is not covered under Workers Compensation insurance or Longshore and Harbor Workers insurance as required by State and Federal statute, the Contractor shall



maintain and cause each Subcontractor to maintain, Employers Liability insurance for limits of at least \$1,000,000 each employee for disease or accident, and shall furnish the District with satisfactory evidence of such.

The contractual coverage of the Contractor's policy shall be sufficiently broad enough to insure the provisions of the HOLD HARMLESS AND INDEMNIFICATION AGREEMENT of this Contract.

Nothing contained in these insurance requirements is to be construed as limiting the extent of the Contractor's responsibility for payment of damages resulting from its operations under this Contract.

### **8.10 SCHEDULE AND PRE-CONSTRUCTION CONFERENCE**

(a) The Schedule shall set forth the order in which the Contractor plans to perform the Work. The Schedule and any supplemental Schedule shall show:

1. Substantial Completion of all Work within the specified Contract Time,
2. The proposed order of Work, and
3. Projected starting and completion times for major phases of the Work and for the total Project.

The Schedule shall also reflect any phasing, sequencing, or timing restrictions set forth in the Contract Documents.

The District allocates resources to a Contract based on the total time allowed in the Contract. The District will accept a Schedule indicating an early Substantial Completion date, but cannot guarantee the District's resources will be available to meet the accelerated Schedule. No additional compensation will be allowed if the Contractor is not able to meet its accelerated Schedule due to the unavailability of the District's resources or for other reasons beyond the District's control.

The Contractor shall submit supplemental Schedules when requested by the Engineer or as required by any provision of the Contract. The supplemental Schedules shall reflect any changes in the proposed order of Work, any construction delays, or other conditions that may affect the progress of the Work. The Contractor shall provide the Engineer with the supplemental Schedules within ten (10) Days of receiving written notice of the request.

The original and all supplemental Schedules shall not conflict with any time and order-of-work requirement in the Contract.



If the Engineer deems that the original or any necessary supplemental Schedule does not provide the information required in this subsection, the District may withhold progress payments until a Schedule containing the required information has been submitted by the Contractor and approved by the Engineer.

- (b) The Schedule may be in graph or tabular form and shall include the date of submission for approval of Plans as may be required, starting dates for construction of the several parts of the Work, and estimated completion dates of such parts, and completion date of the Project. Review by the Engineer of the Schedule shall not in any event excuse the Contractor of the obligation to complete the Work within the time specified in the Contract or of complying with all terms, conditions and provisions of the Contract Documents. Failure of the Contractor to follow the Schedule submitted and accepted, including revisions thereof, shall relieve the District of any and all responsibility for furnishing and making available all or any portion of the Site from time to time and will relieve the District of any responsibility for delays to Contractor in the performance of the Work.
- (c) A pre-construction conference shall be held at a time and place fixed by the Engineer which will generally be within one month from date of Notice of Award. The Contractor must be prepared for a thorough discussion and review of the following:
- Schedule
  - Materials and Equipment
  - Traffic Control
  - Job Procedures
  - Inspection Procedures
  - Plans and Specifications
  - Shop Drawings
  - Schedule of Values of Lump Sum Work
  - Safety
  - Other Matters pertaining to Performance of the Work

## **8.11 SCHEDULE OF VALUES OF LUMP SUM WORK**

If payments are to be made on lump sum items, the Contractor shall submit a schedule of values of the various parts of the Work, including quantities, aggregating the total Contract Price. When approved by the Engineer, the schedule of values shall be used as the basis for certificates for payment unless it is found to be in error. In applying for payments for lump sum Work, the Contractor shall submit estimates of the percentage of Work completed and payment will be based upon the schedule of values for lump sum Work.



## 8.12 MATERIALS AND EQUIPMENT FURNISHED BY CONTRACTOR

The Contractor shall furnish all Materials and Equipment for the completion of the Work to be performed under this Contract and shall be fully responsible for all Materials and Equipment until the completed Project is delivered to and accepted by the District.

The Contractor shall, at its own expense, secure and maintain a storage place for Materials and Equipment. Contractor shall protect Materials and Equipment against damage from careless handling, exposure to weather, mixture with foreign matter, and all other causes. The District will reject and refuse to test Materials and Equipment improperly handled or stored.

- (a) All Materials and Equipment required to be incorporated into the Work shall be new and in accordance with the Plans and Specifications, except as otherwise provided in the Contract Documents. All such Materials and Equipment shall be applied, installed, connected, erected, used, cleaned, maintained and conditioned in accordance with the instructions of the applicable manufacturer, fabricator or processor, except as otherwise provided in the Contract Documents. Upon the request of the Engineer, the Contractor shall furnish satisfactory evidence as to the kind, quality and manufacturer of Materials and Equipment. The Contractor shall furnish the District with copies of the supplier's warranty and adopt the same as the warranty of the Contractor and shall also be liable thereon to the District.
- (b) The Contractor shall furnish for approval all samples as directed by the Contract Documents. The finished Work shall be in accordance with approved samples. Approval of samples by the Engineer does not relieve the Contractor of performance of the Work in accordance with the Contract Documents.
- (c) Substitutions requested by the Contractor will be subject to the District's prior written acceptance and at the District's sole discretion. For each proposed substitution, the Contractor shall submit samples, descriptive and technical data, and reports of tests to the District for approval. The Contractor shall also indicate the difference in Contract Price and/or Contract Time by reason of the proposed substitutions. All costs of any redesign or modification to other systems, parts, equipment or components of the Project or Work, which result from the substitution, shall be borne by the Contractor.
- (d) When the District approves a substitution proposed by the Contractor, the Contractor shall guarantee the substituted Materials or Equipment to be equal to, or better than, those originally specified and shall be compatible with all other systems, parts, Materials, Equipment, or components of the Project and Work. The District has the right to order an unaccepted,





substituted article removed and replaced without additional cost to the District.

- (e) When Materials or Equipment are specified by one or more patents, brand names, or catalog numbers, it shall be understood that this is for the purpose of defining the performance or other salient requirements and shall, unless otherwise expressly stated, be understood as if followed by the words Or Equal whether or not such words appear. If the Contractor proposes to furnish Or Equal Materials or Equipment, then Contractor shall demonstrate (1) conformance to the specified performance, testing, quality, life-cycle or dimensional requirements and (2) suitability of the Materials or Equipment for the use intended. Intended use of any Or Equal Materials or Equipment shall be specifically identified as part of the submittal process, and the Engineer must accept the Contractor's proposed Or Equal Materials or Equipment before it may be used. Any such acceptance shall not relieve Contractor of its obligations to achieve the specified performance, testing, quality, life-cycle or dimensional requirements and suitability of any accepted the Or Equal Materials or Equipment for the use intended under this Contract.
- (f) In the event that the Contractor proposes an alternate design or designs for some portion of the Work, the District may at its option allow the Contractor to proceed on the condition that the Contractor assume full responsibility for the alternate design.

### **8.13 MATERIALS AND EQUIPMENT FURNISHED BY DISTRICT**

- (a) Unless otherwise specifically provided in the Contract Documents, if the Contract requires that the Contractor install Materials and Equipment provided by the District, in the absence of a reasonably apparent defect, such Materials and Equipment shall be considered compliant with the Contract Documents.
- (b) If the Contractor discovers defects in the District-furnished Materials or Equipment the Contractor shall immediately notify the District in writing.
- (c) After such discovery, the Contractor shall not proceed with Work involving such District-furnished Materials and Equipment unless otherwise authorized in writing by the District.
- (d) Contractor's failure to provide immediate written notice of any defects in District-furnished Materials or Equipment shall constitute acceptance of such Materials and Equipment as fit for incorporation into the Work.
- (e) Contractor shall be responsible for any damages or delays resulting from Contractor's failure to provide timely written notice or Contractor's improper



incorporation of such defective District-furnished Materials or Equipment into the Work.

#### **8.14 SUBMITTALS**

- (a) The Contractor shall perform no portion of the Work requiring Submittals until the Submittals have been reviewed and returned by the District with one of the following annotations: (1) "No Exception Taken" or (2) "Make Corrections Noted" or (3) "Revise and Resubmit" or (4) "Rejected" or (5) "Submit Specified Item".
- (b) Prior to furnishing the Submittals to the District, the Contractor shall: (1) review all Contractor and Subcontractor Submittals for accuracy, completeness, and compliance with the Contract; (2) coordinate all Submittals with all Contract Work by other trades and with field measurements; and (3) indicate approval on the Submittals as a representation that it has complied with its obligation to review and coordinate Submittals. Where required by law or by the Contract, an appropriate licensed professional shall stamp Submittals. Submittals lacking required stamps or evidence of Contractor review and approval will be returned without review by the District for resubmission. Submittals shall be sequentially numbered.
- (c) When submitting information, the Contractor shall identify and state reasons for any alteration, variation, addition, deviation, or omission from the Contract. The Contractor shall not perform work that alters, varies, adds, deviates, or omits Work without prior specific written acceptance by the District.
- (d) The Contractor shall provide Submittals with reasonable promptness and in such sequence as to facilitate the timely completion of the Contract. The Contractor shall prepare and keep current, for review by the District, a schedule of Submittals which is coordinated with the Contractor's Project Schedule and allows the District reasonable time for review.
- (e) The District shall review the Contractor's Submittals and respond in writing with reasonable promptness. Unless otherwise agreed, no delay to the Contractor's Work shall be attributable to the failure by the District to respond to a Submittal until thirty (30) Days after the Submittal is received by the District, and then only if failure by the District to respond is unreasonable and affects the Substantial Completion date.
- (f) If the Contractor is required to resubmit a Submittal, any revisions on resubmittals, shall be specifically identified in writing and the resubmitted Submittal shall be sequentially alpha denoted and note revisions in numerical order. The cost of the review of the initial Submittal and the first revised Submittal shall be borne by the District. The costs of all additional



revised Submittals shall be charged to the Contractor. The cost of review shall include, without limitation, administrative, design, and engineering activities directly related to review of Submittals. The District may deduct these costs from any amounts due the Contractor.

- (g) The District shall review the Contractor's Submittals only for conformance with the design of the Work and compliance with the Contract Documents. Review of the Submittals are not conducted to verify the accuracy of dimensions, quantities, or calculations, the performance of Materials, systems, or Equipment, or construction means, methods, techniques, sequences, or procedures, all of which remain the Contractor's responsibility. Failure by the District to take exception to a Submittal shall not relieve the Contractor from any duty, including its responsibility for errors or omissions in Submittals, its duty to make Submittals and its duty to perform the Work according to the requirements of the Contract. The District's review of a Submittal shall not alter or waive the requirements of the Contract unless the District has issued prior written approval of such change or alteration of the Contract requirements.
- (h) The Contractor's failure to identify any error, deviation, or omission and subsequent acceptance of the Submittal by the District shall not relieve the Contractor from the obligation to comply with the all requirements in the Contract Documents.

## **8.15 LABOR AND FACILITIES**

- (a) The Contractor shall provide and pay for all labor, water, tools, light, power, transportation and other facilities necessary for the execution and completion of the Work, except as otherwise stipulated in the Contract Documents.
- (b) Necessary sanitation conveniences for the use of workmen on the Site, properly secluded from public observation, shall be provided and maintained by the Contractor.
- (c) The Contractor shall, at all times, enforce strict discipline and good order among its employees and shall not employ on the Work any person unfit or not skilled in the Work assigned to him. At the Engineer's written request, the Contractor shall immediately remove and replace any incompetent, careless, or negligent employee.
- (d) The Contractor shall remain onsite whenever the Work is under way. Before the Work begins, the Contractor shall name in writing an experienced superintendent who understands the Contract and is able to continuously supervise the Work. This superintendent shall have full authority to represent and act for the Contractor. Any superintendent who repeatedly fails to follow the Engineer's written or oral orders, directions, instructions, or determinations shall be subject to removal from the Project.



Upon the written request of the Engineer, the Contractor shall immediately remove such superintendent and name a replacement in writing.

- (e) During the term of this Contract, neither party shall employ nor hire any employee of the other party, nor of the Engineer, without the written consent of the other party or of the Engineer. The Contractor shall not use any Work performed or any information obtained from any employee hired in violation of this provision in making a claim against the District or Engineer and shall also be liable to the District as liquidated damages in an amount equal to double the amount of salary or wages paid to any such employee so hired in violation hereof.

## **8.16 ROYALTIES AND PATENTS**

The Contractor shall be liable for all suits brought against the District by reason of infringement of patent rights or licenses on any Materials, Equipment, or process used on the Work or incorporated into the finished Project, except where specifically exempted by the Special Provisions. Prices named in the Proposal shall include payment of royalties, if any. Contractor shall defend and hold District harmless from any such suit, costs of defense and any judgment which may be made or entered against District thereon.

## **8.17 PROJECT SITE; PERMITS, LAWS, AND REGULATIONS**

The District will furnish the Site and rights-of-way necessary for carrying out this Contract and completion of the Work herein contemplated and will use due diligence in acquiring said lands and rights-of-way as speedily as possible. If the District's right of access to any lands for the Site, Permits, or rights-of-way is delayed for any reason, Contractor shall exercise reasonable efforts to mitigate consequences and work around the delay. If Contractor believes it is entitled to a change in the Contract Time and/or Contract Price by reason of such delay, Contractor shall comply with the notice and Claim requirements provided in Section 8.23. Nothing in this section shall limit the District's right to terminate as provided in Section 8.31.

Contractor's Work shall be confined to the District's premises, including easements and construction Permit limits. The Contractor shall not enter upon or place Materials or Equipment on other property except by written consent of the individual property owners and the Contractor shall save District harmless from all suits and actions of every kind and description that might result from its use of property other than that of the District.

The Contractor shall be responsible for obtaining all Permits except those specified herein or in the Special Provisions.

The Contractor shall keep fully informed concerning all governmental requirements, including but not limited to all State, Federal, county and municipal laws, ordinances and regulations which in any manner affect the performance of



the Work or the Materials and Equipment used in the Work, or which in any way affect those employed to work in connection with the Project, and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same including the specific legal requirements referenced in the Contract Documents (collectively, the “Governmental Requirements”). The Contractor shall at all times comply with, and shall cause all the Contractor’s agents, employees and Subcontractors to comply with all such Governmental Requirements, and shall indemnify, defend and hold harmless District and all of its commissioners, officers, agents, and employees against all claims, liabilities, losses, damages and expenses (including attorney’s fees and related costs) arising from or based on the violation of any such Governmental Requirement whether by the Contractor or contractor’s agents, employees or Subcontractors. If any discrepancy or inconsistency is discovered in the Contract Documents for the work in relation to any such Governmental Requirements, the Contractor shall immediately report the same to the Engineer in writing.

Wherever the law of the place of construction requires a sales, consumer, use or similar tax, the Contractor shall pay such tax.

#### **8.18 PAYMENT OF PREVAILING WAGES**

The wage rates to be paid all laborers, workers and mechanics who perform any part of this Contract shall meet or exceed the prevailing wage rates as required by Chapter 39.12 of the Revised Code of Washington, as amended. This requirement applies to laborers, workers and mechanics whether they are employed by the Contractor, Subcontractors, sub-Subcontractors, or any other person who performs a portion of the Work contemplated by this Contract.

The current prevailing wage rates as provided to the District by the Industrial Statistician of the Washington State Department of Labor and Industries are available at the following location: <https://lni.wa.gov/licensing-permits/public-works-projects/prevailing-wage-rates/>. In referencing such rates, the District does not imply or warrant that the Contractor will find labor available at those rates. It is the Contractor’s sole responsibility to determine the wage rates it will actually have to pay.

In case any dispute arises as to what are the prevailing rates of wages for work of a similar nature and such dispute cannot be adjusted by the parties in interest, including labor and management representatives, the matter shall be referred for arbitration to the Director of the Department of Labor and Industries of the State and the Director’s decision therein shall be final and conclusive and binding on all parties involved in the dispute, as provided for by Section 39.12.060 of the Revised Code of Washington, as amended.

In connection with this Contract, the Contractor will be required, pursuant to Section 39.12.040 of the Revised Code of Washington to file with the District a “Statement of Intent to Pay Prevailing Wages” and an “Affidavit of Wages Paid” for



itself and all Subcontractors and sub-Subcontractors. The Statements require the “approval” of, and the Affidavits the “certification” of, the industrial statistician of the State Department of Labor and Industries before the Statements or Affidavits are to be presented to the District. The Department of Labor and Industries charges a fee for such approval and certification, which fee shall be paid by the Contractor. Any change in the fee will not be grounds for revision in Contract Price.

All workers delivering fill, sand, gravel, crushed rock, transit/concrete mix, asphalt or other similar Materials and all workers removing any Materials from the Site as required by the Specifications are subject to the provisions of RCW Chapter 39.12 and are entitled to the appropriate prevailing wage rate. For purposes of this Contract, such Materials are for specified future use and per WAC 296-127-018, delivery and pick-up of the above listed Materials constitutes incorporation.

The Contractor is required to include this provision in all subcontracts and shall require that it be placed in all sub-subcontracts at any tier.

#### **8.19 PROTECTION OF WORK, PERSONS, AND PROPERTY**

The Contractor shall be solely and completely responsible for conditions of the Site, including protecting all persons and property, during performance of the Work. The Contractor shall maintain the Site and perform the Work in a manner which meets all statutory and common law requirements or other specific contractual requirements for the provision of a safe place to work and which adequately protects the safety of all persons and property on or near the Site. This obligation shall apply continuously and shall not be limited to normal working hours. The District’s inspection of the Work or presence at the Site does not and shall not be construed to include review of the adequacy of the Contractor’s safety measures in, on or near the site of the Work.

Unless otherwise required in the Contract Documents, the Contractor shall protect and be responsible for any damage or loss to the Work, or to the Materials and Equipment associated with the Work until the date of Substantial Completion. The Contractor remains responsible for any damage or loss caused directly or indirectly by the acts or omissions of the Contractor, Subcontractors, suppliers or third parties authorized or allowed on the Site by the Contractor until Acceptance. The Contractor shall repair or replace without cost to the District any damage or loss that may occur, except damages or loss caused by the acts or omissions of the District.

Contractor shall take adequate precautions to protect existing lawns, trees and shrubs, sidewalks, curbs, pavements, adjoining property, and structures, and to avoid damage thereto. The Contractor shall, at its own expense, completely repair any damage thereto caused by its operations to the satisfaction of the Engineer, except as otherwise provided elsewhere in the Contract Documents. The Contractor shall be solely and completely responsible for damages arising from the Work that affect property adjacent to the Site.



Whenever it is necessary in the course of construction to remove or disturb culverts, driveways, roadways, pipelines, or other existing improvements, without limiting the generality thereof and whether on private or public property, they shall be replaced to a condition equal to that existing before they were so removed and disturbed and all such costs for this replacement shall be borne by the Contractor and considered incidental to the construction and Work covered by the Contract Documents.

The Contractor shall erect and maintain adequate signs, fencing, barricades, lights or security measures and persons to protect the Work until the Engineer authorizes in writing the removal of signs, fencing, barricades, lights or security measures.

## **8.20 SAFETY**

The Contractor shall take all reasonable precautions for the safety of all employees working on this Contract and all other persons who may be affected by such Work. The Contractor shall designate a responsible member of its organization at the Site whose duty shall be to manage and coordinate the Safety Programs and to prevent accidents of the Contractor and Subcontractor and suppliers.

Except as otherwise stated in the Contract, if the Contractor encounters on the Site material reasonably believed to be Hazardous Material including but not limited to asbestos, lead, or polychlorinated biphenyl (PCB), the Contractor shall immediately stop Work in the area affected and give notice of the condition to the District. Work in the affected area shall not be resumed without written direction by the District.

In order to protect the lives and health of persons performing Work under this Contract, the Contractor shall comply with the Federal Occupational Safety and Health Act of 1970 (OSHA), including all revisions, amendments and regulations issued thereunder, and the provisions of the Washington Industrial Safety Act of 1973 (WISHA), including all revisions, amendments and regulations issued thereunder by the Washington State Department of Labor and Industries. The WISHA regulations shall apply, without limitation, to all excavation, tunneling, trenching and ditching operations. In case of conflict between any such requirements, the more stringent regulation or requirement shall apply. There is no acceptable deviation from these safety requirements, regardless of practice in the construction industry. Any violation of OSHA, WISHA or other safety requirements applicable to the Work may be considered a breach of this Contract.

## **8.21 UTILITIES**

In connection with any underground and utility Work, the Contractor shall strictly comply with Chapter 19.122 of the Revised Code of Washington. Any cost or



scheduling impact resulting from the Contractor's failure to comply with these statutory provisions shall be borne by the Contractor.

Unless specified otherwise by the Contract, Contractor shall plan and execute its Work to prevent outages in existing utilities or disruption of service. Where removal or relocation of known or disclosed utilities or temporary utility connections are necessary to accommodate the Work, such removal, relocation or temporary connections shall be performed at the Contractor's sole expense unless it is specified in the Contract Documents that it will be performed by the District or by others.

The District or utility owner may enter the Site from time to time to make changes as may be necessary for the relocation of utilities or to make necessary connections or repairs. Where the utility owner is identified as being responsible for removing or relocating utilities, the Contractor shall make timely arrangements with the utility owner to schedule such work to accommodate the Work. The Contractor shall also cooperate with and facilitate any necessary access to or on the Site by the forces engaged in such work and shall conduct its operations in such a manner as to avoid delay or hindrance to the work being performed by such other forces.

Contractor shall not commence any excavations until existing utilities have been staked or marked by the utility owner. The District will provide utility locates for District-owned utilities. The Contractor may encounter underground utilities adjacent to their Work operations. It shall be the Contractor's responsibility to protect these utilities from damage. If the Contractor discovers the presence of any unknown/unidentified utilities at the Site, the Contractor shall provide the District oral or written notice promptly (and in no event more than 24 hours after discovery). If any underground utility not identified in the Contract Documents must be relocated to accommodate the Project, the Engineer will either arrange for the relocation of such utility or provide a Change Order to the Contractor to do such work. If the Contractor asserts that the discovery entitles it to a change in Contract Price and/or Time, written notification shall be made in accordance with Section 8.24.

The Contractor may request District approval for changes or rearrangement to any utility for the Contractor's convenience in order to facilitate construction of the Work. The District shall be the sole judge of whether the proposed change or rearrangement is acceptable. The Contractor shall be responsible for any delay or cost resulting from this request.

Loss of time, if any, suffered by the Contractor due to delays in removal or relocation of any utilities by others may be considered in relation to a request by the Contractor for an adjustment to the Contract Time in accordance with Sections 8.23 and 8.26.





Utilities damaged by the Contractor shall be repaired by the Contractor to their original condition at the Contractor's expense. The Contractor shall notify the Engineer of any such damage promptly (and in no event more than 24 hours after the damage occurs) and shall begin repairs immediately and work continuously until the utility is restored to the satisfaction of the Engineer.

## **8.22 DISTRICT-INITIATED CHANGES IN THE WORK**

- (a) The District, without invalidating the Contract, may order extra work or make changes by altering, adding to or deducting from the Work. The District reserves the right to make such alterations in the Plans or in the quantities of Work as may be considered necessary. Such alterations shall be in writing by the District and shall not be considered a waiver of any condition of the Contract nor invalidate any of the provisions thereof.
- (b) All such changes in the Work shall be authorized and directed by Change Order.
- (c) Unless the District in its sole discretion agrees otherwise in writing by way of Change Order, an alteration that only increases or decreases the quantity of bid item units to be installed shall not modify or adjust the unit prices set forth in the Proposal or contained in the Contract Price.
- (d) Subject to the limitation set forth above in (c), any modification to the Contract Price due to such changed Work shall be determined, in order of precedence, in the following methods:
  - 1. By unit or lump sum prices set by the Contract.
  - 2. If method (1) does not apply, by prices mutually agreed upon.
  - 3. If no agreement is reached under method (2), such Work will be paid for under Force Account rules established pursuant to Section 8.25 of these General Conditions. In such cases, the Contractor shall keep and present in such form as the Engineer may direct a correct account of such costs, together with supporting time cards and vouchers. The Engineer shall evaluate and determine the amount due Contractor.
- (e) This Section 8.22 applies only to District-initiated changes in the Work.

## **8.23 CONTRACTOR REQUESTS FOR CHANGE / CLAIMS**

If the Contractor believes it is entitled to any additional compensation or time extension for any reason, the Contractor shall comply with the terms and conditions of this Section 8.23. In general, as described further below, the Contractor must adhere to a three-step process in making any request for additional compensation and/or time extension: (1) a timely written Notice of Intent



(2) a timely and properly documented Request for Change Order and, if such Request is denied (3) a timely and properly documented submission of a Claim.

Step 1: If the Contractor claims that the cost to perform the Work has been increased through any act or omission believed to be the District's responsibility (including without limitation District instructions, Plans, Site conditions or any alleged interference or impact by the District) the Contractor shall give the Engineer written Notice of Intent within five (5) Days after the receipt of any such instructions, or occurrence of any other act, omission or impact, and in any event before proceeding to execute the Work (except in emergency endangering life or property). The Notice of Intent shall describe (1) the date, circumstances, and source of the direction, instruction, interpretation, determination by the District and/or the event or impact to the Project (2) reasonable order of magnitude estimate of the change to the Contract Price (3) reasonable order of magnitude estimate of the time impact to the Contract Time; and (4) Contract provisions and substantive basis to support entitlement. Contractor's failure to provide the Notice of Intent as required by this Section 8.23 will act as a waiver of any right to bring any Claim related to the act, omission or impact in question.

Step 2: Within no more than 14 Days of submitting its Notice of Intent, The Contractor shall provide a detailed Request for Change Order to the Engineer. The Request for a Change Order shall include:

- Specific dollar amount covering all costs associated with the requested Change Order calculated in accordance with the Contract;
- Specific request for time extension (number of days);
- All documentation supporting the Request for a Change Order, including but not limited to all cost records and any schedule analysis.

Contractor's failure to provide the Request for Change Order as required by this Section 8.23 will act as a waiver of any right to bring any Claim related to the act, omission or impact in question.

The District will review each submitted Request for Change Order within thirty (30) Days after receipt and will respond in writing approving or denying the Request.

Step 3: If the Request for Change Order is denied, the Contractor within no more than thirty (30) Days of the denial shall file a written Claim. At a minimum, a fully documented Claim must contain the following information:

- A detailed statement of the Claim providing all necessary details, locations, and items of Work affected;
- The date on which the incident arose that gave rise to the Claim;



- The name of each person employed or associated with the Contractor, Subcontractors, suppliers, and/or the District with knowledge about the event or condition which gave rise to the Claim;
- Copies of documents and a written description of the substance of any oral communications that concern or relate to the Claim;
- The specific provisions of the Contract Documents on which the Claim is based;
- If an adjustment in the Contract Price is sought, the exact amount sought, calculated in accordance with the Contract and accompanied by all records supporting the Claim;
- If an adjustment in the Contract Time is sought, the specific days and dates for which it is sought; the specific reason the Contractor believes an adjustment in the Contract Time should be granted; and the Contractor's analyses of its Schedule, any specific Schedule analysis as required by the Contract Documents, and all updates to demonstrate the reason for the adjustment in Contract Time; and,
- A statement certifying, under penalty of perjury, that after the exercise of reasonable diligence and investigation the Claim is made in good faith, that the supporting cost and pricing data are true and accurate to the best of the Contractor's knowledge and belief, that the Claim is fully supported by the accompanying data, and that the amount requested accurately reflects the adjustment in the Contract Price or Contract Time for which the Contractor believes the District is liable.

Failure to comply with the time requirements set for filing a Claim shall constitute acceptance by the Contractor, on behalf of itself and its Subcontractors and suppliers, of the District's denial of a Request for Change Order. Such acceptance shall be considered complete, full, and final settlement of all costs, damages, and Claims related to or arising from the Request for Change Order.

Any modification to the Contract made on account of any Request for Change Order or Claim shall be determined, in order of precedence, in the following ways:

1. By unit or lump sum prices set by the Contract.
2. If method (1) does not apply, by prices mutually agreed upon.
3. If no agreement is reached under method (2), payment for the Request for Change Order or Claim will be made under Force Account rules established pursuant to Section 8.25 of these General Conditions. In such cases, the Contractor shall keep and present in such form as the Engineer may direct a correct account of such costs, together with supporting time cards and vouchers.

After the Contractor has submitted a fully documented Claim that complies with this provision, the District shall respond, in writing, to the Contractor within thirty



(30) Days from the date of receipt of the fully documented Claim. If the District denies the Claim, the Contractor's sole remedy is as set forth in Section 8.46 (Venue/Limitation).

## **8.24 DIFFERING SITE CONDITIONS**

If the Notice of Intent, Request for Change Order or Claim arises from an alleged Differing Site Condition, the requirements of this Section will apply in addition to those set forth in Section 8.23. In the event this Section imposes requirements, deadlines or rules more stringent than those set forth in Section 8.23, the requirements, deadlines or rules of this Section will govern.

The Contractor shall within 24 hours of discovery notify the Engineer in writing of: (1) pre-existing subsurface or latent physical conditions differing materially from those indicated in the Contract, or (2) pre-existing unknown physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work of the character provided for in the Contract. This 24-hour Notice of Intent is in place of the 5 Day Notice of Intent listed in Section 8.23. Provided Contractor complies with this 24 hour Notice of Intent requirement and wishes to pursue relief, it must then comply with Step 2 and Step 3 set forth in Section 8.23. Contractor shall at all times preserve (and not dispose) the physical conditions or materials constituting the alleged Differing Site Condition and upon request make them available to the District for review and/or inspection.

Any geotechnical reports provided to Contractor shall have the following order of precedence: (1) Geotechnical Baseline Report (GBR) and/or Geotechnical Baselines described in the Specifications; (2) Geotechnical Data Report (GDR); (3) Geotechnical Design Report; (4) other soils reports, borings, test pits or additional investigative data. Baseline statements in the GBR and/or Geotechnical Baselines described in the Specifications shall take absolute precedence over any data in the GDR or elsewhere (or any inference or interpolation from such data) even if the baseline statements exceed the physical conditions identified in the data.

## **8.25 FORCE ACCOUNT**

Except as provided herein, Force Account will be paid under the terms and conditions of Section 1-09.6 of the latest published Standard Specifications for Road, Bridge and Municipal Construction of the Washington State Department of Transportation. Notwithstanding the foregoing, the following provisions for Contractor Owned Equipment and Standby shall apply to all Force Account work performed under this contract:

Contractor Owned Equipment: For equipment owned by the Contractor, payment shall be made on the basis of Actual Cost. The term Actual Cost means the ownership and operating cost of the equipment as determined



by the District based on records made available by the Contractor. The District in determining Actual Cost may consider the equipment's acquisition cost, the equipment's useful life, any indirect costs associated with ownership of the equipment, depreciation and other commercially reasonable factors. It is the responsibility of the Contractor to provide cost records to the District upon request to assist with determining the Actual Cost for the equipment. If the Contractor did not keep and maintain such cost records or fails to comply with the document request made by the District, the District may at its option make a reasonable determination of the Actual Cost. If the Contractor disagrees with this determination, it must file a written Notice of Intent and pursue a Request for Change Order as set forth in Section 8.23.

Standby: Payment for equipment during any standby time or shutdown caused by the District shall be paid at: (i) 25% of Actual Cost (for owned equipment) or (ii) 100% of the applicable rental rate (for rental equipment) for a period not to exceed ten (10) Days.

## 8.26 DELAYS AND EXTENSION OF TIME

- (a) If the Contractor seeks an extension of the Contract Time or additional compensation due to an allegedly compensable impact to the Contract Time, its sole remedy is to comply with the Notice of Intent / Request for Change Order / Claim process identified in Section 8.23. The remainder of this Section 8.26 describes the general rules applicable to any timely-filed Notice of Intent / Request for Change Order / Claim related to Contract Time.
- (b) Non-Excusable and Non-Compensable Delays. Delays in the prosecution of the Work that could have been avoided by the exercise of due care, coordination and diligence on the part of the Contractor, its Subcontractors or its suppliers at any tier are neither excusable nor compensable under the Contract. No extension of Contract Time or increase in the Contract Price shall be allowed for any claimed delay that is caused by or results from the breach, fault, negligence, or collusion of the Contractor, or its Subcontractors, sub-Subcontractors, or suppliers.
- (c) Excusable and Non-compensable Delays. The Contract Time may be extended without compensation by the District for a period equivalent to the time that the Engineer determines that the Contractor was delayed in the Work by one or more of the following causes, beyond the control of the District and the Contractor, occurring during the performance of the Work:
  - 1. Fire or other casualty for which the Contractor is not at fault or otherwise responsible;
  - 2. Riot, war, or civil disorder;



3. Unusual and severe weather
4. General industry strikes or labor disputes beyond the reasonable control of Contractor,
5. Unreasonable delay in issuance of a permit by the agency having jurisdiction, and
6. Delay to the Work resulting from causes beyond the control of Contractor and District and that could not have been avoided by Contractor with the exercise of coordination, foresight and diligence.

Such non-compensable extensions of Contract Time will be allowed only to the extent that Substantial Completion of the Work is unreasonably delayed through no fault of the Contractor, which must in all cases be substantiated by impact to the Work on the Schedule. Any extension of the Contract Time by the District will be set forth in a Change Order, which shall specify the Days by which the Contract Time is to be increased.

(d) Excusable and Compensable Delays. The Contract Time may be extended and the Contract Price increased in the event that:

1. The Work was delayed by reason of changes made by the District or by any unreasonable act or omission of the District,
2. The Contractor was not concurrently responsible for the delay in the Work,
3. The Contractor has suffered actual losses as a result of the delay in the Work,
4. The delay in the Work could not have been mitigated despite the Contractor taking reasonable work-around actions, and
5. The delay in the Work was not within the contemplation of the Contract.

In that event, the Contract Time will be extended for a period equivalent to the time that the Engineer determines that the Contractor was delayed in the Work and the Contract Price will be increased to compensate the Contractor for its loss from such delay and associated disruption. Any extension of the Contract Time and increase in the Contract Price by the District will be set forth in a Change Order, which shall specify the Days by which the Contract Time is to be increased and the amount by which the Contract Price is to be increased.



## 8.27 COMPLETION AND/OR CORRECTION OF WORK

- (a) If the Contractor should neglect to prosecute the Work properly and/or fail to perform any provision of this Contract, the District, after five (5) Days' written notice to the Contractor, may, without prejudice to any other remedy it may have, make good such deficiencies and deduct the cost thereof from payments then or thereafter due the Contractor.
- (b) The Contractor shall promptly remove from the construction Site all Materials and/or Equipment rejected by the Engineer as failing to conform to the Contract, whether incorporated in the Work or not; and the Contractor shall promptly replace and re-execute its own Work in accordance with the intent of the Contract and without expense to the District and shall bear the expense of making good all work of other contractors destroyed or damaged by such removal or replacement. If the Contractor does not remove such rejected Work and Materials and/or Equipment and commence re-execution of the Work within five (5) Days of notice from the Engineer, the District may correct the same as otherwise provided herein.
- (c) If the Contractor does not remove such rejected Work and Materials and/or Equipment within the period herein above described, the District may remove and store any such Materials and/or Equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal within ten (10) Days from the notice to Contractor of the fact of such removal, the District may, upon an additional ten (10) Days' written notice, sell such Materials and/or Equipment at public or private sale, and deduct all costs and expenses incurred, including costs of sale, accounting to the Contractor for the net proceeds remaining, and District may bid at any such sale. Contractor shall be liable to District for the amount of deficiency remaining between the costs incurred and the proceeds of sale. District may deduct the costs of such removal, storage and sale and/or remaining deficiency from any funds otherwise due the Contractor.

## 8.28 DEFECTS ARISING IN TWO YEARS AND REMEDIES

- (a) The Contractor shall be responsible for correcting all defects in workmanship and Materials and/or Equipment within two (2) years after Acceptance. When corrections of defects are made, Contractor shall be responsible for correcting all defects in workmanship and/or Materials and Equipment in the corrected Work for two years after proper completion of the correction. The Contractor shall start work to remedy such defects within seven (7) Days of mailing notice of discovery thereof by District and shall complete such work within a reasonable time. In emergencies, where damage may result from delay or where loss of service may result, such corrections may be made by the District, in which case the cost shall be borne by the Contractor. In the event the Contractor does not accomplish



corrections at the time specified, the Work will be otherwise accomplished and the cost of same shall be paid by the Contractor.

- (b) The Contractor shall be liable for any costs, losses, expenses, or damages, including consequential damages suffered by the District resulting from defects in the Work including, but not limited to, cost of Materials and labor extended by District in making emergency repairs and cost of engineering, inspection and supervision by District or Engineer. The Contractor shall hold the District harmless from any and all claims which may be made against the District as a result of any defective Work and the Contractor shall defend any such claims at its own expense.

## **8.29 SUSPENSION OF WORK**

- (a) The District may order the Contractor, in writing, to suspend all or any part of the Work of this Contract for the period of time that the District determines appropriate for the convenience of the District. The Contractor shall not suspend the Work without written direction from the District specifically authorizing the suspension of Work.
- (b) Upon receipt of a written notice suspending the Work, the Contractor shall immediately comply with its terms and take all reasonable steps to minimize costs attributable to such suspension. The District may require the Contractor to furnish temporary roads, patches, safety barricades, restorative work, or other measures to protect the Work, the Site, property adjacent to the Site, and public safety. Within a period up to 120 Days after the suspension notice is received by the Contractor, or within any extension of that period which the District requires, the District shall either:
  - 1. Cancel the written notice suspending the Work; or
  - 2. Terminate the Work for either Default or Convenience as provided in Sections 8.30 and 8.31.
- (c) If a written notice suspending the Work is canceled or the period of the Suspension or any extension thereof expires, the Contractor shall resume Work as required by the District.
- (d) If the performance of all or any part of the Work is, for an unreasonable period of time, suspended by the written direction of the District, and if the cause of the suspension is not the fault, breach or negligence of the Contractor or those for whom Contractor is responsible, the Contractor may be entitled to an adjustment in the Contract Price and/or Contract Time for increases in the time or cost of performance directly attributable to such unreasonably long suspension and provided that the Contractor sufficiently documents all costs and time impacts attributable to the suspension. No adjustments to Contract Price and/or Contract Time shall be allowed unless





the Contractor can demonstrate that the unreasonable period of suspension caused by the District impacted the Work and delayed the Contractor from completing the Work within the Contract Time. The Contractor shall comply with the requirements of Sections 8.23 and 8.26 in seeking an adjustment. Any sums paid to Contractor on account of suspension shall be determined in accordance with the order of precedence described in Section 8.23. Failure to comply with these requirements shall constitute a waiver of Contractor's rights to any adjustment in Contract Time and/or Contract Price.

- (e) No adjustment shall be made under this provision for any suspension to the extent that (1) Contractor's performance would have been suspended, delayed, or interrupted as a result of actions, omissions, fault or negligence caused, in whole or in part, by the Contractor or any of its Subcontractors and suppliers, (2) Contractor failed to diligently pursue the Work before the suspension, (3) the District suspended the Work due to Contractor's failure to comply with the Contract or the Engineer's orders, or (4) an equitable adjustment is provided for or excluded under any other provision of the Contract.
- (f) When ordered by the Engineer to suspend or resume Work, the Contractor shall do so immediately.
- (g) Before and during any suspension the Contractor shall protect the Work from damage or deterioration. Suspension shall not relieve the Contractor from anything the Contract requires unless this section states otherwise.

### **8.30 DISTRICT'S RIGHT TO TERMINATE CONTRACT FOR DEFAULT**

- (a) The District may terminate the Contract and take possession of the premises and of all Materials and Equipment thereon and finish the Work by whatever methods it may deem expedient, upon the occurrence of any one or more of the events hereafter specified, and receipt of the certificate by the Engineer that sufficient cause exists to justify such action:
  - If the Contractor is insolvent, files a petition for bankruptcy protections, is adjudged bankrupt, makes a general assignment for the benefit of its creditors, or a receiver is appointed on account of its insolvency.
  - If the Contractor fails to supply a sufficient number of properly skilled workmen or proper Materials or Equipment for completion of the Work.
  - If the Contractor fails to prosecute the Work or any portion thereof with such diligence as will ensure Substantial Completion within the original Contract Time and any extensions of time which may have been granted to the Contractor by Change Order or otherwise.



- If the Contractor fails to prosecute the Work or any portion thereof with such diligence as will ensure Physical Completion of the Work in a timely manner.
- If the Contractor fails in a material way to repair, replace, or correct Work not in conformance with the Contract.
- If the Contractor fails to make prompt payment to its employees or Subcontractors and suppliers.
- If the Contractor disregards laws, ordinances, rules, codes, regulations, orders or similar requirements of any public entity having jurisdiction over the Contractor, the Work, or the Site.
- If Contractor fails to comply with any Contract safety requirement.
- If the Contractor otherwise materially breaches any provisions or requirements of the Contract or persistently disregards instructions of Engineer.

District shall give Contractor five (5) Days' written notice to cure the default and, if not cured to the satisfaction of District as certified by Engineer, the District may, upon three (3) Days' written notice, elect to so terminate. Any such termination shall be without prejudice to any other right or remedy which District may have against Contractor.

- (b) If Contractor fails to cure the default to the District's satisfaction within the five (5) Day cure period, or if the Contractor abandons the Work undertaken under the Contract, District may, at its option, upon ten (10) Days' written notice to the Surety and without any written notice to Contractor, transfer the employment of said Work from Contractor to Surety. Upon receipt of such notice, the Surety shall enter upon the premises and take possession of all Materials, Equipment, tools and appliances thereon for the purpose of completing the Work included under this Contract and employ, by contract or otherwise, any person or persons to finish the Work and provide the Materials and Equipment therefore, without termination of the continuing full force and effect of the Contract. In case of transfer of such employment to the Surety, the Surety shall be paid in its own name on estimates covering the Work subsequently performed under the terms of the Contract and according to the terms hereof, without any right of Contractor to make any claim for the same or any part thereof.
- (c) In the event that the Contract is terminated for default by the District, Contractor shall not be entitled to receive any further balance of the amount to be paid under this Contract until the Work shall have been fully finished. At such time, if the unpaid balance of the amount to be paid under this Contract exceeds the expense incurred by District in finishing the Work, and all damages sustained or which may be sustained by District by reason of such refusal, neglect, failure of discontinuance of employment, such excess



shall be paid by District to Contractor. If such expense and damages shall exceed the unpaid balance, Contractor and its Surety and each thereof shall be jointly and severally liable therefore to District and shall pay the difference to District. Such expense and damage shall include all reasonable legal costs incurred by District in the employment of attorneys to protect the rights and interests of District under the Contract.

### **8.31 DISTRICT'S RIGHT TO TERMINATE CONTRACT FOR CONVENIENCE**

- (a) Upon written notice to the Contractor, the District may terminate the Work, or any part of it, without prejudice to any right or remedy of the District inclusive of all audit rights in the Contract, for the convenience of the District.
- (b) If the District terminates the Work or any portion thereof for convenience, Contractor shall be entitled to be paid, at applicable Contract rates and prices, for Adjusted Contract Work executed in conformance with the Contract and completed prior to the effective date of the termination.
- (c) Termination for Convenience shall not enlarge, expand, modify, alter or in any way subsume or convert the rights or remedies (if any) of Contractor with respect to any Claim, Request for Change Order, Notice of Intent or other request for any revision to the Contract Price or Contract Time asserted or accrued at the time of the termination (collectively, "Pending Requests"). Without limiting the foregoing, the termination for convenience shall not have the effect of converting the Pending Requests into no-fault or assumed liabilities of the District. Following any Termination for Convenience, Contractor's rights or remedies (if any) to any extra compensation, change in the Contract Price or additional Contract Time for any Pending Requests shall continue to be subject to and governed by the same Contract provisions, legal rules and processes, defenses and burdens of proof that would apply but for the termination.
- (d) Except as provided for above in Section 8.31(b) or (c), the Contractor shall not be entitled to any other costs or damages whatsoever (including without limitation profit or overhead on the terminated Work). The total sum payable upon termination shall also not exceed the Contract Price reduced by prior payments.
- (e) If it appears that due to any cause or reason the Contractor would have incurred a loss on the entire Contract had it been completed, the District shall not reimburse Contractor for any indirect costs for the Adjusted Contract Work completed and shall reduce the settlement to reflect the indicated rate of loss.
- (f) If the payments made by the District prior to the effective date of the termination exceed the reasonable direct cost of the Adjusted Contract



Work completed as of the effective date of the termination (as in, for example, a mobilization payment that exceeds direct mobilization costs or other similar front-loaded payments), the District shall at its option be entitled to a credit for the overpayment. The Contractor shall cooperate with any audit the District elects to conduct pursuant to the terms of the Contract.

- (g) The rights and remedies of the District in this provision are in addition to any other rights and remedies provided by law or under this Contract, inclusive specifically of all audit rights.

### **8.32 CONTRACTOR'S OBLIGATIONS DURING TERMINATION**

Unless the District directs otherwise, after receipt of a written notice of Termination for Default or Termination for Convenience, Contractor shall promptly:

- (a) Stop performing Work on the date and as specified in the notice of termination;
- (b) Place no further orders or subcontracts for Materials, Equipment, services or facilities, except as may be necessary for completion of such portion of the Work not terminated;
- (c) Cancel all orders and subcontracts, upon terms acceptable to the District, to the extent that they relate to the performance of Work terminated;
- (d) Assign as specifically requested by the District all of the rights, title, and interest of Contractor in all orders and subcontracts;
- (e) Take such action as may be necessary or as directed by the District to preserve and protect the Site and any other property related to this Project in the possession of Contractor in which the District has an interest;
- (f) Continue performance of the Work only to the extent not terminated;
- (g) If notified to do so by the District, promptly remove any part or all of its Equipment, Materials, and supplies from the Site; and,
- (h) Take any other steps required by the District with respect to the Project.

If Contractor fails to remove its Equipment, Materials, or supplies within three (3) Days of District's notice to do so, District shall have the right to remove such Equipment, Materials, and supplies at the expense of Contractor, deducting the cost thereof from any funds otherwise due Contractor.



### **8.33 USE OF COMPLETED PORTION OF WORK**

District shall have the right to take possession of and use any completed or partially completed portions of the Work, notwithstanding that the time may not have expired for completing the entire Work. Such taking possession and use shall not be deemed to be completion of the Contract in respect to such Work nor shall the same be deemed to be Acceptance of the Work.

### **8.34 APPLICATION FOR PAYMENT**

On or about the first business day of each month, the Contractor shall submit to the District an Application for Payment. Each application shall be on a form acceptable to the District and designated as an "Application for Payment." The Contractor shall include with each Application for Payment:

1. Current schedule of values reflecting the Work done since the last Application for Payment and the cumulative Work completed to date;
2. Project Schedule and the most current updates; and,
3. Affidavits signed by all Subcontractors performing Work as of the last Application for Payment, stating that each of them has been paid, less earned retainage, as their interests appeared in the last Application For Payment.

The Contractor is not entitled to payment for any Work unless the Application for Payment includes all required documentation. The District reserves the right to withhold payment pursuant to Section 8.38 if it is subsequently determined that all required documentation was not provided by the Contractor or any of the documentation provided by the Contractor was inaccurate or otherwise objectionable. At the District's option, no payments will be made after the date of expiration of the Contract Time, as established in the Contract, until final payment.

The Application for Payment shall correlate the amount requested with the schedule of values and with the state of completion of the Work, as measured by the current Project Schedule. In addition to Work performed by the Contractor, Applications for Payment may include the cost of Materials suitably stored on the Site in accordance with Section 8.35.

The District shall comply with RCW 39.76, as amended, and promptly review each Application for Payment and identify in writing any cause for disapproval within eight (8) working days. In addition to withholding payment for unsatisfactory performance or failure to comply with Contract requirements, if the Contractor's Application for Payment fails to recognize any back-charges, off-sets, credits, change orders, or deductions in payment made in accordance with Section 8.35, the District shall have the right to revise or disapprove Contractor's Application For



Payment because the Application For Payment is not considered a properly completed invoice.

### **8.35 PROGRESS PAYMENTS**

Progress payments will be made no more often than monthly following Contractor's Application for Payment. Payment shall be based upon the actual quantities of Work performed as verified and agreed by the Engineer according to the Contract Documents. Payment shall be based upon invoices approved by the Engineer. Progress payments will be made within forty-five (45) Days of the District's receipt of the properly prepared invoice (Application for Payment). Monthly progress payments will be made to the Contractor during the working period but not after the Substantial Completion date. Five per cent (5%) of the amount of the estimated progress payment will be retained by the District as provided in Chapter 60.28 RCW. The statutory retained percentage shall be managed by the District as specified by the Contractor in the Proposal form of the Bid Documents.

The Contractor is required to make payment to all Subcontractors and suppliers for all Work included within the progress payment within ten (10) Days from the receipt of the progress payment. Furthermore, the Contractor shall require all subcontracts issued under this contract to all Subcontractors and suppliers at all tiers to also make all due payments within ten (10) Days of their receipt of payment. The Contractor must justify to the District in writing any intent to withhold payment of monies due to any Subcontractor or supplier.

The cost of Materials, properly stored, protected and insured at the Site of the Work, will be paid on monthly estimates only when provided for in the Special Provisions, and then only for the specific Materials listed therein for partial payment. In preparing the monthly estimates, advancement will be made therein for ninety per cent (90%) of the cost of such Materials, as evidenced by invoices to Contractor. Advances will not be made for any item of Material amounting to less than five hundred dollars (\$500.00). All Materials must conform to the requirements of the Specifications. However, advancement for Materials will not constitute acceptance of same, and any faulty Materials will be condemned although advancement may have been made for same in the estimates. Deductions at the same rates and equal in amount to the advancements, will be made on the estimates as the Materials are used. All Materials for which costs are allowed under this subparagraph must be substantiated by written documentation from the Material supplier that the Material has been paid for.

### **8.36 FINAL PAYMENT**

The District will make final payment, excluding held retention, to the Contractor following (1) Physical Completion and (2) final resolution by settlement, mediation or litigation of all Requests for Change Orders or Claims. Final payment shall include the entire sum found to be due hereunder after deducting therefrom such



amounts as the terms of the Contract permit. Prior estimates and payments, including those relating to unit price Work, extra Work or Work omitted, shall be subject to review and correction by the final payment. Final payment will be made only for Materials actually incorporated in the Work; and, all Materials remaining for which progress payments have been made shall revert to the Contractor, unless otherwise agreed, and progress payments made for these items shall be deducted from the final payment for the Work.

By accepting final payment, the Contractor shall be deemed thereby to have released the District from all claims of Contractor and all liability to the Contractor for things done or furnished in connection with the Work and for every act and neglect of the District and others relating to or arising out of the Work, other than release and held retention. Final payment by the District shall not release the Contractor or its Surety from any obligation under the Contract or under the performance and payment bonds or under any warranty obligations.

Neither the final payment nor any part of the retained percentage shall become due until Contractor, if requested, shall deliver to District a complete release of all liens arising out of this Contract, or receipts in full in lieu thereof, and, if required in either case, an affidavit that so far as it has knowledge or information, the release and receipts include all labor and Material for which a lien could be filed; but Contractor may, if any Subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to Engineer to indemnify District against any lien. If any lien remains unsatisfied after all payments are made, Contractor shall reimburse to District all moneys that the latter may be compelled to pay in discharging such lien, including all costs and reasonable engineer's and attorney's fees.

### **8.37 ACCEPTANCE AND RELEASE OF RETAINAGE**

Following issuance of the Notice of Physical Completion and the completion of all closeout administrative requirements, the District will formally accept the Project. Once the District determines that the Contractor has fulfilled these requirements, the Engineer will issue a formal Notice of Acceptance.

Promptly following Acceptance, the District will prepare the Notice of Completion of Public Works Contract and submit it to the relevant Washington State agencies.

Release of the retainage will be made no sooner than sixty (60) Days after issuing the Notice of Completion of a Public Works Contract provided the following conditions are met:

1. On Contracts totaling more than \$35,000, a release has been obtained from the Washington State Department of Revenue (RCW 60.28.051);
2. Receipt of a certificate of Payment of Contributions Penalties and Interest on Public Works Contract from the Washington State Employment Security Department;



3. Receipt of a certificate from Washington State Department of Labor and Industries showing the Contractor is current with payments of industrial insurance and medical aid premiums;
4. All claims, as provided by law, filed against the retainage have been resolved. In the event claims are filed and provided the conditions of 1 through 3 above are met, the Contractor will be paid such retained percentage less an amount sufficient to pay any such claims together with a sum determined by the District sufficient to pay the cost of foreclosing on claims and to cover attorney's fees.

It is the responsibility and a condition of this Contract that Contractor promptly notifies all Subcontractors and suppliers of the commencement of the period and of the final day for submitting any liens. As a further condition of this Contract the Contractor is required to place within all subcontracts a clause that states that this shall be done. The Contractor shall by letter inform the District of the compliance with this provision. Failure of the Contractor to comply with this provision may be used by the District as a basis to withhold retainage to ensure payment to uninformed Subcontractors. Failure to comply will also be made a matter of record for future determinations of Bidder responsibility.

### **8.38 DISTRICT'S RIGHT TO WITHHOLD PAYMENTS**

In addition to moneys retained pursuant to RCW 60.28 and without waiver of any other available remedies, the District at its sole option has the right to recapture, withhold, nullify, or back-charge, in whole or in part, any payments due to Contractor or payments made to the Contractor on the following grounds:

1. The Work for which the Contractor is claiming payment was not performed in accordance with the Contract;
2. The Contractor's pay request does not contain the required documentation or is otherwise not in conformance with the requirements of the Contract;
3. There is a good faith dispute over all or a portion of the amount due, in accordance with 39.04.250 RCW;
4. Failure of the Contractor to make payments owed to Subcontractors, or for labor, Materials, or Equipment;
5. Failure of the Contractor to submit Schedule(s), schedule(s) of value or update any schedules as required by the Contract;
6. Failure to prosecute progress of the Work in a timely manner or failure to take necessary steps to regain time or deliver the Work in the prescribed Contract Time;
7. A reasonable doubt that the Contract can be completed for the balance then unpaid;





8. Cost or liability that may occur to the District as the result of the Contractor's or Subcontractor's acts, omissions, fault, or negligence;
9. Failure of the Contractor to repair damaged materials, equipment, property, or Work;
10. Imposition of any liquidated or other delay damages under the Contract;
11. Payments made by mistake; or
12. Payments made erroneously and/or in excess of the sum actually due under the Contract.

The withholding, nullification, or back-charge of any payment(s) by the District shall in no way relieve the Contractor of any of its obligations under this Contract. In the event the District withholds all or a part of a payment for deficiencies in either performance, or in a payment request, the District will notify the Contractor in accordance with RCW 39.76. The Contractor shall have the right to correct all deficiencies that are the basis for the withholding and resubmit the pay request at any time for reconsideration.

### **8.39 HOLD HARMLESS AGREEMENT**

The Contractor shall protect, defend, indemnify and hold harmless the District, its officers, officials, separate contractors, employees, agents, and successors and assigns, (collectively "the Indemnified Parties") from any and all liability, claims, demands, suits, penalties, losses, damages, judgments, or costs of any kind whatsoever (hereinafter "claims"), arising out of or in any way, whether direct, indirect or consequential (including, but not limited to, attorneys' and consultants' fees and other expenses of litigation or arbitration) resulting from the Contractor's and/or Subcontractor's and supplier's of all tiers acts or omissions, performance or failure to perform this Contract, to the maximum extent permitted by law or as defined by RCW 4.24.115, now enacted or as hereinafter amended; provided, however, that if the provisions of RCW 4.24.115 apply to the Work and any injuries to persons or property arising out of performance of this Contract are caused by or result from the concurrent negligence of the Contractor or its Subcontractors, agents or employees, and an Indemnified Party, the indemnification applies only to the extent of the negligence of the Contractor and its Subcontractors, agents or employees. This Paragraph shall not be construed so as to require the Contractor to defend, indemnify, or hold harmless the District from such claims, damages, losses or expenses caused by or resulting from the sole negligence of the District or its agents.

The Contractor specifically assumes potential liability for actions brought by the Contractor's own employees or former employees against any Indemnified Party, and for that purpose the Contractor specifically waives all immunity and limitations on liability under the workers compensation act, RCW Title 51, or any industrial insurance act, disability benefit act or other employee benefit act of any jurisdiction



that would otherwise be applicable in the case of such claim. The Contractor recognizes that this waiver was specifically entered into and was the subject of mutual negotiation. Provided, however, the Contractor's waiver of immunity by the provisions of this paragraph extends only to claims against the Contractor by District, and does not include, or extend to, any claims by the Contractor's employee directly against the Contractor.

The District may, in its sole discretion, (1) withhold amounts sufficient to pay the amount of any claim for injury, and/or (2) pay any claim for injury of which the District may have knowledge, regardless of the formalities of notice of such claim, arising out of the performance of this Contract. Any amount withheld will be held until the Contractor secures a written release from the claimant, obtains a court decision that such claim is without merit, or satisfies any judgment on such claim. In addition, the Contractor shall reimburse and otherwise be liable for claims costs incurred by the District, including, without limitation, attorneys' fees and costs and costs for claims adjusting services, engineering, and administration.

In the event the District incurs any judgment, award, and/or costs arising therefrom, including attorneys' fees, to enforce the provisions of this article, all such fees, expenses, and costs shall be recoverable from the Contractor.

The foregoing indemnities and duties to defend shall survive the termination of this Contract and final payment hereunder, and are in addition to any other rights or remedies which District and/or any of the Indemnified Parties may have by law or under this Contract.

#### **8.40 PERFORMANCE AND PAYMENT BOND**

The Contractor shall furnish a surety bond in compliance with RCW 39.08 in the full amount of the Contract Price which shall guarantee the faithful performance of the Contract and the payment of all labor, mechanics, Subcontractors and Material suppliers. This bond shall remain in force until all obligations of the Contract are extinguished or until the expiration of all applicable statutes of repose or limitation, whichever is later. Without limiting the foregoing, this bond shall cover, for a period of two (2) years after Physical Completion, all faulty workmanship and Materials or items of Work warranted by Contractor. This bond shall be furnished by a corporate surety company rated A-VII or higher by A. M. Best, authorized to do business in the State of Washington, acceptable to the District, and subject to the approval of the District's attorney as to form.

#### **8.41 ASSIGNMENT AND SUBCONTRACTING**

- (a) Contractor shall not assign the Contract in whole or in part without the written consent of District, nor shall Contractor assign any moneys due or to become due to him hereunder without the prior written consent of District.



- (b) Contractor agrees that it is fully responsible to District for the acts or omissions of Subcontractors and persons either directly or indirectly employed by Subcontractors, as well as for the acts and omissions of persons directly employed by Contractor. District's consent to subcontracting parts of the Work shall in no way release Contractor from responsibility for performance of the Work. Contractor will be held, in all aspects, accountable for subcontracted Work as if no consent had been given. Contractor shall be required to give its personal attention to the Work that is subcontracted. Nothing contained in the Contract Documents shall create any contractual relation between any Subcontractor and District.

#### **8.42 SEPARATE CONTRACT - INTERFERENCE WITH OTHER CONTRACTORS**

- (a) District reserves the right to perform work with its own forces or to let other contracts for work under similar general conditions in connection with this Project, of which the work awarded to one or more contractors under separate contracts is a part. Contractor shall afford District and other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their respective work and shall properly connect and coordinate its Work with theirs.
- (b) If the performance of any contract for the Project is likely to be interfered with by the simultaneous execution of some other contract or contracts, Engineer shall decide which contractor shall cease work temporarily and which contractor shall continue or whether the work under the contractor can be coordinated so that the contractors may proceed simultaneously. District shall not be responsible for any damages suffered or extra costs incurred by Contractor resulting directly or indirectly from the award, performance, or attempted performance of any other contract or contracts on the Project or caused by any decision or omission of Engineer respecting the order of precedence in the performance of the contractors other than for an extension of Contract Time.

#### **8.43 CLEANUP**

- (a) During performance of the Work, Contractor shall frequently clean up all refuse, rubbish, scrap material and debris caused by its operations. The Site of the Work shall present a neat, orderly and workmanlike appearance at all times.
- (b) Upon completion of the Work, Contractor shall remove all rubbish, scrap material, tools, scaffolding and surplus Materials and Equipment used in and about the Work. Before the Contract shall be considered complete and prior to final payment, Contractor shall remove all surplus Materials and Equipment, falseworks, temporary structures, including foundations thereof, plants of any description, and debris of every nature, resulting from its



operations, shall clean out all ditches that may have been filled during the Work, replace damaged surfacing, and put the Site in a neat, orderly condition and, in respect to structures, shall clean all windows and leave buildings broom clean.

#### **8.44 PROPERTY RESTORATION RELEASE**

The Contractor shall obtain a written release from each property owner upon whose property Work has been performed or Materials stored. A sample form of such release is included in the Special Provisions section.

#### **8.45 PREVENTION OF ENVIRONMENTAL POLLUTION**

The Contractor shall comply with all Federal, State and local statutes, ordinances and regulations dealing with the prevention of environmental pollution and preservation of public human resources that affect or are affected by this Project including, but not limited to, the State Environmental Policy Act of 1971, the National Environmental Policy Act of 1969, King County Council Ordinance No. 1700, King County Council Motion 1335, and any current amendments thereto which are hereby incorporated into the Contract as if written herein in full. All costs for compliance shall be included in the unit or lump sum prices bid for the several items of Work as indicated in the Proposal.

#### **8.46 VENUE/LIMITATION**

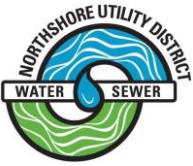
The exclusive venue for any litigation arising from or relating to this Contract or the Project is King County Superior Court, Seattle, Washington. This Contract and all provisions hereof shall be interpreted in accordance with the laws of the State of Washington.

No legal action against the District may be filed on account of a Claim or other liability arising out of or related to this Contract unless:

1. The requirements of Sections 8.23, 8.24, and 8.26 have been strictly complied with;
2. The procedures of Sections 8.23 and 8.24 have been exhausted; and,
3. The lawsuit is filed in the exclusive venue specified above and served on the District within 180 Days of the date of Substantial Completion.

The Contractor's failure to strictly comply with all requirements of this Section shall be a complete bar to any lawsuit.

# **SUPPLEMENTARY GENERAL CONDITIONS**



## SECTION 9 – SUPPLEMENTARY GENERAL CONDITIONS

The General Conditions shall be supplemented as follows:

### 9.1 APPRENTICES

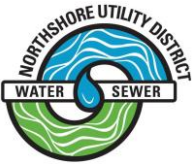
#### **Apprentice Utilization**

This Contract includes an Apprentice Utilization Requirement. Fifteen percent or more of project Labor Hours shall be performed by Apprentices unless Good Faith Efforts are accepted. Apprentice Utilization will be determined using the Department of Labor and Industries (L&I) online Prevailing Wage Intent & Affidavit (PWIA) system.

#### **Definitions**

For the purposes of this specification the following definitions apply:

1. Apprentice is a person enrolled in a State-approved Apprenticeship Training Program.
2. Apprentice Utilization is the apprentice labor hours, on the project, expressed as a percentage of project Labor Hours based on certified payrolls or the affidavits of wages paid, whichever is least. The percentage is not rounded up.
3. Apprentice Utilization Requirement is the minimum percentage of apprentice labor hours required by the Contract.
4. Good Faith Effort(s) (GFE) describes the Contractor's efforts to meet the Apprentice Utilization Requirement including but not limited to the specific steps as described elsewhere in this specification.
5. Labor Hours are the total hours performed by all workers receiving an hourly wage who are subject to prevailing wage requirements for work performed on the Contract as defined by RCW 39.04.310. Labor Hours are determined based on the scope of work performed by the individuals, rather than the title of their occupations in accordance with WAC 296-127.
6. State-approved Apprenticeship Training Program is an apprenticeship training program approved by the Washington State Apprenticeship Council.



7. Apprentice Wage Rates are the applicable wage rates that are to be paid for an apprentice registered in a training program, separate from Journey Level rates, as set by the Washington State Apprenticeship Training Council and Washington State Department of Labor and Industries (L&I).

### **Electronic Reporting**

The Contractor shall use the PWIA System to submit the “Apprentice Utilization Plan.” Reporting instructions are available in the application.

### **Apprentice Utilization Plan**

The Contractor shall submit an “Apprentice Utilization Plan” by filling out the Apprentice Utilization Plan Form (WSDOT Form 424-004) within 30 calendar days of execution, however no later than the preconstruction meeting, demonstrating how and when they intend to achieve the Apprentice Utilization Requirement. The Plan shall be in sufficient detail for the Engineer to track the Contractor’s progress in meeting the utilization requirements. An Apprentice Utilization Plan shall be updated and resubmitted as the Work progresses or when requested by the Engineer.

If the Contractor is unable to demonstrate the ability to meet the Apprentice Utilization Requirement with their initial Apprentice Utilization Plan submission, an effort must be made to find additional registered apprentices to perform on the contract. If after attempts have been made at every tier and every scope, the Contractor must submit GFE documentation to the Contracting Agency. The Contractor shall actively seek out opportunities to meet the Apprentice Utilization Requirement during the construction Work.

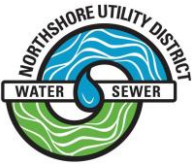
### **Contacts**

The Contractor may obtain information on State-approved Apprenticeship Training Programs by using the [Apprentice Registration and Tracking System \(ARTS\)](https://secure.lni.wa.gov/arts-public/#/program-search) <https://secure.lni.wa.gov/arts-public/#/program-search> or contacting the Department of Labor and Industries directly at:

Specialty Compliance and Services Division, Apprenticeship  
Section, P.O. Box 44530, Olympia, WA 98504-4530 or by phone at  
(360) 902-5320.

### **Compliance**

The Contractor is expected to make attempts to employ Apprentices and shall include the requirement in any subcontracts at any tier. In the event that the Contractor is unable to achieve the Apprentice Utilization Requirement, the Contractor shall submit GFE documentation



demonstrating the efforts and attempts they made. Final GFE documentation shall be submitted to the Contracting Agency after Substantial Completion but no later than 30 days after Physical Completion.

If the Contractor fails to actively attempt to employ Apprentices, submit GFE documentation, or if the Engineer does not approve the GFE, the Contractor will be assessed a penalty. The Engineer will provide the Contractor with a written notice at Final Acceptance of the project informing the Contractor of the failure to comply with this specification which will include a calculation of the penalty to be assessed as provided for in the Payment section in this special provision.

If the Contractor achieves the required Apprentice Utilization an incentive will be assessed with Final Payment.

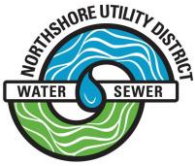
### **Good Faith Efforts**

The GFE shall document the attempts (efforts) the Contractor (and any subcontractor at any tier) made to meet the Apprentice Utilization Requirement. Emails, letters, or other written communications with letterhead, titles, and contact information are required.

Documentation must include one or more of the following accepted GFEs:

1. Demonstrated Lack of Availability of Apprentices. Correspondence from State-approved Apprenticeship Training Program(s), with project specific responses confirming there is a lack of availability of Apprentices for this project.
2. Demonstrated Disproportionate Ratio of Material/Equipment/Products to Labor Hours. Documentation explaining the bid includes a disproportionate high cost of material/equipment/products to Labor Hours. (E.g., a \$2 M estimated contract includes \$1 M or more in procurement costs of equipment to be installed.)
3. Demonstrated Lack of Necessary Labor Hours. Correspondence from a State-approved Apprentice Training Programs confirming there is not enough time in the project to meet required journey level to apprentice training ratios.
4. Demonstrated Lack of Available Approved Programs. Correspondence from State-approved Apprentice Training Programs, confirming there are no programs that train for the scopes included/anticipated on the project. Contractor and state





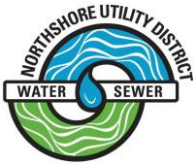
programs to submit training program detail needs and details that could be used for future program creation.

5. **Funding Precedent.** Documentation that shows conflicting, more restrictive, or precedent requirements for other training on the Project. Examples include, but are not limited to, Tribal Employment Rights (TERO), Federal Training Hours, or Special Training that affect the ability to use state-registered apprentices.
6. **Warranty Work.** Documentation from Original Equipment Manufacturers, or similar, confirming that work performed must only be completed by certified journey-level installers or risk voiding warranty, or similar.
7. **Other Effort.** The Contractor may submit other evidence, documentation, or rationale for not being able to achieve the required Apprentice Utilization that are not covered in the other efforts named. Other efforts will still need to be corroborated by an independent, knowledgeable third-party.

Contractors may receive a GFE credit for graduated Apprentice hours through the end of the calendar year for all projects worked on as long as the Apprentice remains continuously employed with the same Contractor/subcontractor they were working for when they graduated. If an Apprentice graduates during employment on a project of significant duration, they may be counted towards a GFE credit for up to 1 year after their graduation or until the end of the project (whichever comes first). Determination of whether Contract requirements were met in good faith will be made by subtracting the hours from the journeyman total reported hours for the project and adding them to the apprentice hour total. If the new utilization percentage meets the Contract requirement, the Contractor will be reported as meeting the requirement in good faith.

### **Approving Good Faith Efforts**

The Contracting Agency will review submitted Good Faith Efforts and issue a determination. The Engineer may request additional information, documentation, evidence or similar in order to approve such efforts. A determination by the Engineer is final. The approved Good Faith Efforts will be loaded into the PWIA system by the Contracting Agency.



## **Payment**

Upon completion of the work, the Contractor shall provide a summary of all hours spent on the project and identify the apprentice utilization rate for the purposes of determining the incentive and/or penalty for the project prior to final progress payment. The District will need to be able to verify these amounts through the L&I PWIA system.

# **APPENDICES**

**APPENDIX A**  
**GEOTECHNICAL REPORT**

December 14, 2022  
PanGEO Project No. 22-019

Mr. Eric Delfel, P.E.  
**Gray & Osborne, Inc.**  
11300 Rainier Avenue South, Suite 300  
Seattle, Washington 98144

Subject: Geotechnical Report  
451 Zone Control Valve Station  
Intersection of 112th Avenue NE and Tolt Pipeline Trail, Bothell, WA

Dear Mr. Delfel:

As requested, PanGEO, Inc. is pleased to present this geotechnical report for the proposed 451 Zone Control Valve Station in Bothell, Washington. This report documents the subsurface conditions at the site and our recommendations for the proposed project.

In summary, our test borings completed at the site encountered about 5 feet of loose to medium dense underlain by very dense glacial till. It is our opinion that the proposed building can be supported on conventional footings. Where excavation support will be needed, we recommend that soldier piles be used. The soldier piles may also be incorporated into the design of the permanent structures.

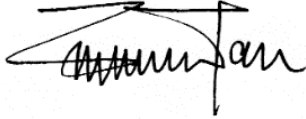
An approximately 5-foot-thick layer of confined aquifer under artesian pressure was encountered at the east end of the project site, at about 25 feet deep. The confined groundwater could impact the installation of soldier piles but should not impact the proposed facility after the construction is completed because the groundwater level is expected to be below the proposed finished grade. On the west side of the site, the uppermost 2 to 3 feet of the site soils were saturated at our test boring, suggesting accumulation of surface water. I anticipate that this can be effectively addressed with proper drainage design.

Geotechnical Report  
451 Zone Control Valve Station, Bothell, Washington  
December 14, 2022

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We appreciate the opportunity to be of service. Should you have any questions, please do not hesitate to call.

Sincerely,

A handwritten signature in black ink, appearing to read "Siew L. Tan". The signature is written in a cursive style with a prominent horizontal stroke at the top.

Siew L. Tan, P.E.  
Principal Geotechnical Engineer

Encl.: Geotechnical Report

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Figure A-1	Terms and Symbols for Boring and Test Pit Logs
Figure A-2	Log of Test Boring PG-1
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**Appendix B Laboratory Test Results**

Figure B-1	Grain Size Distribution
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**GEOTECHNICAL REPORT  
451 ZONE CONTROL VALVE STATION  
BOTHELL, WASHINGTON**

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**1.0 GENERAL**

This report presents the results of our geotechnical studies to support the design and construction of the proposed 451 Control Valve Station building for the Northshore Utility District in Bothell, Washington. Our service scope included reviewing readily available geologic and geotechnical data, observing the performance of two test borings, performed geotechnical laboratory tests on select soil samples, and developing the conclusions and recommendations presented in this report.

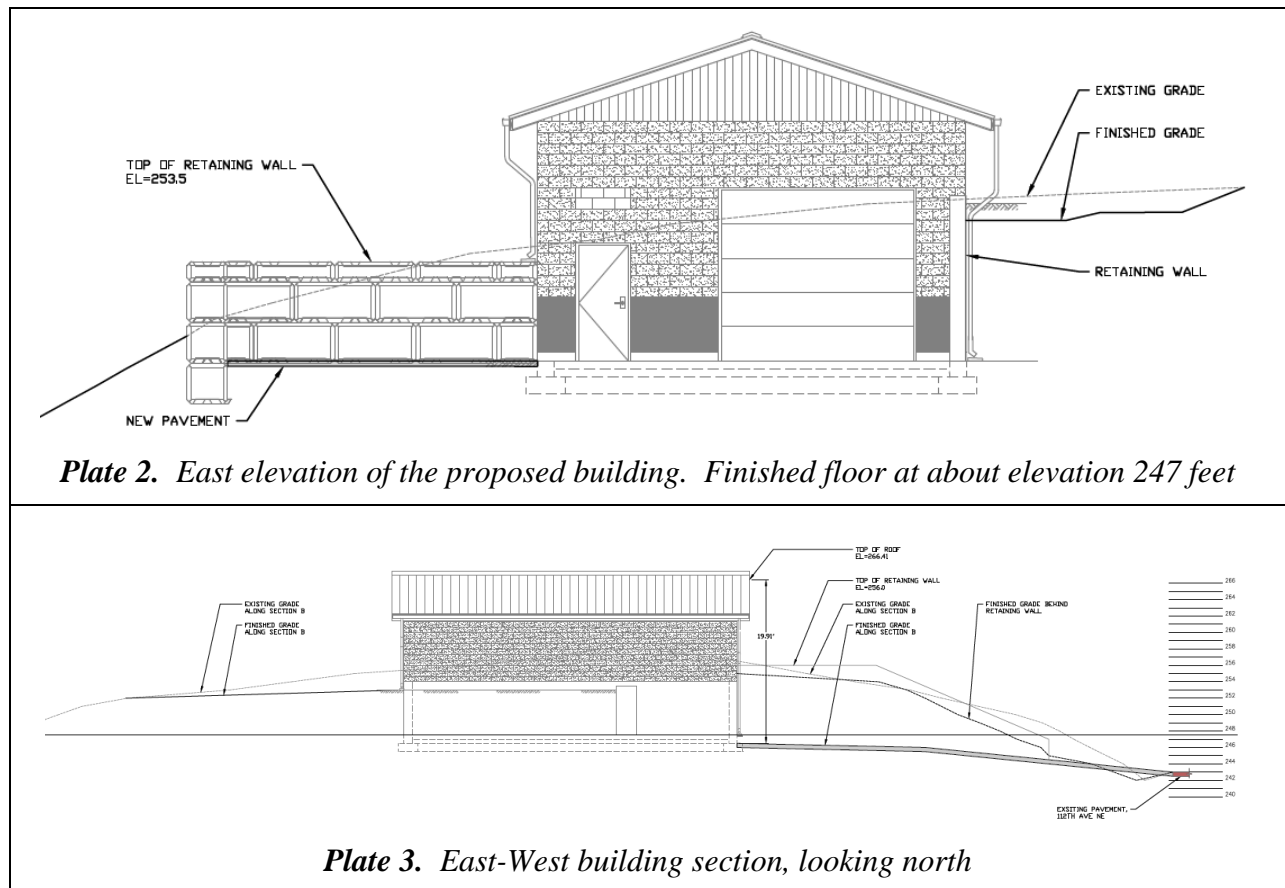
**2.0 SITE AND PROJECT DESCRIPTION**

The project site is a vacant triangle lot located at the intersection of 112<sup>th</sup> Avenue NE and Tolt Pipeline Trail in Bothell, Washington. The approximate site location is shown in Figure 1. It borders Tolt Pipeline trail to the south, 112<sup>th</sup> Avenue NE to the east, and a single-family dwelling (15823 112<sup>th</sup> Avenue NE) to the north. It appears that excavation was previously made to lower the grade along 112<sup>th</sup> Avenue NE and Tolt Pipeline Trail to its current grade, leaving the site a topographic high (see Plate 1, below).



*Plate 1. Looking at the intersection of 112<sup>th</sup> Avenue NE and Tolt Pipeline Trail*

We understand that a building will be constructed to house the control valve station. The site grade will be lowered by as much as 12 feet to achieve the design floor elevation at about Elevation 247 feet. Permanent soldier piles will be installed to support the proposed excavation along the north building line. Gravity block walls are also being proposed to retain parts of the site along the south property line. The proposed layout is shown in Figure 2. Plates 2 and 3, below, depict the proposed building sections.



The conclusions and recommendations in this report are based on our understanding of the proposed development, which is in turn based on the project information provided. If the above project description is incorrect, or the project information changes, we should be consulted to review the recommendations contained in this study and make modifications, if needed.

### **3.0 SUBSURFACE EXPLORATIONS**

#### **3.1 TEST BORINGS**

On March 8, 2022, two test borings (PG-1 and PG-2) were drilled at the approximate locations shown on Figure 2. The borings were advanced to approximately 40 and 20 feet below existing grades, respectively, using 6-inch outside diameter hollow stem augers.

Soil samples were obtained from the borings at 2½- and 5-foot depth intervals in conjunction with Standard Penetration Test (SPT) sampling methods in general accordance with ASTM test method D-1586, in which the samples are obtained using a 2-inch outside diameter (OD) split-spoon sampler. The 2-inch OD samplers were driven into the soil a distance of 18 inches below the auger tip using a 140-pound weight falling a distance of 30 inches. The number of blows required for each 6-inch increment of sampler penetration was recorded. The number of blows required to achieve the last 12 inches of sample penetration is defined as the SPT N-value. The N-value provides an empirical measure of the relative density of cohesionless soil, or the relative consistency of fine-grained soils.

A geologist from PanGEO was present during the field exploration to observe the drilling, to assist in sampling, and to describe and document the soil samples obtained from the borings. The soil samples were described using the system outlined on Figure A-1 in Appendix A. The summary boring logs are included in Appendix A.

#### **3.2 LABORATORY TESTS**

Laboratory tests were performed on select soil samples to determine its in-situ moisture content and grain size distributions. The results of the moisture content tests are indicated on the boring logs in Appendix A. The results from the grain size distribution are summarized in Appendix B.

### **4.0 SUBSURFACE CONDITIONS**

#### **4.1 SITE GEOLOGY**

According to the geologic map compiled by Minard (1983), the surficial geologic soil unit is mapped as Advance Outwash deposits (Qva) within the project site. This soil unit has been consolidated by the advancing glaciers and generally consists of dense to very dense sand with gravel.

Glacial till was mapped near the site. This soil unit generally consists of a heterogeneous mixture of silt, sand and gravel. In its undisturbed state, this soil unit is generally dense to very dense.

#### **4.2 SOIL CONDITIONS**

The soil conditions encountered in both test borings were quite consistent, and generally consisted of about 6 inches of forest duff underlain by about 5 to 6 feet of loose to medium dense sand. We interpret this soil unit as Recessional Outwash, which was not mapped by Minard (1983) at the project.

Directly below the Recessional Outwash, both test borings encountered very dense silty sand with gravel and silt and sand interbeds that appeared consistent with the mapped glacial till near the site. This soil unit extended to at least the termination depth of 40 feet in boring PG-1 and 20 feet in PG-2.

#### **4.3 GROUNDWATER**

During our explorations on March 8, 2022. The upper 2 to 3 feet of the soils in boring PG-1, located at the west end of the site, were saturated. In our opinion, this is a localized pocket of surficial water that is perched on soils that are less permeable.

In boring PG-1, located near the east end of the site, encountered an approximately 5-foot-thick layer of water-bearing sand layer at a depth of about 25 feet below existing grade (or about Elevation 223 feet) at the time of drilling on March 8, 2022. The water-bearing layer was confined by less permeable soils. The groundwater raised to about 11.3 feet below grade (or approximately Elevation 237 feet) after completion of the boring the same day (March 8, 2022), suggesting presence of artesian pressure.

A groundwater monitoring well was subsequently installed in PG-1. On April 22, 2022, the groundwater level in the monitoring well was measured at about 9.6 feet deep (about Elevation 238½ feet).

The groundwater level is anticipated to fluctuate with seasonal precipitation and may be the highest during the winter and spring months.

## **5.0 SEISMIC CONSIDERATIONS**

### **5.1 SITE CLASS**

We anticipate the seismic design of the building will be accomplished in accordance with the 2018 International Building Code (IBC) and ASCE 7-16. Based on the presence of very dense glacial till within 5 to 6 feet of the ground surface, the site is classified as a Site Class C.

### **5.2 SOIL LIQUEFACTION POTENTIAL**

Liquefaction occurs when saturated sands are subjected to cyclic loading and causes the pore water pressure to increase in the soils thereby reducing the inter-granular stresses. As the inter-granular stresses are reduced, the shearing resistance between soil particles decreases. If pore pressures develop to the point where the effective stresses acting between the grains become zero, the soil particles will be in suspension and behave like a viscous fluid. Typically, loose, saturated, granular soils such as sand and silt, that have a low enough permeability to prevent drainage during cyclic loading, have the greatest potential for liquefaction, while more dense soil deposits with higher silt or clay contents have a lesser potential. Soil liquefaction may cause the temporary loss/reduction of foundation capacity and settlement.

Based on the results of our test borings, conditions that are prone to earthquake-induced liquefaction are not present at the site and hence design considerations associated with soil liquefaction are not necessary for this project.

## **6.0 GEOTECHNICAL RECOMMENDATIONS**

### **6.1 FOUNDATION**

Based on the proposed finished floor at about Elevation 247 feet, we assume the footing subgrade will be near Elevation 245 feet. The exposed soil conditions at the footing subgrade are likely to consist of a combination of very dense glacial till and medium dense recessional outwash sand. It is our opinion that the proposed building may be supported on conventional footings bearing on undisturbed native soil, or on properly compacted structural fill placed on the native soils.

In designing the footings, the shape of footings will need to be considered regarding the available space for temporary excavations. Where space may be limited for an unsupported open cut, it may be necessary to use L-shaped perimeter footings in order to conserve space and to allow the temporary excavations to be made within the property limits.

### ***6.1.1 Bearing Pressure***

For footings founded on undisturbed native soils or properly compacted structural fill, we recommend that a maximum allowable bearing pressure of 3,000 psf be used to size the footings for the proposed building or retaining walls.

For allowable stress design, the recommended allowable bearing pressure may be increased by 1/3 for transient conditions such as wind and seismic loadings. Continuous and individual spread footings should have minimum widths of 18 and 24 inches, respectively.

### ***6.1.2 Lateral Resistance***

Lateral forces from wind or seismic loading may be resisted by a combination of passive earth pressures acting against the embedded portions of the foundations and walls, and by friction acting on the base of the foundations.

- Passive resistance may be determined using an equivalent fluid weight of 350 pounds per cubic foot (pcf) for level ground surface. This value includes a factor safety of at least 1.5 assuming properly compacted structural fill will be placed against the footings. Unless covered by pavements or slabs, the passive resistance in the upper 12 inches of soil should be neglected.
- A friction coefficient of 0.35 may be used to determine the frictional resistance at the base of the footings. This coefficient includes a factor of safety of approximate 1.5.

### ***6.1.3 Anticipated Settlement***

Total and differential settlements are anticipated to be within tolerable limits for footings designed and constructed as discussed above. Footing settlement under static loading conditions is estimated to be less than approximately one inch, and differential settlement between adjacent columns should be less than about 1/2 inch. Most settlement will occur during construction as loads are applied.

### ***6.1.4 Footing Drain***

Footing drains should be installed around the perimeter of the building, at or just below the invert of the footings. The footing drains should consist of 4-inch diameter, schedule 40 PVC or SDR 35, perforated pipe embedded in washed drain rock/pea gravel and wrapped in filter fabric. Under no circumstances should roof downspout drain lines be connected to the footing drain

systems. Roof downspouts must be separately tightlined to appropriate discharge locations. Cleanouts should be installed at strategic locations to allow for periodic maintenance of the footing drain and downspout tightline systems.

For wall drainage, please see Section 6.2.3, below.

## **6.2 RETAINING AND BASEMENT WALL DESIGN PARAMETERS**

Retaining and basement walls should be designed to resist the lateral earth pressures exerted by the soils behind the wall. Proper drainage provisions should also be provided behind the walls to intercept and remove groundwater that may be present behind the wall. Our geotechnical recommendations for the design and construction of the retaining/basement walls are presented below.

### ***6.2.1 Lateral Earth Pressures***

Cantilever walls should be designed for an equivalent fluid pressure of 35 pcf, assuming level backslope and drainage provisions behind the walls. If walls will be restrained at the top from free movements, such as basement walls, an equivalent fluid pressures of 50 pcf should be used.

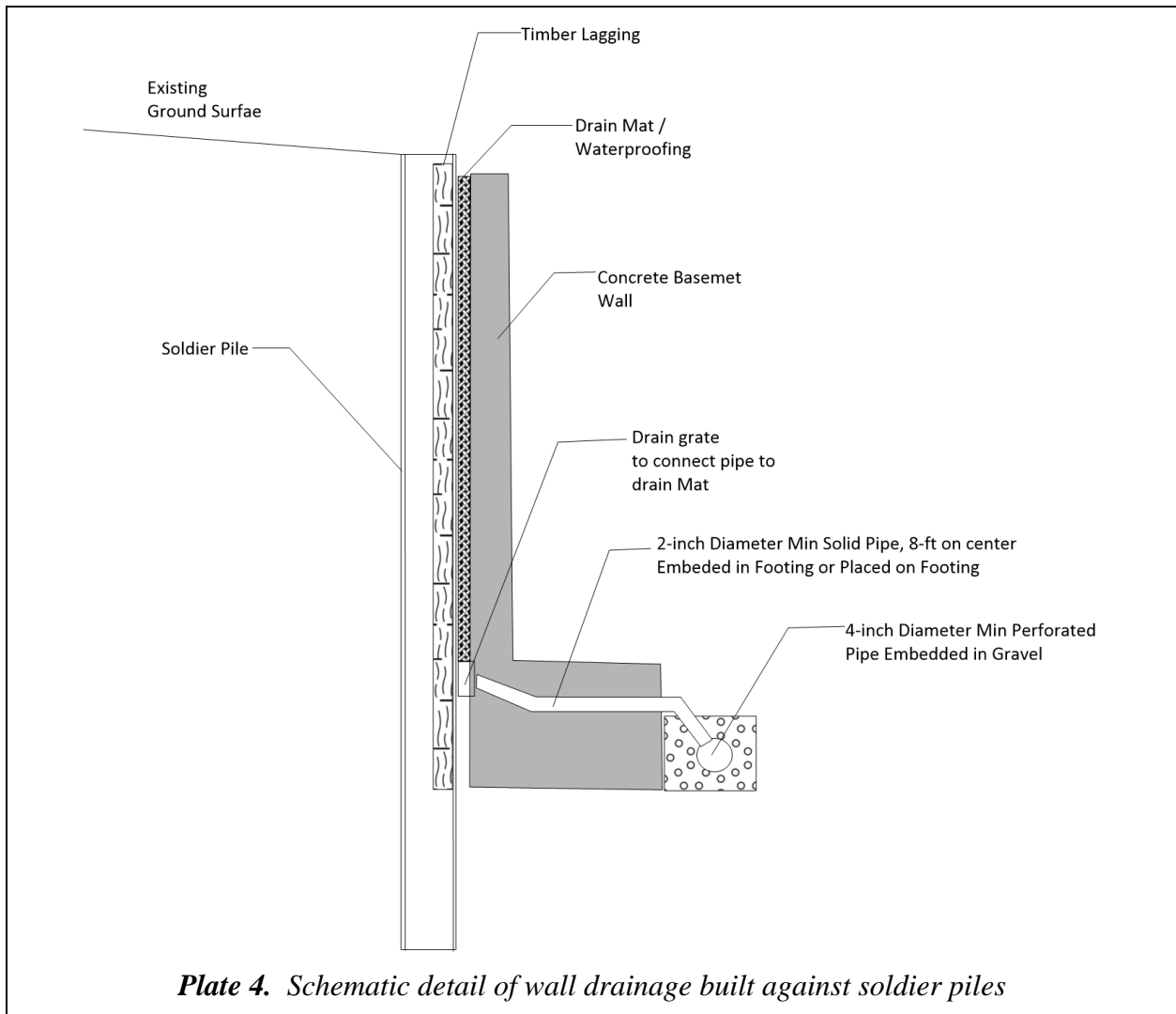
For the seismic condition, we recommend a uniform lateral earth pressure of 10H psf (where H is the retained height) be added to the static pressure for sizing the walls for the ultimate condition.

### ***6.2.2 Surcharge***

Walls should be designed to accommodate surcharges from nearby structures and traffic. The lateral pressure acting on the wall from surcharge loads may be determined using the surcharge diagram found on the attached Figure 3.

### ***6.2.3 Wall and Footing Drainage***

Provisions for permanent control of subsurface water should be incorporated into the design and construction of walls. We recommend that prefabricated drainage mats, such as Mirafi 6000 or equivalent, be installed behind the basement walls constructed against shoring walls such as soldier piles with timber lagging. The collected water should be directed to a 4-inch diameter perforated collector pipe located along the inside perimeter of wall footing and discharged to an appropriate outlet. Plate 4, below, shows a schematic detail of the wall drainage for concrete walls cast directly against soldier piles.



For free standing site retaining walls, wall drainage provision should consist of a 4-inch diameter perforated drainpipe placed behind and at the base of the wall foundation, embedded in 12 to 18 inches of clean crushed rock or pea gravel wrapped with a layer of filter fabric. A minimum 18-inch-wide zone of open-graded free-draining granular soils (i.e., pea gravel or washed rock) is recommended to be placed adjacent to the wall for the full height of the wall. Alternatively, a composite drainage material, such as Miradrain 6000, may be used in lieu of the clean crushed rock or pea gravel drainage layer. The drainpipe at the base of the wall should be graded to direct water to a suitable outlet.

Waterproofing or damp proofing of the basement is beyond our scope of services. A building envelope consultant should be consulted regarding this matter.



#### **6.2.4 Wall Backfill**

Wall backfill, if needed, should consist of free draining granular soils. In our opinion, the on-site excavated soils generally contain a high fines content and are not suitable to be re-used as wall backfill. For planning and cost estimating purposes, we recommend that imported wall backfill such as Gravel Borrow (Section 9.03.14 (1) of the 2022 WSDOT Standard Specifications) be assumed for this project.

Wall backfill should be moisture conditioned to near its optimum moisture content, placed in loose, horizontal lifts less than 12 inches in thickness, and systematically compacted to a dense and relatively unyielding condition. If density tests will be performed, the test results should indicate at least 95 percent of the maximum dry density, as determined using test method ASTM D 1557. Within 5 feet of the wall, the backfill should be compacted to at least 90 percent of the maximum dry density.

#### **6.3 SOLDIER PILE WALLS**

We anticipate that excavation shoring will be needed to limit the excavation to within the property limits. Where needed, we recommend that soldier piles with timber lagging be used for this project.

A soldier pile wall consists of vertical steel beams, typically spaced from 6 to 8 feet apart along the proposed excavation wall, spanned by timber lagging. Prior to the start of excavation, the steel beams are installed into holes drilled to a design depth and then backfilled with lean mix or structural concrete. As the excavation proceeds downward and the steel piles are subsequently exposed, timber lagging is installed between the piles to further stabilize the walls of the excavation. In general, tiebacks are typically used for wall heights greater than about 12 to 15 feet to achieve a more economical design. For the current project, we believe that tiebacks will not be necessary.

The soldier piles may be incorporated into the design of the permanent structures. Considerations for seismic surcharge and corrosion protection will need to be incorporated into the design of the permanent soldier piles.

### **6.3.1 Design Lateral Pressures**

For a cantilevered soldier pile wall or a soldier pile wall, we recommend the earth pressures depicted on Figure 3 be used for design of soldier pile walls for this project.

Above the bottom of excavation, the recommended active earth and surcharge pressures should be applied over the full width of the pile spacing. Below the bottom of excavation, the active pressure should be applied over one pile diameter and the passive resistance should be applied over two times the pile diameter.

### **6.3.2 Surcharge Loads**

The shoring walls should be designed to accommodate surcharge pressures (i.e., traffic load from adjacent streets and adjacent footing load from the adjacent building to the north) located within the height dimension of the wall. The lateral pressure acting on the wall from surcharge loads may be determined by the surcharge diagram found on the attached Figure 3.

Heavy point loads located close to the top of the walls, such as outriggers of heavy cranes or pump trucks, should be individually analyzed and incorporated into the wall design. Surcharge loads including construction equipment or soil stockpiles located within the height dimension of the wall should also be considered in the shoring design. Coordination with the contractor during shoring design may be beneficial.

### **6.3.3 Vertical Capacity**

The vertical capacity of the soldier piles can be determined using an allowable skin friction value of 1.0 ksf for the portion of the pile below the bottom of the excavation, and an allowable end soil bearing capacity value of 25 ksf.

### **6.3.4 Lagging**

For temporary application, the minimum lagging thickness recommended in *FHWA Geotechnical Engineering Circular #4 – Ground Anchors and Anchored System* are considered adequate for this project. Assuming maximum 8-foot pile spacing (center to center), and absence of heavy surcharge loads, nominal 3-inch-thick timber lagging may be used for this project.

Where timber lagging will be subjected to heavy surcharge loads such as crane pads or outriggers, the timber lagging should be designed based on the pressure diagram shown in Figure 3.

For permanent application, the lagging should be sized using the earth pressures presented in Figure xx. It should also be noted that timber lagging has limited service life and will need to be replaced in the future when it rots. The use of concrete facing elements may be considered to provide a longer service life.

We recommend that voids behind the lagging be backfilled with CDF.

### ***6.3.5 Groundwater and Caving Soil Conditions***

The drilling of soldier piles is anticipated to encounter recessional outwash (loose to medium dense sand) underlain by glacial till. The drilling may also encounter groundwater under artesian pressure, as evidenced in our boring PG-1. The presence of artesian pressure in the drilled holes will likely result in caving of the drilled holes. The drilling contractor should be prepared to stabilize the holes by using temporary casings, hydrostatic pressures (i.e., flooding the hole), or drilling fluids.

Where more than 6 inches of water is present at the bottom of the holes at the time of concrete placement, lean concrete or structural concrete backfill should be placed with tremie pipes.

When placing timber lagging, the height of each lift may need to be limited to no more than 4 feet, especially within the upper 5 feet of the existing ground surface where the soils may be relatively loose and prone to soil sloughing. The actual allowable vertical cut for timber lagging placement should be determined in the field, based on the actual conditions observed.

### ***6.3.6 Baseline Survey and Monitoring***

Ground movements will occur as a result of excavation activities. As such, ground surface elevations of the adjacent properties and city streets should be documented prior to commencing earthwork to provide baseline data. As a minimum, optical survey points should be established at the following locations:

- The top of every other soldier pile. These monitoring points should be monitored twice a week until the building foundation is completed. The monitoring frequency may be reduced based on the monitoring results.
- The curbs and the centerlines of adjacent streets. These monitoring points should be spaced no more than 20 feet apart. These monitoring points do not need to be regularly surveyed unless the top of wall deflections exceed about one inch.

- The south face of the adjacent building located immediately north of the subject property.

The monitoring program should include changes in both the horizontal (x and y directions) and vertical deformations. The monitoring should be performed by a licensed surveyor and the results be promptly submitted to PanGEO for review. The results of the monitoring will allow the design team to confirm design parameters and for the contractor to make adjustments if necessary.

We also recommend that the existing conditions along the public right of way and the adjacent private properties be photo-documented prior to commencing earthwork at the site.

#### 6.4 GRAVITY BLOCK WALLS

Gravity retaining walls are planned for the project. We understand it is planned to use pre-cast concrete blocks for the gravity walls, and walls are generally no more than 6 to 8 feet in height. In general, block walls are designed by the wall suppliers, based on the specific dimensions and characteristics of their products.

We recommend that the following soil parameters be use for the wall design:

**Table 1: Soil Parameters for Gravity Wall Design**

<b>Soil Properties</b>	<b>Wall Backfill<sup>1</sup></b>	<b>Retained Soil<sup>2</sup></b>	<b>Foundation Soil</b>
Unit Weight (pcf)	130	125	125
Friction Angle (deg)	38	36	36
Cohesion (psf)	0	0	0
For the Service Limit State, the wall shall be designed to accommodate a maximum differential settlement of 4 inches per 100 feet of wall length.			
For the Extreme Event I Limit State, the wall shall be designed for a horizontal seismic peak ground acceleration based on Site Class C, and the vertical seismic acceleration coefficient $k_v$ of 0.0g.			

Notes: <sup>1</sup> – Wall backfill should be Gravel Borrow or Gravel Backfill for Walls (WSDOT, 2022).

<sup>2</sup> – Retained material should conform to the requirements for Select or Gravel Borrow (WSDOT, 2022)

The wall design should also meet the following minimum requirements.

***Minimum Embedment*** – All walls should be founded on competent native soils or structural fill, with a minimum of 12 inches of embedment, assuming level ground surface in front of the walls. In addition, the bottom of the block wall should be located below a 2H:1V projection from the toe of the slope located along the Tolt Pipeline Trail.

***Foundation Subgrade Preparation*** – The foundation bearing soils should be compacted to a firm and unyielding condition prior to placing the initial course of blocks. To provide a firm and uniform support for the walls, a minimum 4-inch-thick layer of Crushed Surfacing Top or Base Course (CSTC or CSBC, WSDOT 9-03.9(3)) should be placed as a leveling course.

***Surcharge*** - Lateral pressures from surface surcharges located within a distance equal to the exposed wall height should be estimated using a lateral pressure coefficient of 0.35 (i.e., the ratio of lateral pressure to vertical pressure). Where applicable, a lateral uniform pressure of 80 psf should be used to account for traffic surcharge.

## **6.5 FLOORS SLABS**

It is our opinion that conventional slab-on-grade concrete floors are appropriate for this project. All loose soils and organic-rich soils, if present, should be removed from below the slabs, and backfilled with properly compacted structural fill.

The concrete slab-on-grade floors should be underlain by a capillary break consisting of at least 4 inches of compacted ¾-inch, clean crushed rock (less than 3 percent fines) placed on compacted subgrade soil. The capillary break material should also have no more than 10 percent passing the No. 4 sieve and less than 5 percent by weight of the material passing the U.S. Standard No. 100 sieve. The capillary break should be placed on a subgrade that has been compacted to a dense and unyielding condition.

We also recommend that a 15-mil polyethylene vapor barrier be placed below the entire slab on grade as part of the methane mitigation measures (see additional discussions in Section 6.0 of this report).

## **6.6 GROUNDWATER CONSIDERATIONS**

As discussed in Section 4.3 of this report, an approximately 5-foot-thick confined aquifer with artesian pressure was encountered in boring PG-1 and the water level was observed to raise to about Elevation 418½ feet on April 22, 2022. The measured groundwater level is lower than the proposed finished floor of Elevation 427 feet and the excavation subgrade of about Elevation 425 feet (assume 2 feet lower than the finished floor). Therefore, we do not anticipate the groundwater to impact the proposed improvement. However, the drilling for soldier piles could encounter the confined aquifer and artesian pressure which could lead to caving of the drilled holes. The contractor should be prepared to address the issues associated with the artesian pressure.

## **6.7 INFILTRATION CONSIDERATIONS**

Based on the results of our test borings, dense to very dense glacial till (hardpan) is anticipated to be present at the proposed finished grade. Based on King County Surface Water Design Manual, glacial till (hardpan) is considered an impermeable layer. As such, it is our opinion that infiltration of surface water at this site is considered not feasible. Non-infiltration alternatives for surface water management will be needed.

## **7.0 EARTHWORK CONSIDERATIONS**

### **7.1 TEMPORARY SLOPED EXCAVATIONS**

Where space is available, temporary sloped cuts can be used to reduce the height, extent and cost of temporary shoring. For planning purposes, temporary excavations may be sloped as steep as 1.5H:1V (Horizontal:Vertical) within 6 feet of the ground surface, and 1:1 below 6 feet where glacial till is anticipated.

Temporary excavations should be evaluated in the field during construction based on actual observed soil conditions. If seepage is encountered, excavation slope inclinations may need to be reduced. During wet weather, the cut slopes may need to be flattened to reduce potential erosion or should be covered with plastic sheeting.

Temporary excavations should be constructed in accordance with Part N of the WAC (Washington Administrative Code) 296-155. The contractor is responsible for maintaining safe excavation slopes and/or shoring.

## **7.2 STRUCTURAL FILL AND COMPACTION**

In the context of this report, structural fill is defined as compacted fill placed under footings, slabs, and/or other load-bearing areas. The on-site fill soils contain varying amounts of fines and are not suitable to be used as structural fill. For planning and cost estimating purposes, we recommend that imported backfill such as Gravel Borrow (Section 9.03.14 (1) of the 2021 WSDOT Standard Specifications) be assumed for this project.

The use of recycled crushed concrete can also be considered, and the materials should be approved prior to its use. In areas where the space is limited, clean crushed rock and controlled density fill (CDF) may be used as backfill without compaction.

Structural fill should be moisture conditioned to near its optimum moisture content, placed in loose, horizontal lifts less than 12 inches in thickness, and compacted to at least 95 percent of its maximum dry density as determined using ASTM D-1557 (Modified Proctor). The procedure to achieve proper density of a compacted fill depends on the size and type of compacting equipment, the number of passes, thickness of the lifts being compacted, and certain soil properties. If the excavation to be backfilled is constricted and limits the use of heavy equipment, smaller equipment can be used, but the lift thickness will need to be reduced to achieve the required relative compaction.

## **7.3 WET WEATHER EARTHWORK RECOMMENDATIONS**

General recommendations relative to earthwork performed in wet weather or in wet conditions are presented below. The following procedures are best management practices recommended for use in wet weather construction:

- Glacial till is anticipated to be present at the bottom of the excavation. Glacial till is considered highly moisture sensitive and will need to be protected from moisture-related disturbance. It is the contractor's responsibility to protect the footing subgrade from disturbance. One option is to place 4 to 6 inches of crushed surfacing base course on the foundation subgrade as soon as the subgrade is exposed.
- Earthwork should be performed in small areas to minimize subgrade exposure to wet weather. Excavation or the removal of unsuitable soil should be followed promptly by the placement and compaction of clean structural fill. The size and type of construction equipment used may have to be limited to prevent soil disturbance.

- During wet weather, the allowable fines content of the structural fill should be reduced to no more than 5 percent by weight based on the portion passing the 0.75-inch sieve. The fines should be non-plastic.
- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water.
- Geotextile silt fences should be installed at strategic locations around the site to control erosion and the movement of soil.
- Excavation slopes and soils stockpiled on site should be covered with plastic sheeting.

#### **7.4 EROSION AND DRAINAGE CONSIDERATIONS**

Surface runoff during construction can be controlled by careful grading practices. Typically, this includes the construction of shallow, upgrade perimeter ditches or low earthen berms in conjunction with silt fences to collect runoff and prevent water from entering excavations or to prevent runoff from the construction area leaving the immediate work site. Temporary erosion control may require the use of geotextile silt fences and hay bales on the downhill side of the project to prevent water from leaving the site and potential storm water detention to trap sand and silt before the water is discharged to a suitable outlet. All collected water should be directed under control to a positive and permanent discharge system.

Permanent control of surface water should be incorporated in the final grading design. Adequate surface gradients and drainage systems should be incorporated into the design such that surface runoff is collected and directed away from the structure to a suitable outlet. Potential issues associated with erosion may also be reduced by establishing vegetation within disturbed areas immediately following grading operations.

#### **8.0 CLOSURE**

We have prepared this report for Gray & Osborne and the project design team. Recommendations contained in this report are based on a site reconnaissance, a subsurface exploration program, review of pertinent subsurface information, and our understanding of the project. The study was performed using a mutually agreed-upon scope of services.

Variations in soil conditions may exist between the locations of the explorations and the actual conditions underlying the site. The nature and extent of soil variations may not be evident until



construction occurs. If any soil conditions are encountered at the site that are different from those described in this report, we should be notified immediately to review the applicability of our recommendations. Additionally, we should also be notified to review the applicability of our recommendations if there are any changes in the project scope.

The scope of our work does not include services related to construction safety precautions. Our recommendations are not intended to direct the contractors' methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design. Additionally, the scope of our services specifically excludes the assessment of environmental characteristics, particularly those involving hazardous substances. We are not mold consultants nor are our recommendations to be interpreted as being preventative of mold development. A mold specialist should be consulted for all mold-related issues.

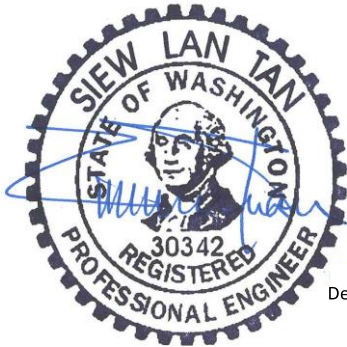
This report has been prepared for planning and design purposes for specific application to the proposed project in accordance with the generally accepted standards of local practice at the time this report was written. No warranty, express or implied, is made.

This report may be used only by the client and for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both off and on-site), or other factors including advances in our understanding of applied science, may change over time and could materially affect our findings. Therefore, this report should not be relied upon after 24 months from its issuance. PanGEO should be notified if the project is delayed by more than 24 months from the date of this report so that we may review the applicability of our conclusions considering the time lapse.

It is the client's responsibility to see that all parties to this project, including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk. Any party other than the client who wishes to use this report shall notify PanGEO of such intended use and for permission to copy this report. Based on the intended use of the report, PanGEO may require that additional work be performed and that an updated report be reissued. Noncompliance with any of these requirements will release PanGEO from any liability resulting from the use this report.

Sincerely,

**PanGEO, Inc.**



December 14, 2022,

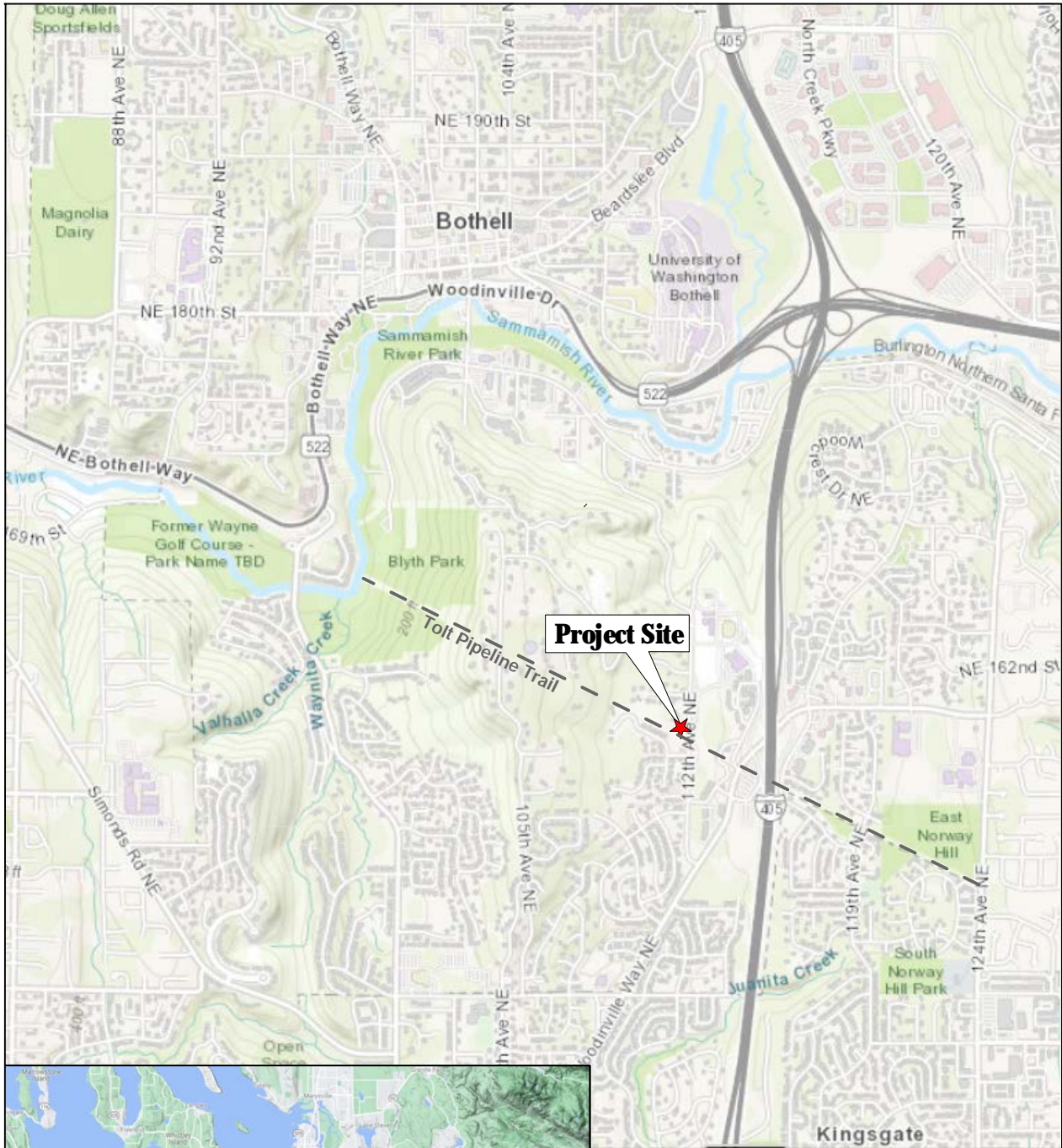
Siew L Tan, P.E.  
Principal Geotechnical Engineer

## 9.0 REFERENCES

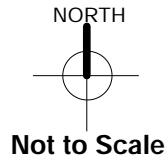
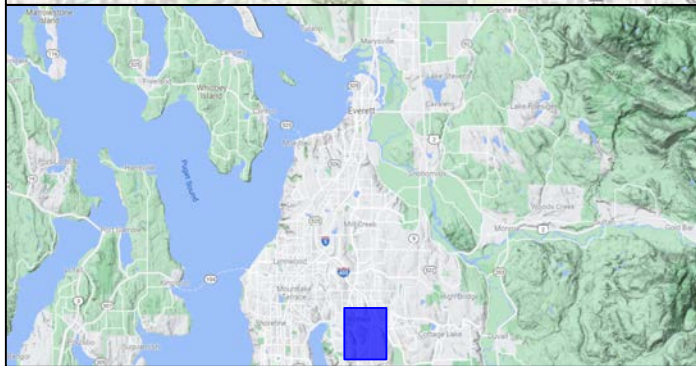
International Code Council, 2018, *International Building Code (IBC)*.

Minard, J. P., 1983, *Geologic Map of the Kirkland Quadrangle, Washington*. USGS  
*Miscellaneous Field Studies Map MF-1543, 1:24,000 scale*.

WSDOT, 2022, *Standard Specifications for Road, Bridge and Municipal Construction, M 41-10*.



Base Map: ESRI Topographic



22-019 Fig 1 - Vicinity Map.grf 7/6/22 (5:25:40) SPS



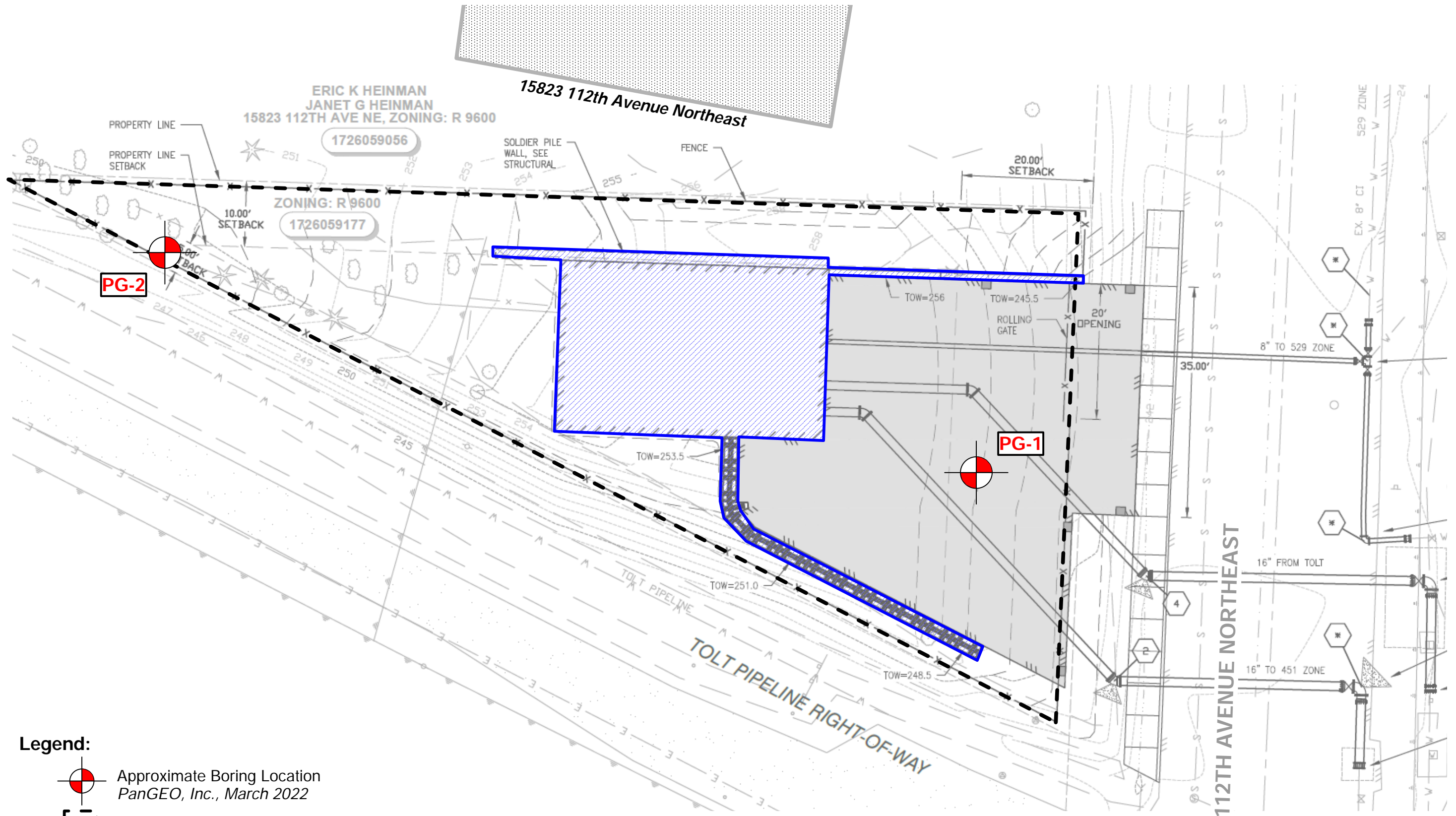
451 Zone Control Valve Station  
Northshore Utility District  
Bothell, Washington

VICINITY MAP

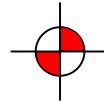
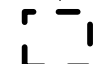


Project No. **22-019**

Figure No. **1**

22-019 Fig 2 Site and Exploration Plan.grf 7/7/22 (3:56:05) SPS



**Legend:**

-  Approximate Boring Location  
*PanGEO, Inc., March 2022*
-  Approximate Property Boundary
-  Approximate Proposed Building and Retaining Walls
-  Approximate Existing Structures



Approx. Scale:  
1 inch = 15 feet

Base map modified from DRAFT Proposed Site and Piping Plan 1 - Area 1 provided by Gray & Osborne, Inc., dated April 2022

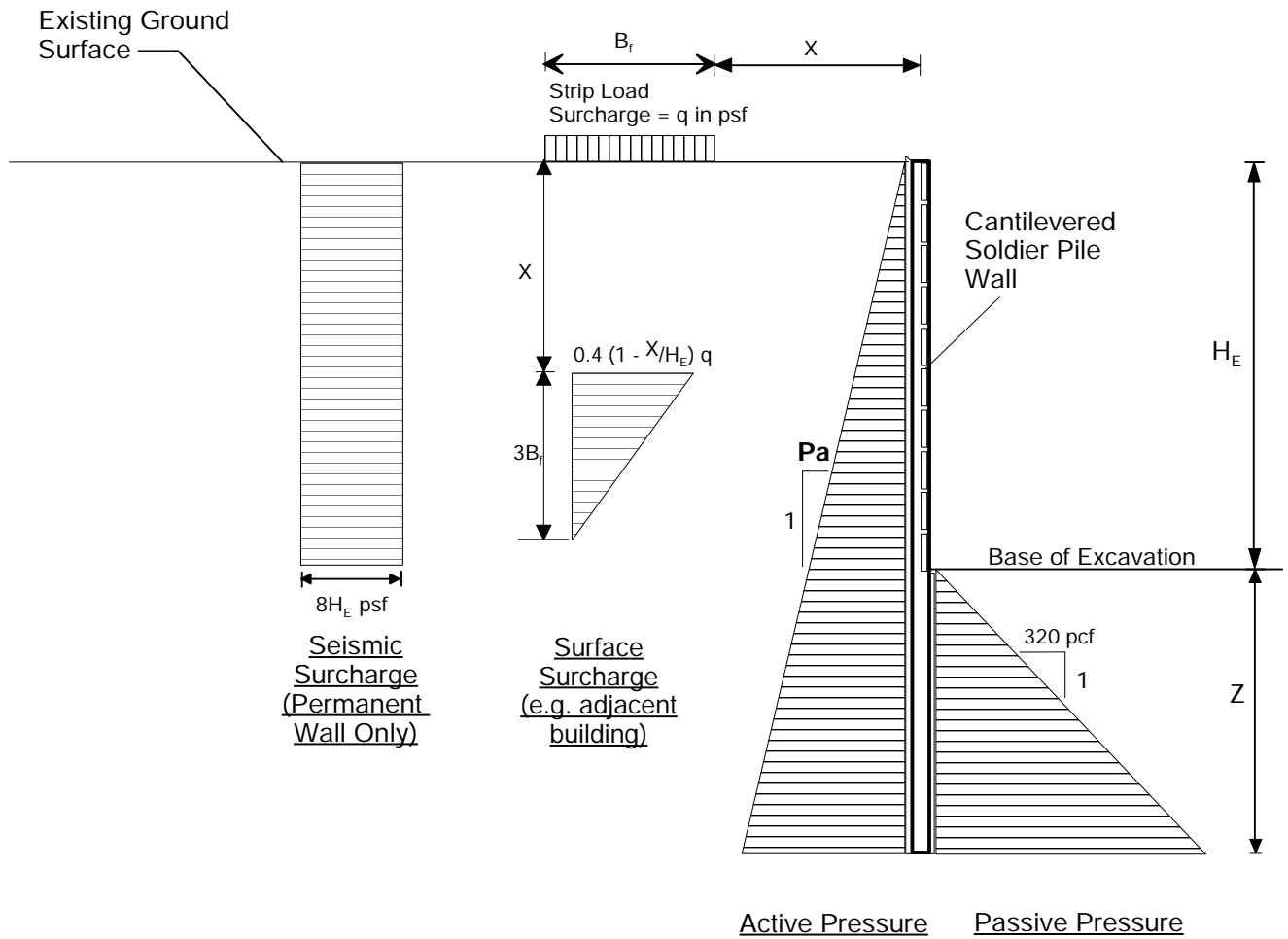


451 Zone Control Valve Station  
Northshore Utility District  
Bothell, Washington

**SITE AND EXPLORATION PLAN**

Project No. 22-019

Figure No. 2



$P_a = 35$  pcf (level backslope)

Notes:

1. Embedment ( $Z$ ) should be determined by summation of moments at the bottom of the soldier piles. Minimum embedment should be at least 10 feet.
2. A factor of safety of 1.5 has been applied to the recommended passive earth pressure value. No factor of safety has been applied to the recommended active earth pressure values.
3. Active and surcharge pressures should be applied over the full width of the pile spacing above the base of the excavation, and over one pile diameter below the base of the excavation.
4. Passive pressure should be applied to two times the diameter of the soldier piles.
5. Refer to report text for additional discussions.

**APPENDIX A**  
**SUMMARY BORING LOGS**

**RELATIVE DENSITY / CONSISTENCY**

SAND / GRAVEL			SILT / CLAY		
Density	SPT N-values	Approx. Relative Density (%)	Consistency	SPT N-values	Approx. Undrained Shear Strength (psf)
Very Loose	<4	<15	Very Soft	<2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Med. Dense	10 to 30	35 - 65	Med. Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	>50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	>30	>4000

**UNIFIED SOIL CLASSIFICATION SYSTEM**

MAJOR DIVISIONS		GROUP DESCRIPTIONS	
Gravel 50% or more of the coarse fraction retained on the #4 sieve. Use dual symbols (eg. GP-GM) for 5% to 12% fines.	GRAVEL (<5% fines)		GW: Well-graded GRAVEL
	GRAVEL (>12% fines)		GP: Poorly-graded GRAVEL
Sand 50% or more of the coarse fraction passing the #4 sieve. Use dual symbols (eg. SP-SM) for 5% to 12% fines.	SAND (<5% fines)		GM: Silty GRAVEL
	SAND (>12% fines)		GC: Clayey GRAVEL
			SW: Well-graded SAND
			SP: Poorly-graded SAND
Silt and Clay 50% or more passing #200 sieve	Liquid Limit < 50		SM: Silty SAND
			SC: Clayey SAND
			ML: SILT
	Liquid Limit > 50		CL: Lean CLAY
			OL: Organic SILT or CLAY
			MH: Elastic SILT
			CH: Fat CLAY
Highly Organic Soils		OH: Organic SILT or CLAY	
		PT: PEAT	

**TEST SYMBOLS**

for In Situ and Laboratory Tests listed in "Other Tests" column.

- ATT Atterberg Limit Test
- Comp Compaction Tests
- Con Consolidation
- DD Dry Density
- DS Direct Shear
- %F Fines Content
- GS Grain Size
- Perm Permeability
- PP Pocket Penetrometer
- R R-value
- SG Specific Gravity
- TV Torvane
- TXC Triaxial Compression
- UCC Unconfined Compression

**SYMBOLS**

Sample/In Situ test types and intervals

- 2-inch OD Split Spoon, SPT (140-lb. hammer, 30" drop)
- 3.25-inch OD Split Spoon (300-lb hammer, 30" drop)
- Non-standard penetration test (see boring log for details)
- Thin wall (Shelby) tube
- Grab
- Rock core
- Vane Shear

- Notes:**
- Soil exploration logs contain material descriptions based on visual observation and field tests using a system modified from the Uniform Soil Classification System (USCS). Where necessary laboratory tests have been conducted (as noted in the "Other Tests" column), unit descriptions may include a classification. Please refer to the discussions in the report text for a more complete description of the subsurface conditions.
  - The graphic symbols given above are not inclusive of all symbols that may appear on the borehole logs. Other symbols may be used where field observations indicated mixed soil constituents or dual constituent materials.

**DESCRIPTIONS OF SOIL STRUCTURES**

<b>Layered:</b> Units of material distinguished by color and/or composition from material units above and below	<b>Fissured:</b> Breaks along defined planes
<b>Laminated:</b> Layers of soil typically 0.05 to 1mm thick, max. 1 cm	<b>Slickensided:</b> Fracture planes that are polished or glossy
<b>Lens:</b> Layer of soil that pinches out laterally	<b>Blocky:</b> Angular soil lumps that resist breakdown
<b>Interlayered:</b> Alternating layers of differing soil material	<b>Disrupted:</b> Soil that is broken and mixed
<b>Pocket:</b> Erratic, discontinuous deposit of limited extent	<b>Scattered:</b> Less than one per foot
<b>Homogeneous:</b> Soil with uniform color and composition throughout	<b>Numerous:</b> More than one per foot
	<b>BCN:</b> Angle between bedding plane and a plane normal to core axis

**COMPONENT DEFINITIONS**

COMPONENT	SIZE / SIEVE RANGE	COMPONENT	SIZE / SIEVE RANGE
Boulder:	> 12 inches	Sand	
Cobbles:	3 to 12 inches	Coarse Sand:	#4 to #10 sieve (4.5 to 2.0 mm)
Gravel	3 to 3/4 inches	Medium Sand:	#10 to #40 sieve (2.0 to 0.42 mm)
		Fine Sand:	#40 to #200 sieve (0.42 to 0.074 mm)
Coarse Gravel:	3 to 3/4 inches	Silt	0.074 to 0.002 mm
Fine Gravel:	3/4 inches to #4 sieve	Clay	<0.002 mm

**MONITORING WELL**

- Groundwater Level at time of drilling (ATD)
- Static Groundwater Level
- Cement / Concrete Seal
- Bentonite grout / seal
- Silica sand backfill
- Slotted tip
- Slough
- Bottom of Boring

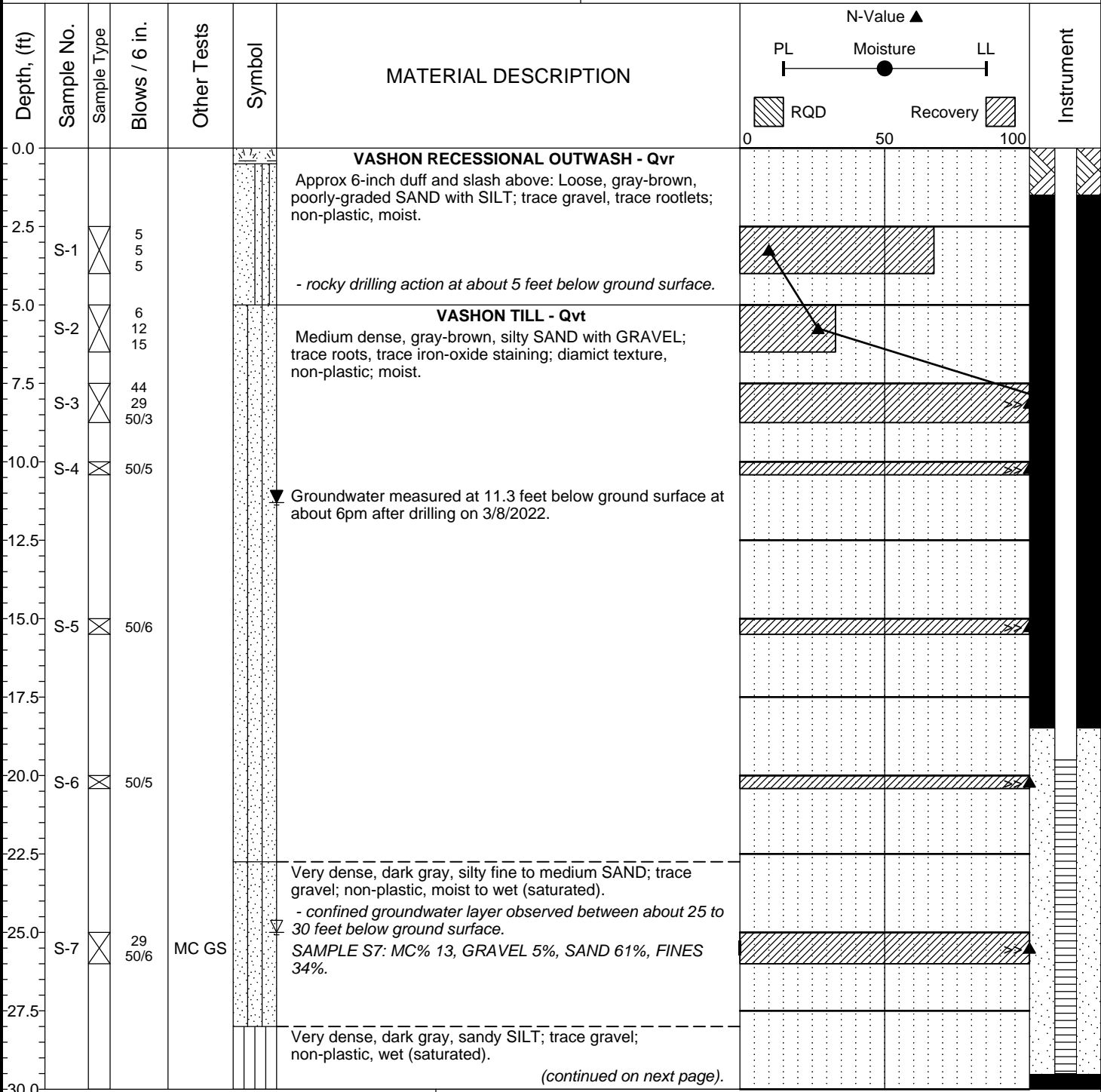
**MOISTURE CONTENT**

Dry	Dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water

LOG KEY 16-056 LOGS.GPJ PANGEO.GDT 02/22/16



Project:	451 Control Valve Station - NUD	Surface Elevation:	~248 feet (NAVD88)
Job Number:	22-019	Top of Casing Elev.:	N/A
Location:	Intersection of 112th Ave NE and Tolt Pipeline Trail	Drilling Method:	EC-95 Track Mounted Drill Rig, HSA
Coordinates:	Northing: 273891, Easting: 1306202	Sampling Method:	SPT w/rope & cathead



Completion Depth:	40.3ft	Remarks: Standard penetration test (SPT) sampler driven with a 140 lb. safety hammer w/30" drop. Hammer operated with a rope and cathead mechanism. Coordinates and elevation are approximate and based on their relative location to known site features. This information is provided for relative information only and is not a substitution for field survey. <b>Datum: WA State Plane N / NAVD88</b>
Date Borehole Started:	3/8/22	
Date Borehole Completed:	3/8/22	
Logged By:	S. Scott	
Drilling Company:	Boretac, Inc	

Project:	451 Control Valve Station - NUD	Surface Elevation:	~248 feet (NAVD88)
Job Number:	22-019	Top of Casing Elev.:	N/A
Location:	Intersection of 112th Ave NE and Tolt Pipeline Trail	Drilling Method:	EC-95 Track Mounted Drill Rig, HSA
Coordinates:	Northing: 273891, Easting: 1306202	Sampling Method:	SPT w/rope & cathead

Depth, (ft)	Sample No.	Sample Type	Blows / 6 in.	Other Tests	Symbol	MATERIAL DESCRIPTION	N-Value ▲		Instrument	
							PL	Moisture		LL
30.0	S-8	⊗	25 32 50/4	MC GS		<b>VASHON TILL - Qvt (continued)</b> Very dense, dark gray, sandy SILT; trace gravel; non-plastic, wet (saturated) to moist.  <i>SAMPLE S8: MC% 14, GRAVEL 7%, SAND 40%, FINES 53%.</i>	0	50	100	[Hatched Box] RQD [Hatched Box] Recovery
32.5						Very dense, dark gray, silty SAND; trace gravel; diamict texture; non-plastic, moist.				
35.0	S-9	⊗	50/5							
37.5										
40.0	S-10	⊗	50/3							
42.5						Boring terminated at approximately 40.25 feet below ground surface. Piezometer installed with Ecology Well Tag# BMS527. Confined groundwater layer observed from about 25 to 30 feet below ground surface. Groundwater measured at 11.3 feet below ground surface at about 6pm after drilling on 3/8/2022.				
45.0										
47.5										
50.0										
52.5										
55.0										
57.5										
60.0										

Completion Depth: 40.3ft  
Date Borehole Started: 3/8/22  
Date Borehole Completed: 3/8/22  
Logged By: S. Scott  
Drilling Company: Boretect, Inc

Remarks: Standard penetration test (SPT) sampler driven with a 140 lb. safety hammer w/30" drop. Hammer operated with a rope and cathead mechanism. Coordinates and elevation are approximate and based on their relative location to known site features. This information is provided for relative information only and is not a substitution for field survey. **Datum: WA State Plane N / NAVD88**

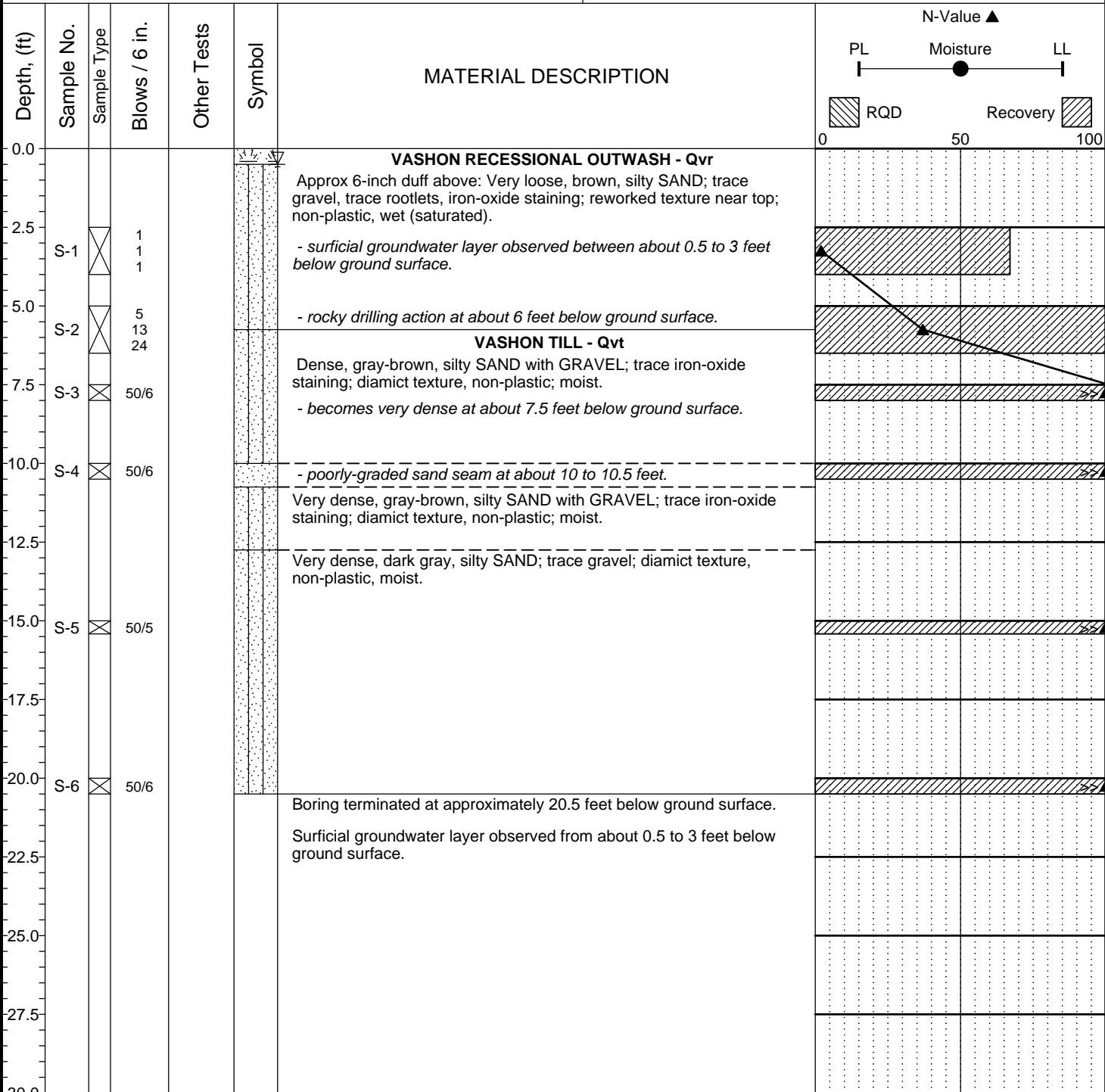


**LOG OF TEST BORING PG-1**

**Figure A-2**

The stratification lines represent approximate boundaries. The transition may be gradual.

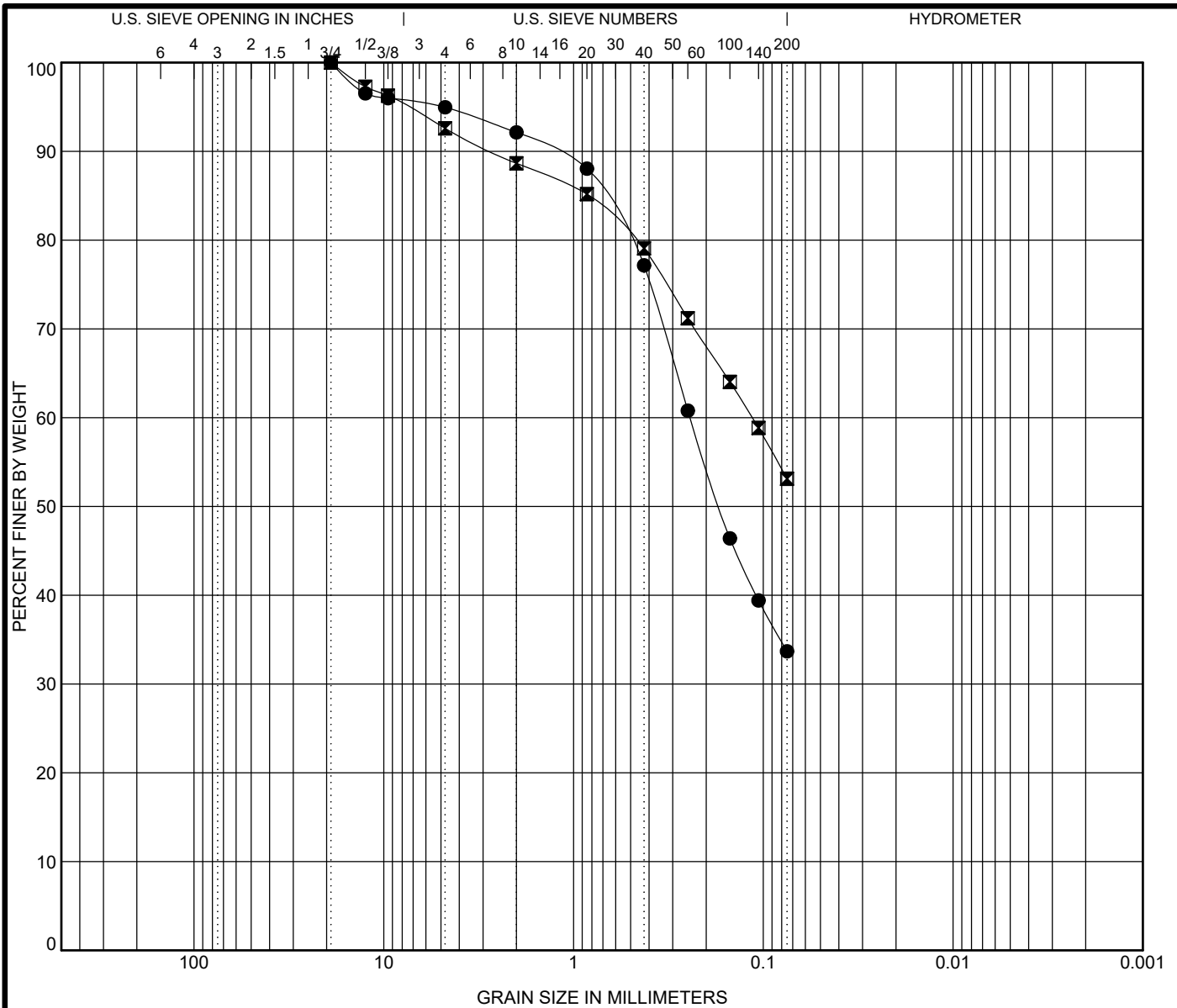
Project:	451 Control Valve Station - NUD	Surface Elevation:	~249 feet (NAVD88)
Job Number:	22-019	Top of Casing Elev.:	N/A
Location:	Intersection of 112th Ave NE and Tolt Pipeline Trail	Drilling Method:	EC-95 Track Mounted Drill Rig, HSA
Coordinates:	Northing: 273929, Easting: 1306070	Sampling Method:	SPT w/rope & cathead



Completion Depth:	20.5ft	Remarks: Standard penetration test (SPT) sampler driven with a 140 lb. safety hammer w/30" drop. Hammer operated with a rope and cathead mechanism. Coordinates and elevation are approximate and based on their relative location to known site features. This information is provided for relative information only and is not a substitution for field survey. <b>Datum: WA State Plane N / NAVD88</b>
Date Borehole Started:	3/8/22	
Date Borehole Completed:	3/8/22	
Logged By:	S. Scott	
Drilling Company:	Boretac, Inc	

**APPENDIX B**

**LABORATORY TEST RESULTS**



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● PG-1 @ 25.0 ft.	SILTY SAND(SM)	NP	NP	NP		
■ PG-1 @ 30.0 ft.	SANDY SILT(ML)	NP	NP	NP		

Specimen Identification	D100	D90	D60	D10	%Gravel	%Sand	%Silt	%Clay
● PG-1 25.0	19	1.278	0.243		5.0	61.3	33.7	
■ PG-1 30.0	19	2.69	0.114		7.4	39.5	53.1	

### GRAIN SIZE DISTRIBUTION

Project: 451 Control Valve Station - NUD  
 Job Number: 22-019  
 Location: Intersection of 112th Ave NE and Tolt Pipeline Trail

**Figure B-1**



GRAIN SIZE 22-019 BORING LOGS.GPJ PAN GEO.GDT 4/4/22

# **APPENDIX B**

## **PERMITS**



City of Bothell™

# Grading

Permit Number: GRA2023-34784

Type: Grading

Work Class: Type II

Issue Date: 06/28/2024

## Permit Information

<b>Job Address:</b>	<b>Sub Area:</b>	Waynita / Simonds / Norway Hill
<b>Parcel:</b> 1726059117	<b>Expiration Date:</b>	06/29/2026
<b>Description:</b>	E23-33930 NUD 451 Zone Control Valve Facility & Control Vault TSite work for construction of the facility consists of a one-story CMU building that will house a cluster of piping including three control valves that distribute flow between the Tolt Pipeline and the Northshore Utility District's 451 and 529 pressure zones.	

## Contacts

Type	Contact Name	Address	Phone	State Lic #
Applicant	GRAY & OSBORNE, INC		(206) 284-0860	
Contractor	NORTHSHORE UTILITY DISTRICT	PO BOX 82489 KENMORE, WA 98028		
Owner	NORTHSHORE UTILITY DISTRICT	6830 NE 185TH ST Kenmore, WA 98028	425-398-4403	

## Fees Paid

Fee	Amount	Fee	Amount
5% Technology	\$149.60	Citywide Stormwater Facility Charge	\$2,992.03
5% Tech Fee-Submittal	\$105.75	Clearing and Grading Permit Base Charge	\$2,115.00

## Agreement

**Work performed under this permit must be inspected. See reverse side of this form for instructions.**

**This permit, the inspection record and the plans approved by the City must remain together in a visible and easily accessible location on the job site for use by City inspectors. Failure to comply with this requirement can result in delayed inspections and imposition of re-inspection fees.**

I certify that the information furnished by me is true and correct to the best of my knowledge and the applicable City of Bothell requirements will be met.

Owner or  Agent  
(Check one)

\_\_\_\_\_ (Print Name) \_\_\_\_\_ DATE: \_\_\_\_\_

\_\_\_\_\_ (Signature)

**If you are unclear as to what a particular inspection is for or which inspections are required, please ask your inspector or contact an inspector at 425-806-6400.**

**Request your inspections online at [permits.bothellwa.gov](http://permits.bothellwa.gov) .**

- Go to [permits.bothellwa.gov](http://permits.bothellwa.gov) in your browser
- Log in to your account - select the “remember me” box when logging in
- Select Request Inspection
- Click on Search by permit number here (link is on the page)
- Enter your permit number in the search field
- Click on the permit number to go to the permit screen
- Click on Inspections (tab on screen)
- Select the inspection you need
- Enter your information as requested and select the inspection date.

**If you want your inspection the next business day, schedule prior to 4 p.m. Requests received after 4 p.m. will be scheduled for the second business day.**

**If you need an inspection not listed please use "Misc. Inspection" to request your inspection, and add the inspection type in the Comments area.**

**For occupied residential units, you must be present at the inspection: failure to attend can result in delayed inspections and imposition of re-inspection fees. The inspector will evaluate the work performed for compliance with the City approved plans: Please make sure you follow those plans precisely.**

**It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code (BMC Section 20.02.195). This includes storage/household items being moved out of the way of access areas at time of inspection and permit holder providing ladders and/or lifts that allow safe entry to areas/equipment needing inspection.**

**Inspections**

- |  |                                       |
|--|---------------------------------------|
| 1. <u>Final - CI</u>                     | 2. <u>Temporary Traffic Control</u>   |
| 3. <u>Storm Main Video Inspection</u>    | 4. <u>Road Subbase</u>                |
| 5. <u>Sidewalk Subbase</u>               | 6. <u>Storm Drainage Catch Basin</u>  |
| 7. <u>Asphalt Inspection</u>             | 8. <u>Backfill</u>                    |
| 9. <u>Clearing and Grading</u>           | 10. <u>Temporary Patch Inspection</u> |
| 11. <u>Control Structure</u>             | 12. <u>Control Tubing</u>             |
| 13. <u>Soils reports/Density Testing</u> | 14. <u>Site Precon</u>                |
| 15. <u>Erosion Control</u>               | 16. <u>Tree Protection Fence</u>      |
| 17. <u>Grade Stake</u>                   | 18. <u>Misc. Inspection - BLD</u>     |
| 19. <u>Misc. Inspection - PLN</u>        |                                       |





**SPECIAL INSPECTIONS**

**Y**

Project Name \_\_\_\_\_ Bldg Permit Number \_\_\_\_\_

Site Address \_\_\_\_\_

**Special Inspections Form**

For certain types of construction special inspections (which are conducted by a WABO certified special inspector, not a City inspector) are required. The special inspection agency evaluates aspects of construction that are critical to structural safety, site stability, and environmental conditions.

The Owner, Contractor, Engineer or Architect of Record, and Special Inspector shall sign page 3 acknowledging this agreement to have special inspections performed as needed. A pre-construction conference with the parties involved may be required to review the special inspection requirements and procedures.

A project applicant shall choose and contract with the special inspector, who shall perform the special inspections. A list of special inspections agencies and inspectors is available on the WABO website: [Special Inspection Agencies \(wabo.org\)](http://Special Inspection Agencies (wabo.org)).

**Approval of Special Inspectors**

Each Special Inspector shall be WABO registered, and approved by the Building Division prior to performing any duties. Special Inspectors shall display approved identification, as stipulated by the Building Division, when performing the function of a Special Inspector.

Special inspection and testing shall meet the minimum requirements of the Bothell Municipal Code 20.02.180 and International Building Code (IBC) Chapter 17. The following conditions are also applicable.

- The company performing inspections must be WABO certified. The individual completing inspections must also be WABO certified in the type of work that is being inspected.
- The Special Inspector shall observe the work assigned for conformance to the approved design drawings and specifications.
- The Special Inspector shall furnish inspection reports to the building official, the Engineer or Architect of Record, and other designated persons. All discrepancies shall be brought to the immediate attention of the Contractor for correction, then, if uncorrected, to the proper design authority and to the building official.
- The Special Inspector shall submit a final signed Certificate of Compliance stating whether the work requiring special inspection was, to the best of the inspector’s knowledge, in conformance to the approved plans and specifications and the applicable workmanship provisions of the code. The final report shall include any items that have not been corrected prior to the final inspection.

**Some work requiring Special Inspection**

Special Inspections will be required for the following categories of work in accordance with BMC 20.02.180 and IBC Chapter 17.

Fabrication of Structural Load Bearing Members	Wood Construction
Steel Frame	Soils
Concrete	Bolts installed in concrete
Special moment resisting concrete frames	Reinforcing steel and prestressing steel tendons
Structural welding	High strength bolting
Structural Masonry	Reinforced gypsum concrete
Insulating concrete fill	Spray applied fire-resistive materials
Piling, drilled piers and caissons	Shotcrete
Special grading, excavation and filling	Smoke-control system
Exterior Insulation and Finish Systems (EIFS)	Rebar epoxy or hold down epoxy application
Mass Timber Construction	Special cases determined by the Building Official



## SPECIAL INSPECTIONS

Y

### Owner Responsibilities

The project Owner or the Architect or Engineer of Record acting as the Owner’s Agent shall fund special inspection services.

### Contractor Responsibilities

#### ***Notify the Special Inspector***

The Contractor is responsible for notifying the Special Inspector or Agency regarding individual inspections of items listed on the attached schedule *and* as noted on the Building Division approved plans as specified by the Architect and/or Engineer.

#### ***Provide Access to the Approved Plans***

The Contractor is responsible for providing the Special Inspector access to approved plans at the job site.

#### ***Retain the Special Inspection Records***

The Contractor is also responsible for retaining at the job site all special inspection records submitted by the Special Inspector, and providing these records for review by the Building Division’s Inspector upon request.

#### ***Monitor Special Inspection***

Work requiring special inspection and the performance of Special Inspectors shall be monitored by the Building Division’s Inspector. The Contractor shall provide adequate notice for inspection requests to both the Building Division Inspector and the Special Inspector. All work requiring special inspection must be approved prior to concealing or covering said work.

### Duties and Responsibilities of Special Inspector

#### ***Observe the work***

The Special Inspector shall observe the work for conformance with the Building Division approved (stamped) design drawings and specifications and applicable workmanship provisions of the IBC/IRC, Engineer/Architect reviewed shop drawings and/or placing drawings may be used only as an aid to inspection.

Many special inspections are to be performed on a continuous basis. Meaning, that the Special Inspector is on site in the general area at all times observing the work requiring special inspection. Code allowed continuous and periodic inspections, must be followed. Any code deviations to time, continuous or periodic, is to be approved by the Building Official, and project Architect and Engineer. With sufficient documentation for review and approval provided.

#### ***Report Non-conforming Items***

The Special Inspector shall bring non-conforming items to the immediate attention of the Contractor and note all such items in the daily report. If any item is not resolved in a timely manner or is about to be incorporated in the work, the Special Inspector shall immediately notify the Building Division by telephone (425) 806-6400 or in person, and notify the project Architect or Engineer.

#### ***Furnish Daily Reports***

On request, each Special Inspector shall complete and sign both the Special Inspection Record and the Daily Report form for each day’s inspections. Both forms are to remain at the job site with the Contractor for review by the Building Division’s inspector.

#### ***Furnish Daily Reports***

The Special Inspector or Inspection Agency shall furnish weekly reports of tests and inspections directly to the Building Division, project Architect/Engineer, and others as designated. These reports must include the following:

- a. Description of daily inspections and tests made, with applicable locations;
- b. Listing of all non-conforming items;
- c. Report of how non-conforming items were resolved or unresolved, as applicable: and
- d. Itemized changes authorized by the Architect, Engineer, and Building Division, if not included in the non-conformance items.

#### ***Furnish Final Certificate of Compliance***

The Special Inspector or Inspection Agency shall submit a final signed Certificate of Compliance to the Building Division stating that all items requiring special inspection and testing were fulfilled and reported and, to the best of his/her knowledge, in conformance with the approved design drawings, specifications, approved change orders and the applicable workmanship provisions of the IBC/IRC. Items not in conformance, unresolved items or any discrepancies in



# SPECIAL INSPECTIONS

Y

inspection coverage (i.e., missed inspections, periodic inspections when continuous was required, etc.) shall be specifically itemized in this report.

### Architect or Engineer of Record Responsibilities

- a. Has include special inspection requirements and specifications on the plans. SHEET LOCATION \_\_\_\_\_.
- b. Prepare the Statement of Special Inspections in accordance with IBC section 1704.3 and identify Structural Testing for Seismic Resistance per IBC section 1704.3.2 (When required). The statement of special inspections shall identify items fabricated on the premises of an approved fabricator where special inspections are not required by section 1704.2.5.
- c. Provide structural observation, where required per IBC Section 1704.6.
- d. Review the special inspection reports and provide corrective action for work that may not conform to the approved plans or product requirements.

### Building Division Responsibilities

#### *Approve Special Inspection*

- a. The Building Division shall approve all Special Inspectors and special inspection requirements.
- b. A special inspection based on product stipulation, IBC chapter 17, and or other, and not a part of the architects or engineers design, signature of acknowledgement from the architect or engineer is not necessary.

#### *Issue Certificate of Occupancy or Certificate of Completion*

The Building Division may issue a Certificate of Occupancy or Certificate of Completion after all special inspection reports and the final report have been submitted and accepted.

### Signature of Acknowledgement

*I have read and agree to comply with the terms and conditions of this agreement.*

Owner name \_\_\_\_\_

Please print or type

Signature \_\_\_\_\_ Date \_\_\_\_\_

Contractor name \_\_\_\_\_

Please print or type

Signature \_\_\_\_\_ Date \_\_\_\_\_

Special Inspector/Agency name \_\_\_\_\_

Please print or type

Signature \_\_\_\_\_ Date \_\_\_\_\_

Architect/Engineer of Record \_\_\_\_\_

Please print or type

Signature \_\_\_\_\_ Date \_\_\_\_\_

*City of Bothell  
acceptance  
stamp area*



City of Bothell™

# Utility

Permit Number: UTL2024-36425

Type: Utility

Work Class: Type I

Issue Date: 06/28/2024

## Permit Information

<b>Job Address:</b>	<b>Sub Area:</b>	Waynita / Simonds / Norway Hill
<b>Parcel:</b> 1726059117	<b>Expiration Date:</b>	06/29/2026
<b>Description:</b>	E24-01985 NUD 451 Zone Control Valve Facility - The facility consists of a one-story CMU building that will house a cluster of piping including three control valves that distribute flow between the Tolt Pipeline and the Northshore Utility District's 451 and 529 pressure zones. (BNR2023-34767)	

## Contacts

Type	Contact Name	Address	Phone	State Lic #
Applicant	GRAY & OSBORNE, INC		(206) 284-0860	
Contractor	NORTHSHORE UTILITY DISTRICT	PO BOX 82489 KENMORE, WA 98028		
Owner	NUD			

## Fees Paid

Fee	Amount	Fee	Amount
Stormwater Utility Base Charge	\$662.00	5% Tech Fee-Submittal	\$33.10
Stormwater Utility Improv. Fee per 100 line	\$751.00		

## Agreement

**Work performed under this permit must be inspected. See reverse side of this form for instructions.**

**This permit, the inspection record and the plans approved by the City must remain together in a visible and easily accessible location on the job site for use by City inspectors. Failure to comply with this requirement can result in delayed inspections and imposition of re-inspection fees.**

I certify that the information furnished by me is true and correct to the best of my knowledge and the applicable City of Bothell requirements will be met.

Owner or  Agent

(Check one)

\_\_\_\_\_

(Print Name)

\_\_\_\_\_

DATE:

\_\_\_\_\_

(Signature)

If you are unclear as to what a particular inspection is for or which inspections are required, please ask your inspector or contact an inspector at 425-806-6400.

**Request your inspections online at [permits.bothellwa.gov](http://permits.bothellwa.gov) .**

- Go to [permits.bothellwa.gov](http://permits.bothellwa.gov) in your browser
- Log in to your account - select the “remember me” box when logging in
- Select Request Inspection
- Click on Search by permit number here (link is on the page)
- Enter your permit number in the search field
- Click on the permit number to go to the permit screen
- Click on Inspections (tab on screen)
- Select the inspection you need
- Enter your information as requested and select the inspection date.

**If you want your inspection the next business day, schedule prior to 4 p.m. Requests received after 4 p.m. will be scheduled for the second business day.**

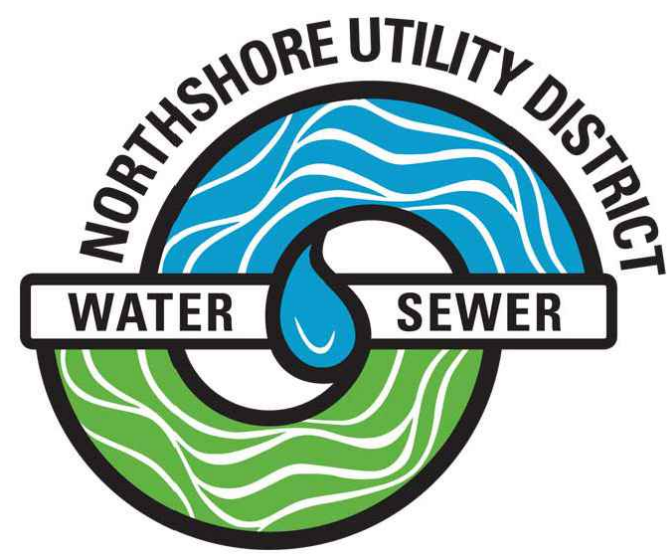
**If you need an inspection not listed please use "Misc. Inspection" to request your inspection, and add the inspection type in the Comments area.**

**For occupied residential units, you must be present at the inspection: failure to attend can result in delayed inspections and imposition of re-inspection fees. The inspector will evaluate the work performed for compliance with the City approved plans: Please make sure you follow those plans precisely.**

**It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code (BMC Section 20.02.195). This includes storage/household items being moved out of the way of access areas at time of inspection and permit holder providing ladders and/or lifts that allow safe entry to areas/equipment needing inspection.**

**Inspections**

- |                                       |                                      |
|---------------------------------------|--------------------------------------|
| 1. <u>Storm Stub to Lots</u>          | 2. <u>Storm Testing</u>              |
| 3. <u>Storm Connection</u>            | 4. <u>Final - CI</u>                 |
| 5. <u>Storm Main Video Inspection</u> | 6. <u>Storm Drainage Catch Basin</u> |
| 7. <u>Storm Drain Main</u>            | 8. <u>Water Valve</u>                |
| 9. <u>Water Pressure Test</u>         | 10. <u>Misc. Inspection - CI/ENG</u> |
| 11. <u>Backflow Assembly</u>          | 12. <u>Material</u>                  |
| 13. <u>Site Precon</u>                | 14. <u>Saw Cut</u>                   |
| 15. <u>Side Sewer</u>                 | 16. <u>Side Sewer Repair</u>         |
| 17. <u>Water Main Tap</u>             | 18. <u>Water Service</u>             |
| 19. <u>Meter Assembly</u>             |                                      |



# NORTHSHORE UTILITY DISTRICT

## King County, Washington

NUD 451 Zone Control Valve Facility

(Title of drawing/document)

APPROVED AED

2/1/24

(DATE)

(Signature/Initial)

### 451 ZONE CONTROL VALVE IMPROVEMENTS



**Gray & Osborne, Inc.**  
CONSULTING ENGINEERS

**SUSAN GREATHOUSE** President of the Board  
**TRUDY C. ROLLA** Secretary of the Board  
**D. BRUCE GARDINER** Commissioner  
**THOMAS D. MORTIMER** Commissioner  
**MATT BREYSSE** Commissioner  
**AMANDA CAMPBELL** General Manager

PERMIT PLANSET

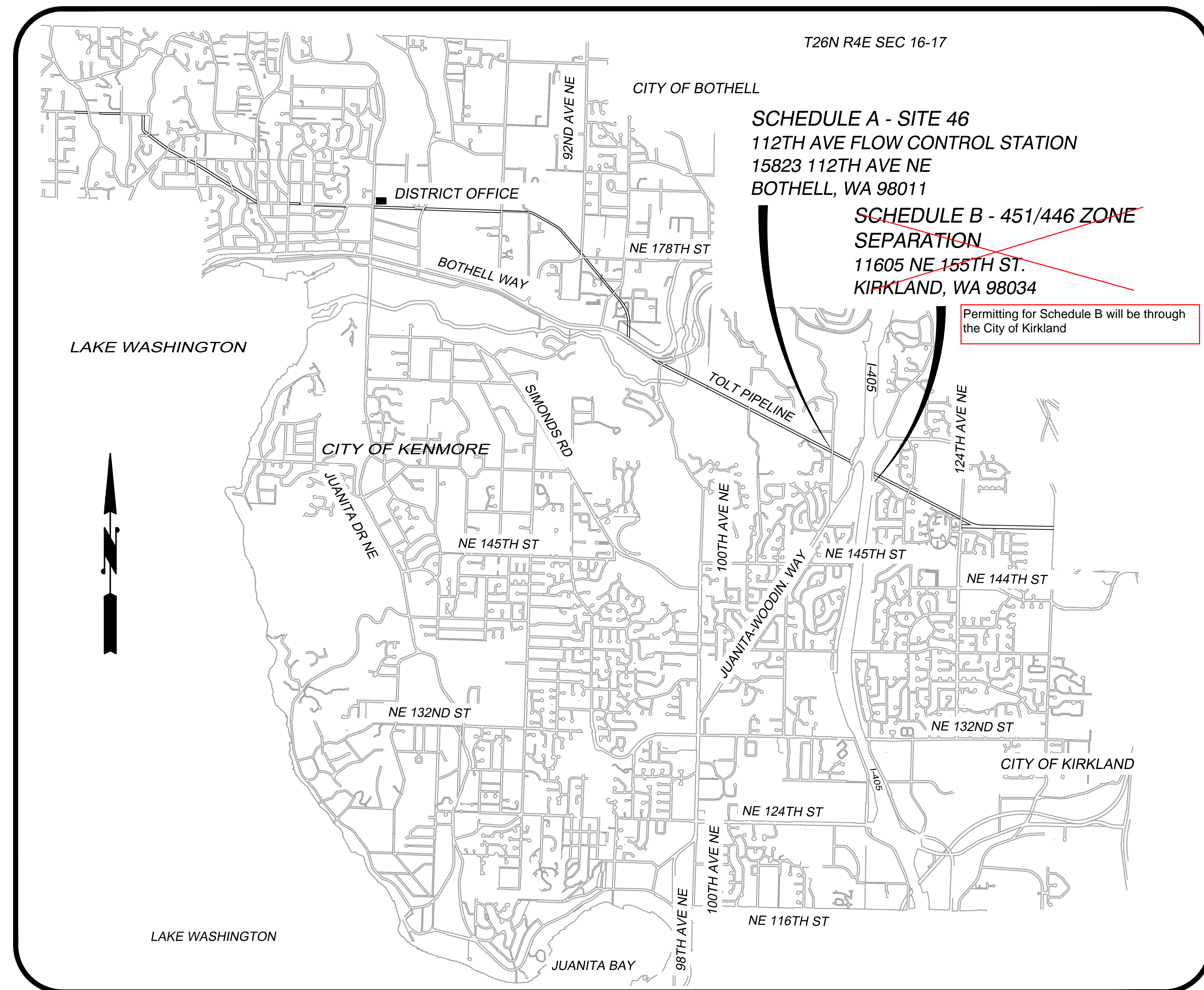
AREA 2 ITEMS CROSSED OUT WITH RED LINE ARE NOT PART OF THIS PERMIT SET. THEY WILL BE SUBMITTED TO THE CITY OF KIRKLAND FOR A SEPERATE PERMIT.

**SCHEDULE A - AREA 1, CITY OF BOTHELL**  
**SCHEDULE B - AREA 2, CITY OF KIRKLAND**

SHEET NO.	TITLE
--	COVER, VICINITY MAP AND SHEET INDEX
G-1	LEGEND, ABBREVIATIONS, AND GENERAL NOTES
G-2	TESC NOTES AND DETAILS
G1-1	SURVEY CONTROL PLAN
<del>G2-1</del>	<del>SURVEY CONTROL PLAN</del>
C1-1	EXISTING SITE, DEMOLITION & TESC PLAN
C1-2	EXISTING PRESSURE REDUCING STATION DEMOLITION DETAILS
C1-3	EXISTING PRESSURE REDUCING STATION DEMOLITION PHOTOS
C1-4	PROPOSED SITE AND PIPING PLAN
C1-5	SITE RESTORATION AND GRADING PLAN
C1-6	SITE GRADING SECTIONS
C1-7	PROPOSED PIPE PROFILES
C1-8	PROPOSED SEWER PROFILE
TC1-1	TRAFFIC CONTROL
TC1-2	TRAFFIC CONTROL
<del>C2-1</del>	<del>EXISTING SITE, DEMOLITION AND TESC PLAN</del>
<del>C2-2</del>	<del>PROPOSED SITE AND PIPING PLAN</del>
<del>C2-3</del>	<del>SITE RESTORATION AND GRADING PLAN</del>
<del>TC2-1</del>	<del>TRAFFIC CONTROL</del>
CD-1	CIVIL DETAILS 1
CD-2	CIVIL DETAILS 2
CD-3	CIVIL DETAILS 3
CD-4	CIVIL DETAILS 4
CD-5	CIVIL DETAILS 5
M1-1	MECHANICAL PLAN
M1-2	MECHANICAL SECTIONS
<del>M2-1</del>	<del>MECHANICAL PLAN &amp; SEC</del>
MD-1	MECHANICAL DETAILS (1)
MD-2	MECHANICAL DETAILS (2)
A1-1	BUILDING NOTES AND SCHEDULES
A1-2	FLOOR PLAN
A1-3	BUILDING ELEVATIONS
A1-4	BUILDING SECTIONS AND DETAILS
H1-1	HVAC DESIGN CRITERIA, NOTES, AND SYMBOLS
H1-2	HVAC SCHEDULES
H1-3	HVAC PLAN
P1-1	PLUMBING, DRAINAGE, AND VENT NOTES, LEGEND, PLAN, AND DETAILS

S-1	GENERAL STRUCTURAL NOTES
S-2	SPECIAL INSPECTION SCHEDULE, STRUCTURAL ABBREVIATIONS & LEGEND
S-3	TYPICAL STRUCTURAL DETAILS
S1-1	FOUNDATION AND FLOOR PLANS
S1-2	CMU WALL AND ROOF FRAMING PLANS
S1-3	DETAILS
S1-4	DETAILS
E-1	ELECTRICAL SYMBOLS, ABBREVIATIONS, SHEET LIST, AND WORK SUMMARY
E-2	PANELBOARD SCHEDULES
E-3	ANALOG LOOP DIAGRAMS
E-4	CABLE AND CONDUIT SCHEDULES
E-5	ELECTRICAL DETAILS
E-6	ELECTRICAL DETAILS
E1-1	SITE ELECTRICAL PLAN AND ONE LINE DIAGRAM
E1-2	BUILDING ELECTRICAL PLAN AND DEVICE TAG LIST
E1-3	BUILDING LIGHTING AND RECEPTACLES
E1-4	BUILDING HVAC AND SECURITY PLAN
<del>E2-1</del>	<del>SITE ELECTRICAL PLAN, ONE LINE DIAGRAM, AND TAG LIST</del>
<del>E2-2</del>	<del>VAULT ELECTRICAL PLAN AND CONTROL PANEL (02-GP-01) ELEVATION</del>

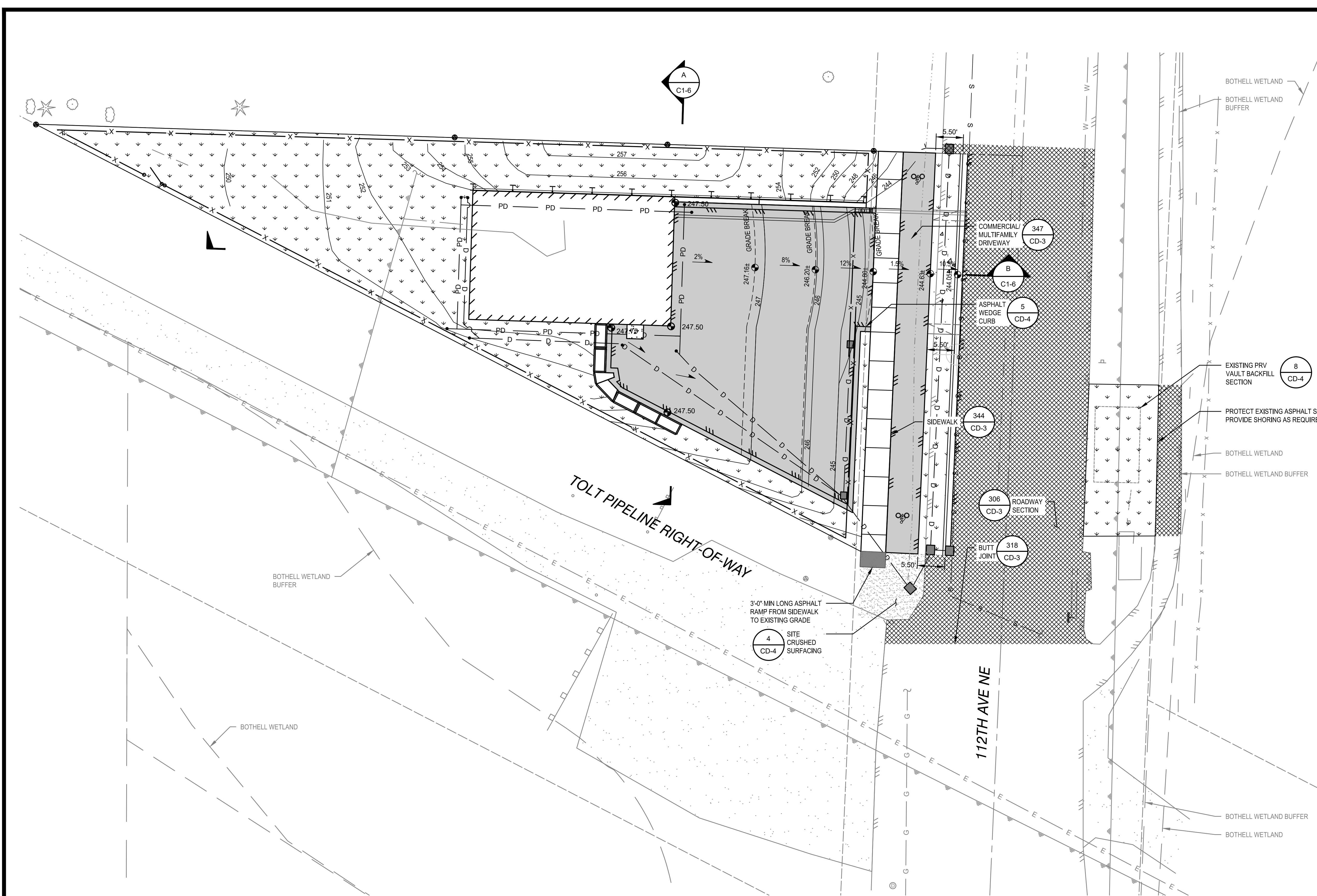
Approved  
 Bothell Fire Department  
 AFM Stephen Pasley  
 08/07/2023



VICINITY MAP

NOT TO SCALE

I:\GIS\SERVER3\data\2\Nsh\18691\_451\_zone\_control\_valve\_station\plans\set-mar-2022\General\RESTO\SCH A.dwg, 5/9/2024 11:26 AM, PATRICK SMILEY



**LEGEND**

	ASPHALT PAVEMENT
	ASPHALT OVERLAY
	LANDSCAPING RESTORATION, HYDROSEED
	SITE CRUSHED SURFACING
	CONCRETE DRIVEWAY

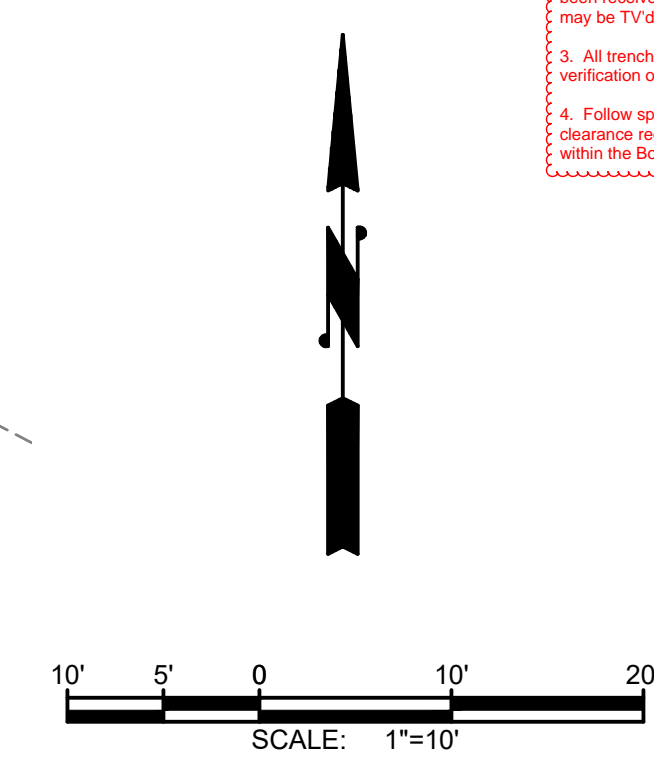
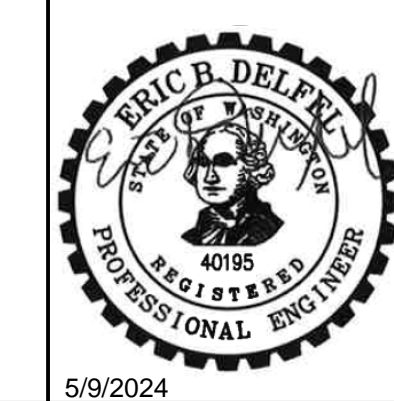
**PROPERTY QUANTITIES TABLE**

DESCRIPTION	QUANTITY	COMMENT
ASPHALT PAVEMENT (DRIVEWAY)	2,245 SF	25 SF IN ROW, 2,220 ON PRIVATE PROPERTY
ASPHALT PAVEMENT (BIKE PATH)	525 SF	ALL IN ROW
ASPHALT OVERLAY (ROADWAY SECTION)	2,944 SF	ALL IN ROW
CEMENT CONCRETE (SIDEWALK)	404 SF	ALL IN ROW
CEMENT CONCRETE (DRIVEWAY)	123 SF	ALL IN ROW
HYDROSEED	4143 SF	753 SF IN ROW, 3,390 ON PRIVATE PROPERTY

- COB NOTES:**
- See attached ROW Conditions
  - Must call in a job start every work day
  - Allowable Lane closure hours: 9am-2pm M-Thur
  - Contact the construction inspector at (425)-471-0099 to schedule a pre-con meeting prior to start of work.
  - 2-Week notice required before hard start date
  - Contact King County Metro -15 days prior to implementing plan if Work zone impacts transit. (Non Trolley) (206)477 1140, construction.cord@kingcounty.gov.

- COB CLEARANCE REQUIREMENTS FOR PUBLIC UTILITIES:**
- For Bothell water mains, a minimum of 36" of vertical clearance from the bottom of the main to the top of the proposed installation must be maintained for trenchless installations, and a minimum of 18" of vertical clearance from the bottom of the main to the top of the proposed installation must be maintained for open trench installations. A minimum of 10' of horizontal clearance from the edge of the main to the edge of the proposed installation must be maintained unless specific written approval from the City has been received.
  - A minimum of 18" of vertical clearance from the bottom of the City storm main to the top of the proposed installation and from the top of a City sewer main to the bottom of the proposed installation must be maintained. Additionally, a minimum of 5' of horizontal clearance from the edge of any City storm or sewer main to the edge of the proposed installation must be maintained unless specific written approval from the City has been received. In lieu of potoling, storm and sanitary sewer may be TV'd after the fact.
  - All trenchless utility crossings shall be potoled for visual verification of clearances.
  - Follow specific Utility District horizontal and vertical clearance requirements for water and sewer utilities not located within the Bothell Utility District service areas.

City of Bothell Public Works Department  
**APPROVED FOR CONSTRUCTION AS NOTED**  
*Eric B. DeFina*  
 Approved by: 06/11/2024  
 Date: \_\_\_\_\_  
 Approval of these plans does not relieve the Applicant or Contractor from compliance with all city ordinances, adopted codes, standards, and specifications. Construction may not begin without a Pre-Construction Meeting.



NO	BY	APPD	REVISION	DATE

**PRELIMINARY NOT FOR CONSTRUCTION**

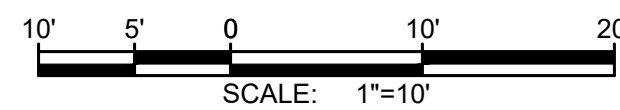
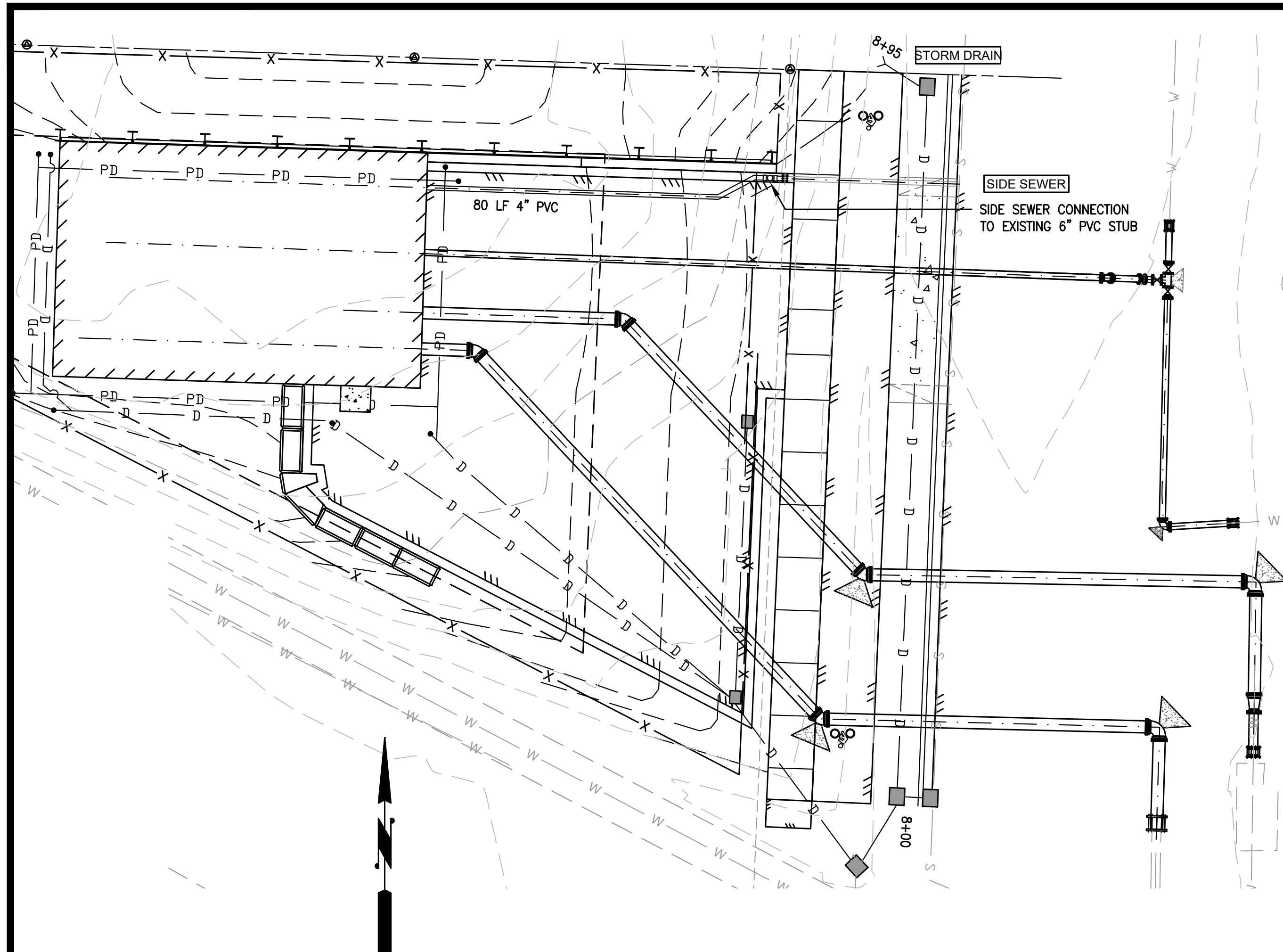
**WARNING**  
  
 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

	DESIGNED BY	AKG
	DRAWN BY	MAN
	CHECKED BY	AKG
	APPROVAL	EBD
	DATE	APR 2024

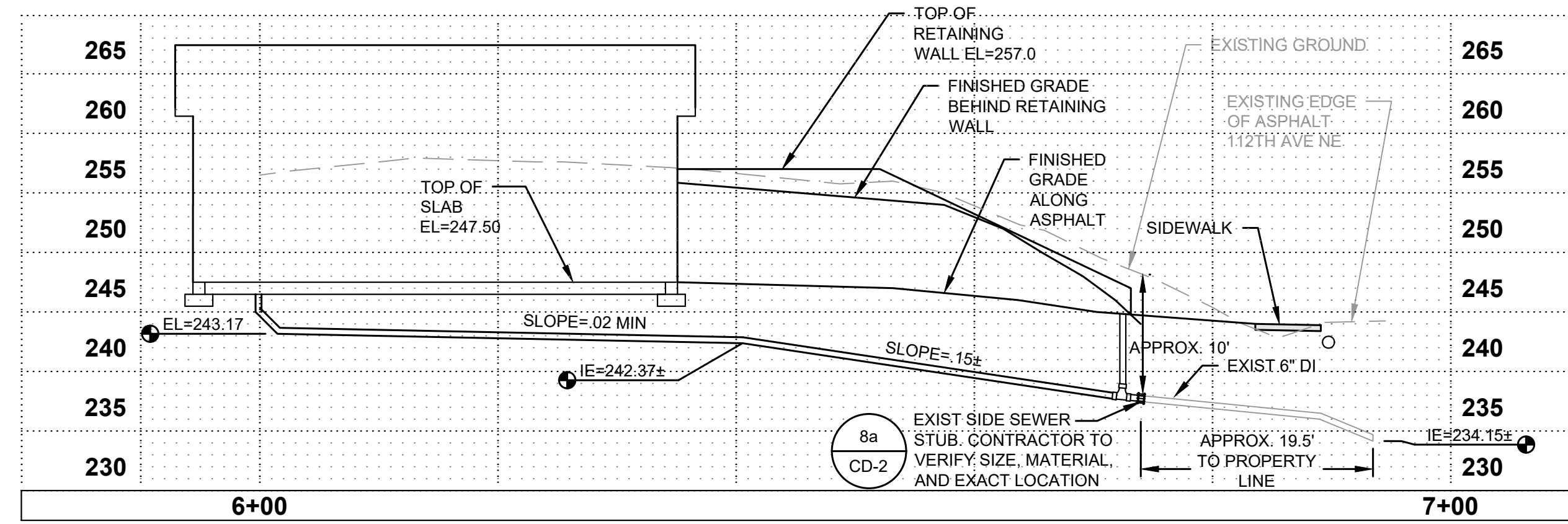
**NORTHSHORE UTILITY DISTRICT**  
  
 6830 NE 185th St. P.O. Box 82489  
 Kenmore, WA 98028-2684 Kenmore, WA 98028-2684  
 Ph: (425) 398-4400 | Fax: (425) 398-4430 | www.nud.net

**CONTRACT 2024-03**  
**451 ZONE CONTROL VALVE IMPROVEMENTS**  
**SCHEDULE A**  
**SITE RESTORATION AND GRADING PLAN**

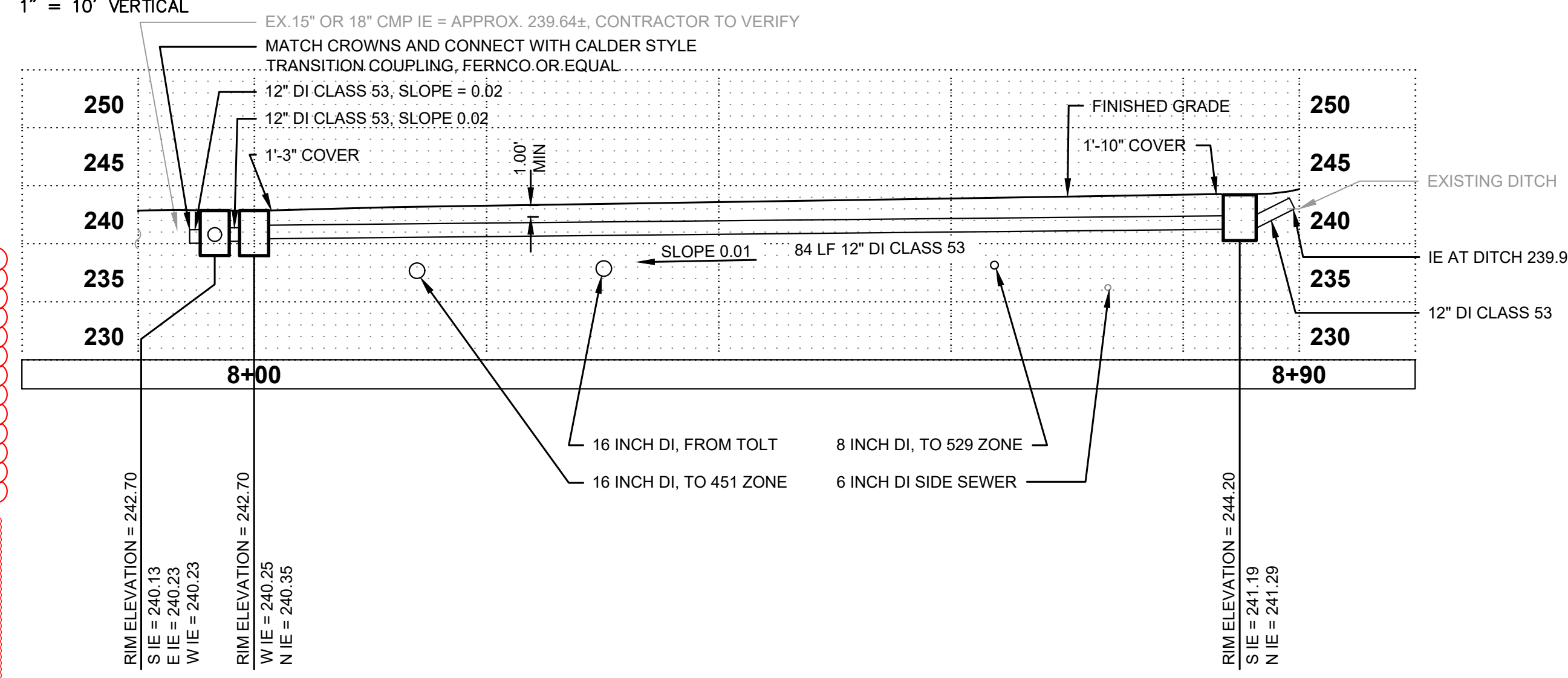
M:\Northshore\18591\_451\_Zone Control Valve Station\PlanSet-Mar-2022\General\IC-SEWER.dwg, 5/3/2024, 4:53 PM, BERNIE HAYDEN



SEWER\_CONN CENTERLINE PROFILE  
SCALE: 1" = 10' HORIZONTAL  
1" = 10' VERTICAL



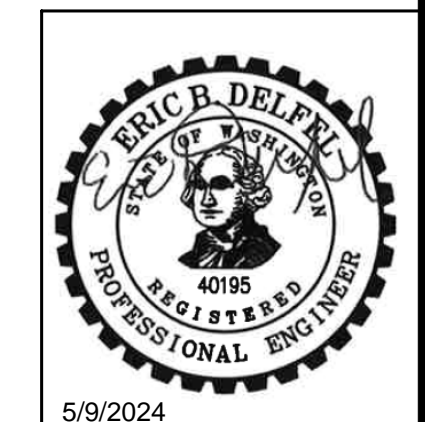
PROPOSED STORM CENTERLINE PROFILE  
SCALE: 1" = 10' HORIZONTAL  
1" = 10' VERTICAL



- COB NOTES:**
1. See attached ROW Conditions
  2. Must call in a job start every work day
  3. Allowable Lane closure hours: 8am-2pm M-Thur
  4. Contact the construction inspector at (425)-471-0099 to schedule a pre-con meeting prior to start of work.
  5. 2-Week notice required before hard start date
  6. Contact King County Metro -15 days prior to implementing plan if Work zone impacts transit. (Non Trolley) (206)477 1140, construction.cord@kingcounty.gov.

- COB CLEARANCE REQUIREMENTS FOR PUBLIC UTILITIES:**
1. For Bothell water mains, a minimum of 36" of vertical clearance from the bottom of the main to the top of the proposed installation must be maintained for trenchless installations, and a minimum of 5' of vertical clearance from the bottom of the main to the top of the proposed installation must be maintained for open trench installations. A minimum of 10' of horizontal clearance from the edge of the main to the edge of the proposed installation must be maintained unless specific written approval from the City has been received
  2. A minimum of 18" of vertical clearance from the bottom of the City storm main to the top of the proposed installation and from the top of a City sewer main to the bottom of the proposed installation must be maintained. Additionally, a minimum of 5' of horizontal clearance from the edge of any City storm or sewer main to the edge of the proposed installation must be maintained unless specific written approval from the City has been received. In lieu of potoling, storm and sanitary sewer may be TV'd after the fact.
  3. All trenchless utility crossings shall be potoled for visual verification of clearances.
  4. Follow specific Utility District horizontal and vertical clearance requirements for water and sewer utilities not located within the Bothell Utility District service areas.

City of Bothell Public Works Department  
**APPROVED FOR CONSTRUCTION AS NOTED**  
*[Signature]*  
Approved By: 08/11/2024  
Date:  
Approval of these plans does not relieve the Applicant or Contractor from compliance with all city ordinances, adopted rules, standards, and specifications. Construction may not begin without a Pre-Construction Meeting.



5/9/2024

NO	BY	APPD	REVISION	DATE

**WARNING**  
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE



DESIGNED BY	AKG
DRAWN BY	MAN
CHECKED BY	AKG
APPROVAL	EBD
DATE	APR 2024



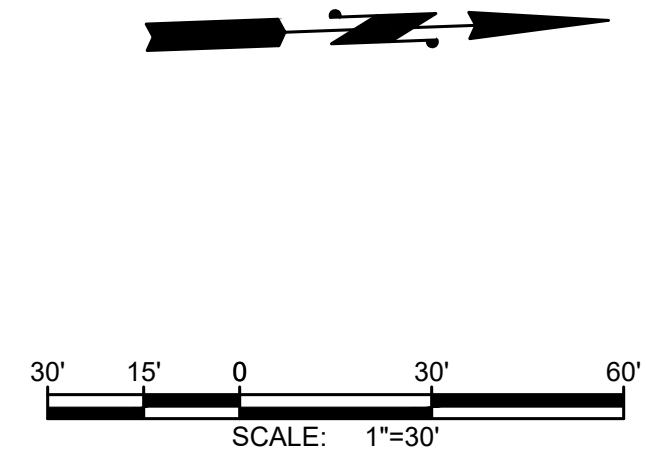
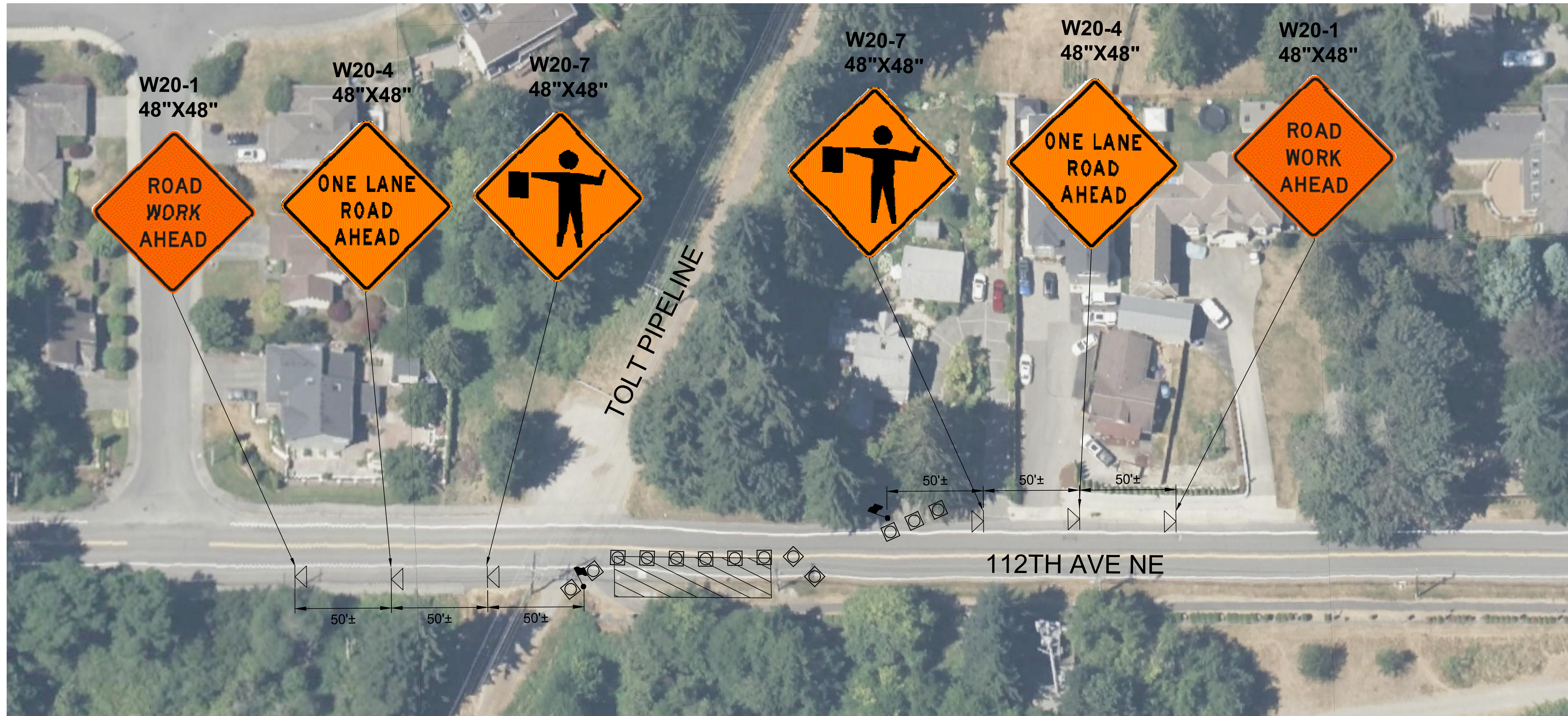
**NORTHSHORE UTILITY DISTRICT**  
6830 NE 185th St. P.O. Box 82489  
Kenmore, WA 98028-2684 Kenmore, WA 98028-2684  
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**CONTRACT 2024-03**  
**451 ZONE CONTROL VALVE IMPROVEMENTS**  
**SCHEDULE A**  
**PROPOSED SEWER AND STORM DRAIN PROFILE**






**CIVIL**  
**SHEET: C1-8**  
**12 OF 55**

**PRELIMINARY NOT FOR CONSTRUCTION**





**LEGEND**

-  TEMPORARY SIGN LOCATION
-  WORK ZONE
-  CHANNELIZING DEVICES
-  FLAGGING STATION
-  TYPE III BARRICADE

**NOTES**

1. SIGNS SHALL BE BLACK (NON-REFL.) ON ORANGE BACKGROUND (REFL.) UNLESS OTHERWISE NOTED.
2. NIGHT WORK REQUIRES ADDITIONAL ROADWAY LIGHTING AT FLAGGING STATIONS. SEE WSDOT STANDARD SPECIFICATIONS FOR ADDITIONAL DETAILS.
3. CONTRACTOR TO COMPLY WITH WORK HOUR RESTRICTIONS OF THE PERMITTING AGENCY.
4. ALL SPACING MAY BE ADJUSTED TO ACCOMMODATE INTERSECTIONS AND DRIVEWAYS.
5. EXTEND TAPER DEVICES ACROSS SHOULDER.
6. MOTORCYCLES USE EXTREME CAUTION SIGNS SHALL BE INSTALLED WHEN THE FOLLOWING ROADWAY CONDITIONS EXIST:  
 -GROOVED PAVEMENT  
 -ABRUPT LANE EDGE  
 -STEEL PLATES  
 -LOOSE GRAVEL OR EARTH
7. OPEN TRENCHES WITHIN THE TRAVELED WAY OR AUXILIARY LANE SHALL HAVE A STEEL-PLATE COVER PLACED AND ANCHORED OVER THEM. A WEDGE OF SUITABLE MATERIAL, IF REQUIRED, SHALL BE PLACED FOR A SMOOTH TRANSITION BETWEEN THE PAVEMENT AND THE STEEL PLATE. WARNING SIGNS SHALL BE USED TO ALERT MOTORISTS OF THE PRESENCE OF THE STEEL PLATES.

CHANNELIZATION DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
35/45	10 TO 20	60
25/30	10 TO 20	40

City of Bothell Public Works Department  
**APPROVED FOR CONSTRUCTION AS NOTED**

*Wajim Khak*  
 Approved By

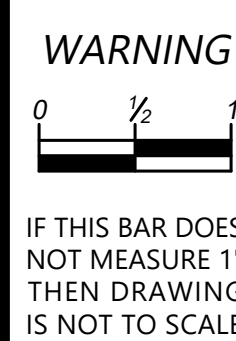
08/03/2023  
 Date

Approval of these plans does not relieve the Applicant or Contractor from compliance with all city ordinances, adopted codes, standards, and specifications. Construction may not begin without a Pre-Construction Meeting.



NO	BY	APPD	REVISION	DATE

**PRELIMINARY NOT FOR CONSTRUCTION**



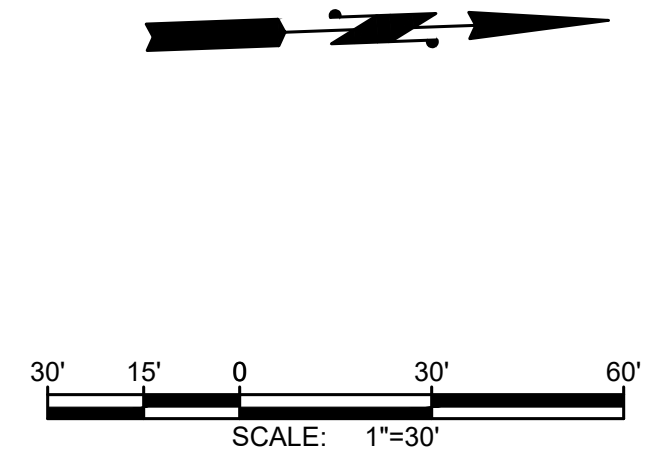
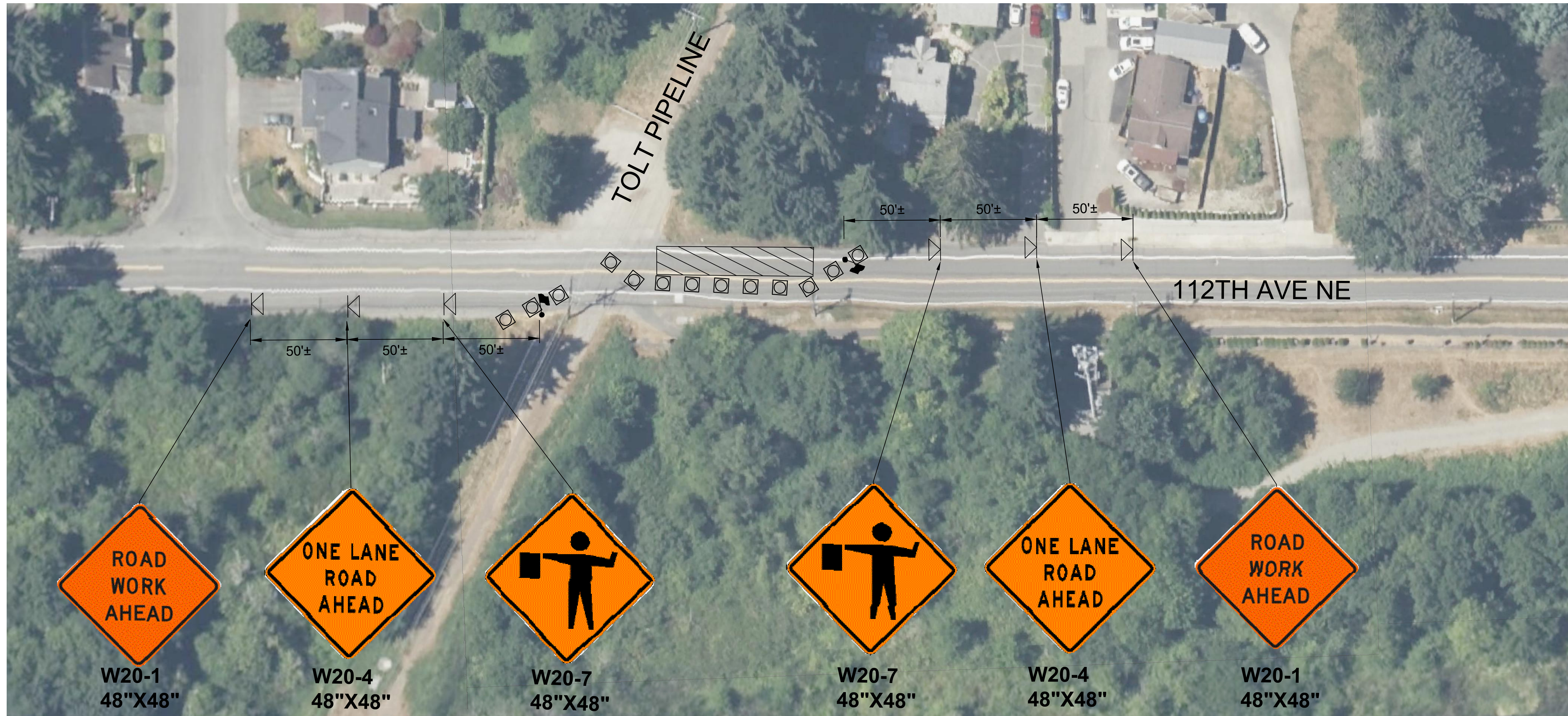
DESIGNED BY	PLS
DRAWN BY	PLS
CHECKED BY	AKG
APPROVAL	EBD
DATE	JUNE 2023



**NORTHSHORE UTILITY DISTRICT**  
 6830 NE 185th St. P.O. Box 82489  
 Kenmore, WA 98028-2684 Kenmore, WA 98028-2684  
 Ph: (425) 398-4400 | Fax: (425) 398-4430 | www.nud.net

**CONTRACT 2023-XX**  
**451 ZONE CONTROL VALVE FACILITY**  
**TRAFFIC CONTROL**

TRAFFIC  
 SHEET:TC1-1  
 13 OF 55



**W20-1**  
48"X48"



**W20-4**  
48"X48"



**W20-7**  
48"X48"



**W20-7**  
48"X48"



**W20-4**  
48"X48"



**W20-1**  
48"X48"

**LEGEND**

- TEMPORARY SIGN LOCATION
- WORK ZONE
- CHANNELIZING DEVICES
- FLAGGING STATION
- TYPE III BARRICADE

**NOTES**

1. SIGNS SHALL BE BLACK (NON-REFL.) ON ORANGE BACKGROUND (REFL.) UNLESS OTHERWISE NOTED.
2. NIGHT WORK REQUIRES ADDITIONAL ROADWAY LIGHTING AT FLAGGING STATIONS. SEE WSDOT STANDARD SPECIFICATIONS FOR ADDITIONAL DETAILS.
3. CONTRACTOR TO COMPLY WITH WORK HOUR RESTRICTIONS OF THE PERMITTING AGENCY.
4. ALL SPACING MAY BE ADJUSTED TO ACCOMMODATE INTERSECTIONS AND DRIVEWAYS.
5. EXTEND TAPER DEVICES ACROSS SHOULDER.
6. MOTORCYCLES USE EXTREME CAUTION SIGNS SHALL BE INSTALLED WHEN THE FOLLOWING ROADWAY CONDITIONS EXIST:  
 -GROOVED PAVEMENT  
 -ABRUPT LANE EDGE  
 -STEEL PLATES  
 -LOOSE GRAVEL OR EARTH
7. OPEN TRENCHES WITHIN THE TRAVELED WAY OR AUXILIARY LANE SHALL HAVE A STEEL-PLATE COVER PLACED AND ANCHORED OVER THEM. A WEDGE OF SUITABLE MATERIAL, IF REQUIRED, SHALL BE PLACED FOR A SMOOTH TRANSITION BETWEEN THE PAVEMENT AND THE STEEL PLATE. WARNING SIGNS SHALL BE USED TO ALERT MOTORISTS OF THE PRESENCE OF THE STEEL PLATES.

CHANNELIZATION DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
35/45	10 TO 20	60
25/30	10 TO 20	40

City of Bothell Public Works Department  
APPROVED FOR CONSTRUCTION AS NOTED

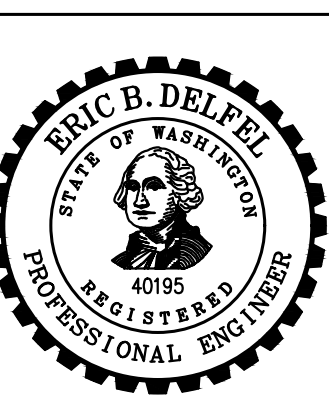
Wanin Khak

Approved By

08/03/2023

Date

Approval of these plans does not relieve the Applicant or Contractor from compliance with all city ordinances, adopted codes, standards, and specifications. Construction may not begin without a Pre-Construction Meeting.



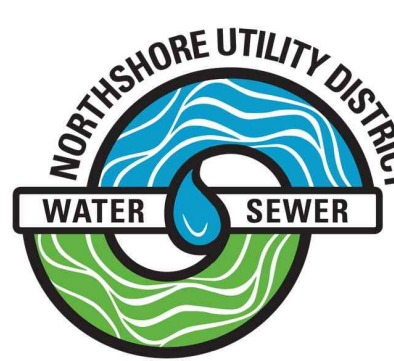
NO	BY	APPD	REVISION	DATE

**WARNING**

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE



DESIGNED BY	PLS
DRAWN BY	PLS
CHECKED BY	AKG
APPROVAL	EBD
DATE	JUNE 2023



**NORTHSHORE UTILITY DISTRICT**

6830 NE 185th St.      P.O. Box 82489  
 Kenmore, WA 98028-2684      Kenmore, WA 98028-2684

Ph: (425) 398-4400 | Fax: (425) 398-4430 | www.nud.net

**CONTRACT 2023-XX**  
**451 ZONE CONTROL VALVE FACILITY**

**TRAFFIC CONTROL**

TRAFFIC  
 SHEET:TC1-2

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14 OF 55

PRELIMINARY NOT FOR CONSTRUCTION

m:\Northshore\18591\_451\_valve\_control\_valve\_station\plans\set-mar-2023\General\TC.dwg, 6/26/2023 7:07 AM, ALEX GORDON



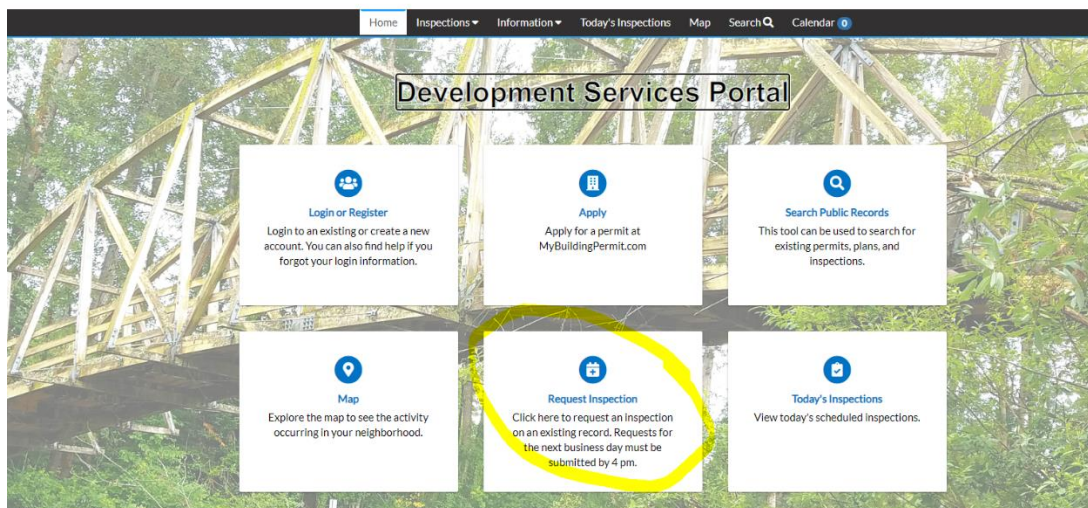
## INSPECTION SCHEDULING

If you have questions please contact our Administration staff:

- E-mail: [cdadmin@bothellwa.gov](mailto:cdadmin@bothellwa.gov) Phone: 425.806.6400

**All inspection scheduling is online through: [permits.bothellwa.gov](http://permits.bothellwa.gov)**  
*If you want your inspection the next business day, schedule prior to 4 p.m. Requests received after 4 p.m. will be scheduled for the second business day.*

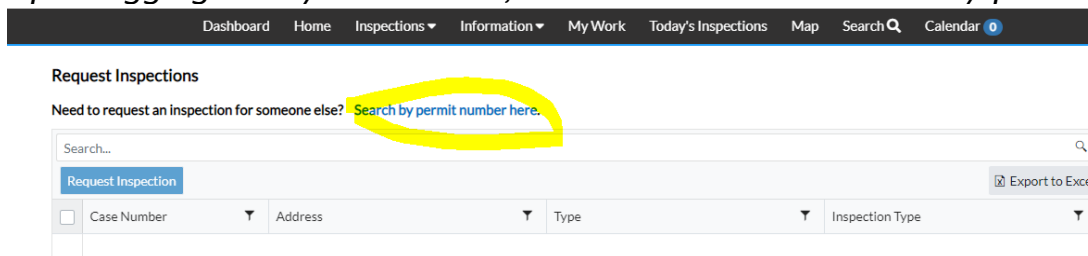
- Select "Request Inspection".



- First time users must register, you will receive a confirmation email. When logging in to your account, below your username/password is a box marked "remember me", click that box.

The screenshot shows the 'Log In' form. It includes fields for 'Username' and 'Password', a 'Remember Me' checkbox (circled in yellow), and a 'Log In' button. Below the form are links for 'Forgot your password? Reset it', 'Forgot your username? Email it', and 'Don't have an account yet? Register Here'.

- After logging in to your account, click on the link to "Search by permit number here".



- Enter your permit number, search. Click on your permit number.

Dashboard Home Inspections Information My Work Today's Inspections Map Search Q Calendar 0

**Public Information**

Please enter a case number or keyword(s).  
To schedule an inspection, search for the permit and click the permit number to see available inspections.  
For advanced searches, select a case type from the dropdown list.

Search All for Search Keywords and Addresses Exact Phrase Search Reset

**Public Information**

Please enter a case number or keyword(s).  
To schedule an inspection, search for the permit and click the permit number to see available inspections.  
For advanced searches, select a case type from the dropdown list.

Search All for BSF2021-28829 Exact Phrase Search Reset Export

Found 1 result

Filter Results

All 1 Permit 1

Next | Top | **Paging Options** | Filter Options | Main Menu

Permit Number **BSF2021-28829**

Type Building - Single Family - Alteration

Project Name

Status Issued

Applied Date 07/19/2021  
Issued Date 10/07/2021  
Expiration Date 10/09/2023  
Finalized Date

**Select Inspections and schedule your inspection.**

Permit Details | Tab Elements | Main Menu

Type: Building - Single Family - Alteration Status: Issued Project Name:

Applied Date: 07/19/2021 Issue Date: 10/07/2021

District: Bloomberg Hill Expire Date: 10/09/2023

Square Feet: 0.00 Valuation: \$70,000.00 Finalized Date:

Description: E21-34692, Geetha Remodel, (attached condo) New range hood, exterior penetration for vent, redesign of kitchen layout.

- Summary Locations Fees **Inspections** Attachments Contacts Sub-Records Holds More Info

- Summary Locations Fees **Inspections** Attachments Contacts Sub-Records Holds More Info

**Request Inspections**

Sort Order

Description	Reinspection	Action
Plumbing Rough-In	No	<input type="checkbox"/>
Mechanical Rough-In	No	<input type="checkbox"/>
Framing	No	<input type="checkbox"/>
Misc. Inspection - BLD	No	<input type="checkbox"/>
Misc. Inspection - BLD	No	<input type="checkbox"/>
Misc. Inspection - BLD	No	<input type="checkbox"/>
Final - BLD	No	<input type="checkbox"/>
Final - CI	No	<input type="checkbox"/>

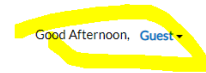
Results per page 10 1 - 8 of 8 << < 1 > >>

Request Inspection

Existing Inspections | Request Inspections | Optional Inspections | Next Tab | Permit Details | Main Menu

- **Make sure that you're logged in, at the top right hand corner, if it says "Guest" that means you need to log back in. You will not be able to schedule inspections unless you are logged in. See the snapshot below.**

of Bothell™



Home Inspections Information Today's Inspections Map Search Calendar

Permit Number: BSF2021-28829

Permit Details | Tab Elements | Main Menu

Type:	Building - Single Family - Alteration	Status:	Issued	Project Name:	
Applied Date:	07/19/2021	Issue Date:	10/07/2021		
District:	Bloomberg Hill	Expire Date:	10/09/2023		
Square Feet:	0.00	Valuation:	\$70,000.00	Finalized Date:	

- **Single family plumbing or mechanical inspections** may be virtual inspections. You will be contacted by the assigned inspector the morning of your inspection if it is to be virtual (such as zoom, or facetime).
- For occupied residential units, you must be present at the inspection: failure to attend can result in delayed inspections and imposition of re-inspection fees. The inspector will evaluate the work performed for compliance with the City approved plans: Please make sure you follow those plans precisely.
- It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code (BMC Section 20.02.195). This includes storage/household items being moved out of the way of access areas at time of inspection and permit holder providing ladders and/or lifts that allow safe entry to areas/equipment needing inspection.

If you have questions or concerns please contact our Administration staff:

- E-mail: [cdadmin@bothellwa.gov](mailto:cdadmin@bothellwa.gov)
- Phone: 425.806.6400

More information and Holidays observed can be found by visiting our [Inspection Scheduling webpage](#).



City of Bothell™

## **NOTICE: CONTRACTOR INFO REQUIRED PRIOR TO PERMIT ISSUANCE**

This permit is ready to issue, however we do require the contractor's information prior to permit issuance. **The contractor must have a current City Business License and current state Construction Contractor license prior to permit issuance.**

Please upload this information to the application on MyBuildingPermit.com, including the contractor's:

- **Name**
- **UBI number**
- **State contractor license number**

If a City of Bothell business license needs to be acquired or renewed, please visit the [Department of Revenue](#) website for more information and how to apply.

- \* If the contractor is the **homeowner** upload this information to the application on MyBuildingPermit.com.

Community Development  
18415 101<sup>st</sup> Ave NE.  
Bothell, WA 98011  
(425) 806-6400  
[www.bothellwa.gov](http://www.bothellwa.gov)



City of Bothell™

**NOTICE: PLUMBING CONTRACTOR INFORMATION REQUIRED PRIOR  
TO PERMIT ISSUANCE**

This permit is ready to issue, however we do require the Plumbing Contractor's information prior to permit issuance (Plumbing Contractor license is required per RCW 18.106.440).

- **The plumbing contractor must have a current City of Bothell Business License and State Plumbing Contractor License in order to issue the permit.**

Please upload the Plumbing Contractor's information to MyBuildingPermit.com, including the:

- Business Name
- UBI number
- State Plumbing Contractor License number

If the Plumbing Contractor needs to obtain or renew a city of Bothell business, please visit [The Department of Revenue website](#) to do so.

- \* *If the plumbing contractor is the **homeowner** please upload this information to the application on MyBuildingPermit.com.*



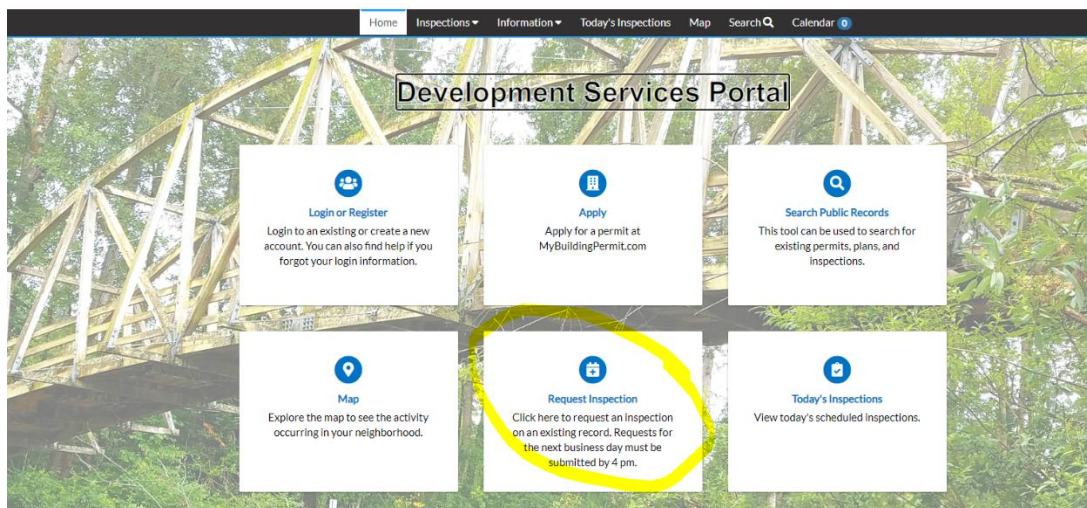
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**Log In**

\* Username

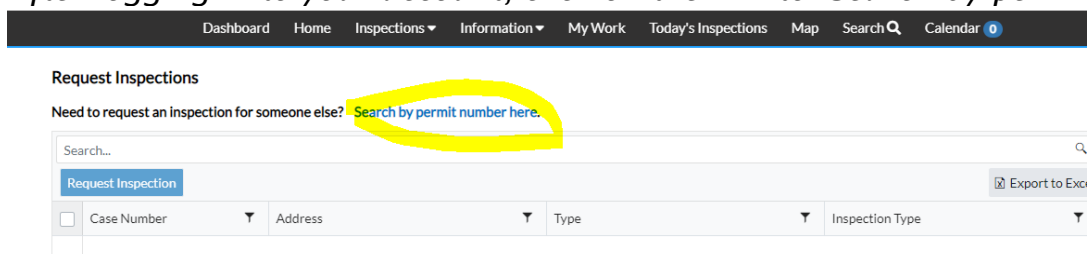
\* Password

Remember Me

Log In

Forgot your password? [Reset it](#)  
Forgot your username? [Email it](#)  
Don't have an account yet? [Register Here](#)

- After logging in to your account, click on the link to "Search by permit number here".





- Enter your permit number, search. Click on your permit number.

Dashboard Home Inspections Information My Work Today's Inspections Map Search Q Calendar 0

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Search All for BSF2021-28829 Exact Phrase Search Reset Export

Found 1 result

Filter Results

All 1 Permit 1

Next | Top | **Paging Options** | Filter Options | Main Menu

Permit Number **BSF2021-28829**

Type Building - Single Family - Alteration

Project Name

Status Issued

Applied Date 07/19/2021  
Issued Date 10/07/2021  
Expiration Date 10/09/2023  
Finalized Date

**Select Inspections and schedule your inspection.**

Permit Details | Tab Elements | Main Menu

Type: Building - Single Family - Alteration Status: Issued Project Name:

Applied Date: 07/19/2021 Issue Date: 10/07/2021

District: Bloomberg Hill Expire Date: 10/09/2023

Square Feet: 0.00 Valuation: \$70,000.00 Finalized Date:

Description: E21-34692, Geetha Remodel, (attached condo) New range hood, exterior penetration for vent, redesign of kitchen layout.

- Summary Locations Fees **Inspections** Attachments Contacts Sub-Records Holds More Info

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**Request Inspections**

Sort Order

Description	Reinspection	Action
Plumbing Rough-In	No	<input type="checkbox"/>
Mechanical Rough-In	No	<input type="checkbox"/>
Framing	No	<input type="checkbox"/>
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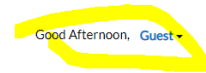
Results per page 10 1 - 8 of 8 << < 1 > >>

**Request Inspection**

Existing Inspections | Request Inspections | Optional Inspections | Next Tab | Permit Details | Main Menu

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Home Inspections Information Today's Inspections Map Search Calendar

Permit Number: BSF2021-28829

Permit Details | Tab Elements | Main Menu

Type:	Building - Single Family - Alteration	Status:	Issued	Project Name:	
Applied Date:	07/19/2021	Issue Date:	10/07/2021		
District:	Bloomberg Hill	Expire Date:	10/09/2023		
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- **Single family plumbing or mechanical inspections** may be virtual inspections. You will be contacted by the assigned inspector the morning of your inspection if it is to be virtual (such as zoom, or facetime).
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If you have questions or concerns please contact our Administration staff:

- E-mail: [cdadmin@bothellwa.gov](mailto:cdadmin@bothellwa.gov)
- Phone: 425.806.6400

More information and Holidays observed can be found by visiting our [Inspection Scheduling webpage](#).



**ROW**

City of Bothell™

Permit Number: ROW2023-34782

Type: ROW

Work Class: Franchise Major

Issue Date: 08/15/2024

**Permit Information**

<b>Job Address:</b>		<b>Sub Area:</b>	Waynita / Simonds / Norway Hill
<b>Parcel:</b>	1726059117 451	<b>Expiration Date:</b>	08/17/2026
<b>Description:</b>	E23-33913 NUD 451 Zone Control Valve Facility and Control Vault he facility consists of a one-story CMU building that will house a cluster of piping including three control valves that distribute flow between the Tolt Pipeline and the Northshore Utility District's 451 and 529 pressure zones.		

**Contacts**

Type	Contact Name	Address	Phone	State Lic #
Applicant	GRAY & OSBORNE, INC		(206) 284-0860	
Contractor	NORTHSHORE UTILITY DISTRICT	PO BOX 82489 KENMORE, WA 98028		
Owner	NORTHSHORE UTILITY DISTRICT	6830 NE 185TH ST Kenmore, WA 98028	425-398-4403	

**Fees Paid**

Fee	Amount	Fee	Amount

**Agreement**

**Work performed under this permit must be inspected. See reverse side of this form for instructions.**

**This permit, the inspection record and the plans approved by the City must remain together in a visible and easily accessible location on the job site for use by City inspectors. Failure to comply with this requirement can result in delayed inspections and imposition of re-inspection fees.**

I certify that the information furnished by me is true and correct to the best of my knowledge and the applicable City of Bothell requirements will be met.

Owner or  Agent

(Check one)

\_\_\_\_\_

(Print Name)

\_\_\_\_\_

DATE:

\_\_\_\_\_

(Signature)

**If you are unclear as to what a particular inspection is for or which inspections are required, please ask your inspector or contact an inspector at 425-806-6400.**

**Request your inspections online at [permits.bothellwa.gov](http://permits.bothellwa.gov) .**

- Go to [permits.bothellwa.gov](http://permits.bothellwa.gov) in your browser
- Log in to your account - select the “remember me” box when logging in
- Select Request Inspection
- Click on Search by permit number here (link is on the page)
- Enter your permit number in the search field
- Click on the permit number to go to the permit screen
- Click on Inspections (tab on screen)
- Select the inspection you need
- Enter your information as requested and select the inspection date.

**If you want your inspection the next business day, schedule prior to 4 p.m. Requests received after 4 p.m. will be scheduled for the second business day.**

**If you need an inspection not listed please use "Misc. Inspection" to request your inspection, and add the inspection type in the Comments area.**

**For occupied residential units, you must be present at the inspection: failure to attend can result in delayed inspections and imposition of re-inspection fees. The inspector will evaluate the work performed for compliance with the City approved plans: Please make sure you follow those plans precisely.**

**It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code (BMC Section 20.02.195). This includes storage/household items being moved out of the way of access areas at time of inspection and permit holder providing ladders and/or lifts that allow safe entry to areas/equipment needing inspection.**

**Inspections**

- |                                      |                               |
|--------------------------------------|-------------------------------|
| 1. <u>Final - CI</u>                 | 2. <u>Job Start</u>           |
| 3. <u>Site Precon</u>                | 4. <u>Asphalt Inspection</u>  |
| 5. <u>Backfill</u>                   | 6. <u>ADA Grade</u>           |
| 7. <u>Temporary Traffic Control</u>  | 8. <u>Road Subbase</u>        |
| 9. <u>Temporary Patch Inspection</u> | 10. <u>ADA Ramp</u>           |
| 11. <u>Misc. Inspection - CI/ENG</u> | 12. <u>Permanent Patch</u>    |
| 13. <u>Striping Layout</u>           | 14. <u>Erosion Control</u>    |
| 15. <u>Pothole Utilities</u>         | 16. <u>Saw Cut</u>            |
| 17. <u>Subbase Construction</u>      | 18. <u>Top Lift Placement</u> |
| 19. <u>Utility Adjustment</u>        |                               |



# City of Bothell, WA

## Standard Right-of-Way Conditions of Approval

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### **Unless superseded by special conditions of approval, the following conditions apply to all Right-of-Way Permits.**

1. All work must be inspected and approved. The conditions below may be superseded by any notes on the approved plan set(s).
2. **Job Start notification to City of Bothell. Request Job Start inspection using the City of Bothell Inspection Scheduling system <https://permits.bothellwa.gov> prior to 4pm** on the day prior to work start. Information needed when scheduling: ROW permit number, site address, date of work start, and contact name and phone number. The contact listed shall be the jobsite foreman/ field lead.
3. After work is completed a **Final Inspection MUST** be requested using the City of Bothell Inspection Scheduling system <https://permits.bothellwa.gov>.
2. A pre-construction meeting (on site) is required for work on collector or arterial roads or work which involves boring in the location of utilities **prior to the start of work**. **Required inspections** will be identified during the meeting. All utility locates (city and private), including all traffic signal loops, in the work area must have their location clearly marked and must be in place prior to the pre-construction meeting. All City approved documents must be on site. The pre-construction meeting may be scheduled through <https://permits.bothellwa.gov> and select "Site Precon" inspection.
4. A copy of the right-of-way permit and approved plans **must be on site at all times** when work is being done.
5. Applicant is responsible for assuring that all contractors/subcontractors are knowledgeable of the City of Bothell Design and Construction Standards and Specifications.
6. All city utilities and traffic signal loops in the work area must have their location clearly marked **prior to the start** of any work.
7. **For water mains, a minimum of 36 inches of vertical clearance** from the bottom of any city utility to the top of the proposed installation must be maintained for directional bores and a minimum of **18 inches of vertical clearance** from the bottom of any city utility to the top of the proposed installation must be maintained for open cuts unless specific written approval from the City has been received.
8. **For water mains, a minimum of 10 feet of horizontal clearance** from the edge of any city utility to the edge of the proposed installation must be maintained unless specific written approval from the City has been received.
9. **For sewer and storm mains, a minimum of 18 inches of vertical clearance** from the bottom of any city utility to the top of the proposed installation must be maintained unless specific written approval from the City has been received. For sanitary sewer mains, the clearance must be maintained above the main.
10. **For storm and sewer mains, a minimum of 5 feet of horizontal clearance** from the edge of any city utility to the edge of the proposed installation must be maintained unless specific written approval from the City has been received.

11. If locations of proposed installations need to be changed to meet clearance requirements, the applicant is responsible for any redesign. Any redesign must be approved by the City of Bothell.
12. Inspection is provided only between 8:00 a.m. and 4:00 p.m., Monday through Friday. Work in the right-of-way may not be done outside these hours without special prior arrangement.
13. Lane closures on any arterial or collector street are limited to 9am to 3pm, Monday through Friday. No non-emergency work is allowed on City holidays unless otherwise approved in writing.
14. The Applicant/Contractor shall apply traffic control plans 701 to 713 of the City of Bothell Design and Construction Standards and Specifications and/or section K "Traffic Control Plans" of WSDOT Standard Plans for Road, Bridge and Municipal Construction.
15. A minimum of one traffic lane shall be open at all times for police and fire apparatus emergency access. Full road closure is not allowed without prior written approval by the City of Bothell.
16. Applicant shall maintain unimpeded access to fire hydrants and driveways for emergency vehicles.
17. Pavement removed in conjunction with this permit must be replaced in accordance with the City of Bothell Standard Detail #317, "Pavement Patch Detail". Subbase repair shall be per detail 470. Note that the final perimeter of the pavement patch area is to be **saw cut**.
18. If a portion of the sidewalk or curb and gutter is impacted, the entire portion between expansion joints must be replaced in conformance with the current city standards.
19. Temporary erosion control measures shall be employed to protect adjacent property and storm drain facilities.
20. For projects with street cuts and directional boring or hole hogging, the contractor must do a video inspection of the City owned sanitary sewer line before any work is done and do a video inspection of the sanitary sewer line and the storm drainage line after the work is done. The recording must be provided to the City construction inspector for review prior to final inspection. Any damages to the City storm or sewer line must be fixed prior to the final inspection of the permit.



**PUBLIC WORKS RIGHT-OF-WAY PERMIT  
For Franchise Utilities and Telecoms**

City of Kirkland Public Works  
123 5th Avenue  
Kirkland, WA 98033  
(425) 587-3800

**Electronic**

Permit Number: PUB23-09238

**Permit Information**

<b>Job Address:</b> ROW 116TH AVE NE / 15500 BLOCK	<b>Issue Date:</b> 01/16/2024
<b>Parcel:</b>	<b>Expiration Date:</b> 09/30/2024

**Scope of Work**

Work Order #: See Description  
Right of way permit to Install new underground control valve vault that will allow connection of two different pressure zone of Northshore Utility District water main. This work will include installation of the vault, trenching and installation of water main to connect to vault, installation of an associated above ground electrical panel and canopy, trenching for PSE power line to panel, trenching for vault drain connecting to existing sewer manhole, and restoration of site, including minor paving for installation of vault drain. This work will be on a site where existing water main goes from Kirkland, under i-405 and only changes how this connection will be able to function.

**Contacts**

<u>Type</u>	<u>Name</u>	<u>Address</u>	<u>Phone</u>
Applicant	GRAY & OSBORNE INC. PATRICK SMILEY		B: 20628408601117 C:
Franchise Utility/Telecom	NORTHSHORE UTILITY DISTRICT GEORGE MATOTE	6830 NE 185TH ST KENMORE, WA 98028	B: 425-398-4400, Ext #121

**Fees**

	<u>Fee Amount</u>	<u>Amount Due</u>
PW - ROW Insp (Standard)*	\$661.00	\$661.00
MyBuildingPermit.com PW Surcharge	\$23.14	\$23.14
<b>Amount to be billed:</b>		<b>\$684.14</b>

**Inspections**

**JOB START NOTIFICATION MUST BE AT LEAST 48 HOURS PRIOR.** Requests for the job start notification or other inspections must be by 6 pm on the day prior to the notification/inspection. The notification/inspection should be requested online by using [www.mybuildingpermit.com](http://www.mybuildingpermit.com).

**FINAL INSPECTION REQUIRED.** After the work has been completed, including final restoration, a Final inspection is required to close out the permit. Requests for the final inspection must be by 6 pm of the day prior to the inspection. The inspection should be requested online by using [www.mybuildingpermit.com](http://www.mybuildingpermit.com).



Permit Number: PUB23-09238

## General Conditions

All work to be done in accordance with the ordinances of the City of Kirkland and the rules and regulations of the Public Works Department.

A minimum of 5' horizontal and 18" vertical separation from all water, sewer, and storm mains is required. Minimum 36" depth is required. All utilities must be potholed for crossings.

All construction activity within the public right-of-way shall have traffic control signing and flagging per the standards within the Manual on Uniform Traffic Control Devices (MUTCD). The Public Works Inspector may place a "Stop Work Order" on any construction activity within the public right-of-way which fails to conform to the MUTCD.

No steel sheets are allowed in right-of-way over weekend or on city closure days. Sheets must be removed and asphalt patching in place before 3 pm Friday.

No utility work in the right-of-way after 12:00 pm on Fridays; restoration only.

If sidewalks or crosswalks are blocked, provide advance warning to pedestrians 1) "Sidewalk/Crosswalk Closed Ahead, Use Other Side" to be placed at the nearest crossings on either side of the work zone, so that pedestrians can safely cross to the other side, and 2) "Sidewalk Closed" on either side of closed sidewalk zone. **DO NOT BLOCK THE SIDEWALK WITH EQUIPMENT OR TRAFFIC CONTROL SIGNS** unless you have a closure route in place.

If bike lanes are closed, provide advance warning to bicyclists. 1) "Bike Lane Closed Ahead" and 2) "Bikes Merge w/ Traffic".

Tree pruning of City street trees/ trees in the public right-of-way is to be performed by the PW City arborist unless otherwise noted. The Public Works arborist can be reached at 425-587-3908. Any tree fencing encountered must not be disturbed.

Adequate drainage protection must be provided for adjacent properties. Applicants must control runoff to ensure activities will not cause nuisance or adverse impact to adjacent private and public property. Streets and Storm Drains shall be kept Clean: Contractor is responsible for keeping streets clean and free of contaminants at all times and for preventing an illicit discharge (KMC 15.52) into the municipal storm drain system. If your construction project causes an illicit discharge to the municipal storm drain system, the City of Kirkland Storm Maintenance Division will be called to clean the public storm system, and other affected public infrastructure. The contractor, property owner, and any other responsible party may be charged all costs associated with the clean-up and may also be assessed monetary penalties (KMC 1.12.200). The minimum penalty is \$500. A Final Inspection of your Project will not be granted until all costs associated with the clean-up, and penalties are paid to the City of Kirkland.

Construction drainage control shall be maintained by the contractor and subject to periodic inspections. During the period from May 1 to September 30, all denuded soils must be covered within 7 days; between October 1 and April 30, all denuded soils must be covered within 12 hours. Additional erosion control measures may be required based on site and weather conditions. Exposed soils shall be stabilized at the end of the workday prior to a weekend, holiday, or predicted rain event.





Permit Number: PUB23-09238

**Permit Specific Conditions**

## **APPENDIX C**

### **OWNER-SUPPLIED CONTROL PANELS**



5015 208<sup>th</sup> St. SW, Suite 1-B  
Phone (425) 778-8280

Lynnwood, Washington 98036  
[www.qualitycontrolscorp.com](http://www.qualitycontrolscorp.com)

## Scope of Work and Quotation

January 3, 2024      Quote Number: Q4295B

To:                      Northshore Utility District

Project:                Northshore Utility 451 Zone Control Valve Facility

Reference:             Preliminary Electrical Drawings – dated 5/16/23

Bid Date:              TBD                      Bid Close:      NA

Terms:                 Net 30

FOB:                    Lynnwood, WA

Freight:                Prepaid and allowed

This quote is valid for 60 days

QCC is pleased to provide this quotation for the above referenced project. Quality Controls Corp. (QCC) provides services and materials, FOB Lynnwood, WA, complete, ready for installation and field termination by others. QCC's quoted price does not include tax or the cost to bond this project.

Please call me with any technical questions or if you have any questions concerning the pricing on this quotation.

Sincerely,

A handwritten signature in black ink that reads 'James T. Cross'.

James Cross

5015 – 208<sup>th</sup> Street S.W. Unit 1B      Lynnwood, Washington 98036  
Phone: 425.778.8280      Fax: 425.778.4541  
Email: [JamesC@Quality-Controls.com](mailto:JamesC@Quality-Controls.com)

## Clarifications and Exclusions

1. QCC specifically excludes that following material and services:
  - Equipment installation and field termination services
  - Field instruments and devices not integral to the control panels listed below.
  - Valves, valve actuators, solenoids, and valve position switches.
  - Backup private radio system hardware. To be provided as part of future radio system upgrade.
  
2. QCC provides the following unless specifically excluded on our bill of material:
  - Equipment shipped FOB factory with freight allowed, tailgate, destination.
  - Instruction manuals as required.
  - All necessary field start-up and calibration of the equipment we supply.
  
3. QCC does **NOT** provide the following unless specifically included in our bill of material:
  - Pipe, tubing, valves or fittings between the instrument and the process.
  - Conduit, wire or cable not integral to instrument or control panels supplied by QCC.
  - Mounting brackets, stanchions, supports or mounting pads not an integral part of the instrument.
  - Labor to install the equipment.
  - The Cost, (if due to local union regulations), to have local craftsman make adjustments or wiring modifications to our equipment during start-up and calibration.
  - Any material or services not in our quoted sections.

## Pricing

Total Price for the Scope of Work Detailed Below:

**\$ 139,920.00**

## Scope of Work

1. QCC supplies the following control panels for installation and field termination by others:

- **Control Panel 01 CP 01**, UL listed complete, including the following major components:
  - NEMA 4/12 steel enclosure- Wall mount.
  - Qty 1 x Panel light, LED door activated.
  - Qty 1 x Door mounted receptacle/RJ45 programming port.
  - Qty 1 x Door mounted laptop shelf.
  - Qty 1 x Control power main breaker- 120VAC, 1-pole, 20A
  - Qty 6 x 120VAC branch circuit protection breakers, 120VAC, 1-pole
  - Qty 1 x 24VDC uninterruptable power supply, includes battery.
  - Qty 1 x Industrial ethernet switch, managed, Ntron 708Tx.
  - Qty 1 x Programmable logic Controller, PLC – Allen Bradley CompactLogix 5780, with following IO includes 20% installed spares:
    - a. Qty 32 x Discrete Inputs, 24VDC
    - b. Qty 8 x Discrete Outputs, 24VDC
    - c. Qty 8 x Analog Inputs, 24VDC
  - Qty 1 x Operator Interface Terminal (OIT) – Automation Direct 10” touch screen.
  - Pilot Devices:
    - a. 01 FCV 01-
      - i. 3-position switch – “Open – Auto – Close”
  - Qty 1 x Cradlepoint IBR650C cellular router, din rail mounted.
  - Qty 2 x LTE MIMO Antenna assembly – remote mounted configuration for exterior building mounted antenna.
  - Qty 1 x Radio Antenna, TVSS, and Antenna cable for future radio installation.
  - Qty AR x Relays, timers, terminals, labels, nameplates, wire, etc.
- **Enclosure - 02 CP 01**, UL listed complete, including the following major components:
  - NEMA 4X Utility Enclosure, Skyline custom aluminum housing.
    - a. Pad mounted Aluminum NEMA 3R- Separate utility entrance section and controls sections. Independent 3-point latch hasp style locking doors.
  - Qty 1 x Utility meter base, 240VAC 1ph, 10KAIC
  - Qty 1 x Panelboard, 240/120VAC 3ph, 3W, 100A Service Entrance Rated
    - a. Qty 1 x Main Breaker, 240VAC, 2P, 100A
    - b. Qty 1 x SPD 240/120VAC 2P, 22.5kA
    - c. Qty 4 x Circuit breakers, 20A, 1P

Control Panel 02 CP 01 – Including the following major components:

- NEMA 4/12 steel enclosure- Wall mount.
- Qty 1 x Panel light, LED door activated.
- Qty 1 x Door mounted receptacle/RJ45 programming port.

- Qty 1 x Door mounted laptop shelf.
- Qty 1 x Control power main breaker- 120VAC, 1-pole, 20A
- Qty 4 x 120VAC branch circuit protection breakers, 120VAC, 1-pole
- Qty 1 x 24VDC uninterruptable power supply, includes battery.
- Qty 1 x Industrial ethernet switch, managed, Ntron 708Tx.
- Qty 1 x Programmable logic Controller, PLC – Allen Bradley CompactLogix 5780, with following IO includes 20% installed spares:
  - a. Qty 16 x Discrete Inputs, 24VDC
  - b. Qty 8 x Discrete Outputs, 24VDC
  - c. Qty 8 x Analog Inputs, 24VDC
- Qty 1 x Operator Interface Terminal (OIT) – Automation Direct 10” touch screen.
- Pilot Devices:
  - a. 02 FCV 01-
    - i. 3-position switch – “Open – Auto – Close”
- Qty 1 x Cradlepoint IBR650C cellular router, din rail mounted.
- Qty 2 x LTE MIMO Antenna assembly – remote mounted configuration for exterior enclosure mounted antenna.
- Qty 1 x Radio Antenna, TVSS, and Antenna cable for future radio installation.
- Qty AR x Relays, timers, terminals, labels, nameplates, wire, etc.

All control panels supplied by QCC will be UL listed and contain all required components and sub-assemblies.

2. QCC provides the required configuration and programming required for a fully functional SCADA and telemetry system. Includes programming of control panel PLCs, OITs, telemetry configuration, and SCADA application updates.
3. QCC supplies field start-up, instrument calibration, and training as required for all equipment included in this scope of work.
4. QCC provides Bill of Materials and Operation and Maintenance manuals for all equipment included in this scope of work.

**APPENDIX D**

**SUPPLEMENTAL BIDDER  
CRITERIA CHECKLIST**

**APPENDIX D**

**SUPPLEMENTAL BIDDER RESPONSIBILITY CRITERIA FORMS  
451 ZONE CONTROL VALVE FACILITY AND CONTROL VALVE VAULT**

**These forms shall be completed in their entirety and submitted by the apparent two lowest Bidders to the Northshore Utility District by 12:00 p.m. (noon) of the second business day following the bid submittal deadline.**

Failure to submit and meet the requirements as stated in Section 1.12 of the Instructions to Bidders shall be grounds for rejection of the bid. The Northshore Utility District will be the sole judge in determining if the prospective contractor meets the minimum experience requirements.

Contractor:

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_

Contact Person: \_\_\_\_\_

**2. Delinquent State Taxes**

Instructions to Bidders: Check the appropriate box

- The Bidder does not owe delinquent taxes to the Washington State Department of Revenue.
- Alternatively, the Bidder does owe delinquent taxes to the Washington State Department of Revenue.

If the Bidder owes delinquent taxes, they must submit a written payment plan approved by the Department of Revenue, to the Contracting Agency.

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Print Name)

\_\_\_\_\_  
(Title)



**3. Subcontractor Responsibility:**

Instructions to Bidders: Check all boxes that apply

- The Bidder's standard subcontract form includes the subcontractor responsibility language required by RCW 39.06.020.
- The Bidder has a procedure for validating the responsibility of subcontractors with which the Bidder contracts.
- The Bidder's subcontract form includes a requirement that each of its subcontractors shall have and document a similar procedure to determine whether the sub-tier subcontractors with whom it contracts are also "responsible" subcontractors as defined by RCW 39.06.020.

If the Bidder is unable to check all of the above boxes, provide an explanation as to how the bidder will comply with RCW 39.06.020.

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Print Name)

\_\_\_\_\_  
(Title)

**4. Claims Against Retainage and Bonds:**

Instructions to Bidders: Check the appropriate box

- The Bidder has not had claims against retainage and bonds in the 3 years prior to the bid submittal date.
- Alternatively, the Bidder has had claims against retainage and bonds in the 3 years prior to the bid submittal date.

If the Bidder has had claims against retainage and bonds in the 3 years prior to the bid submittal date, submit a list of public works projects completed during this period that have had claims against retainage and bonds and include name of Project, contact information for the Owner, a list of claims filed against retainage and/or payment bond for any of the projects listed; and a written explanation of circumstances surrounding each claim and the ultimate resolution of the claim.

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Print Name)

\_\_\_\_\_  
(Title)

**5. Public Bidding Crime:**

Instructions to Bidders: Check the appropriate box

- The undersigned certifies that the Bidder and/or its Owners have not been convicted of a crime involving bidding on a public works contract in the 5 years prior to the bid submittal date.
  
- Alternatively, the undersigned confirms that the Bidder and/or its Owners have been convicted of a crime involving bidding on a public works contract in the 5 years prior to the bid submittal date.

If the Bidder and/or its Owners have been convicted of a crime involving bidding on a public works contract, provide a written explanation identifying the date of the conviction and a description of the circumstances surrounding the conviction.

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Print Name)

\_\_\_\_\_  
(Title)

**6. Termination for Cause/Termination for Default**

Instructions to Bidders: Check the appropriate box

- The undersigned certifies that the Bidder has not had any public works contracts terminated for cause or terminated for default by a government agency in the 5 years prior to the bid submittal date.
  
- Alternatively, the undersigned confirms that the Bidder has had public works contracts terminated for cause or terminated for default by a government agency in the 5 years prior to the bid submittal date.

If the Bidder has had any public works contracts terminated for cause or terminated for default in the 5 years prior to the bid submittal date, provide a written explanation for all contracts terminated for cause or terminated for default by identifying the project contract that was terminated, the government agency which terminated the Contract, the date of the termination, and a description of the circumstances surrounding the termination.

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Print Name)

\_\_\_\_\_  
(Title)

**7. Lawsuits**

Instructions to Bidders: Check the appropriate box

- The undersigned certifies that the Bidder has not had any lawsuits with judgments entered against the Bidder in the 5 years prior to the bid submittal date that demonstrate a pattern of failing to meet the terms of contracts.
  
- Alternatively, the undersigned confirms that the Bidder has had any lawsuits with judgments entered against the Bidder in the 5 years prior to the bid submittal date that demonstrate a pattern of failing to meet the terms of contracts.

If the Bidder has had any lawsuits with judgments entered against the Bidder in the 5 years prior to the bid submittal date that demonstrate a pattern of failing to meet the terms of contracts, submit a list of lawsuits along with a written explanation of the circumstances surrounding each lawsuit. The Contracting Agency shall evaluate these explanations to determine whether the lawsuits demonstrate a pattern of failing to meet the terms of contracts.

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Print Name)

\_\_\_\_\_  
(Title)

**8. Contract Time (Liquidated Damages)**

Instructions to Bidders: Check the appropriate box

- The undersigned certifies that the Bidder has not had liquidated damages assessed on any project it has completed in the 5 years prior to the bid submittal date.
  
- Alternatively, the undersigned confirms that the Bidder has had liquidated damages assessed on projects in the 5 years prior to the bid submittal date.

If the Bidder has had liquidated damages assessed against projects in the 5 years prior to the bid submittal date, submit a list of projects along with Owner contact information, and number of days assessed liquidated damages. The Contracting Agency shall determine whether the Contractor has a pattern of failing to complete projects within Contract Time.

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Print Name)

\_\_\_\_\_  
(Title)

**9. Capacity and Experience**

The Bidder shall have sufficient current capacity and the project superintendent assigned to the project shall have experience to meet the requirements of this project. The Bidder and the project superintendent shall have successfully completed at least two projects as the prime contractor, of a similar size, scope, and complexity during the 5-year period immediately preceding the bid submittal deadline for this project. Similar size is defined as a minimum of 70 percent of the bid amount submitted by the Bidder, as well as having elements of earthwork, pipeline installation of depths requiring shoring, building construction, and soldier pile wall construction.

**A. Capacity**

i. Gross dollar amount of work currently under contract:

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ii. Gross dollar amount of contracts currently not completed:

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iii. List five major pieces of equipment which are anticipated to be used on this project by the Contractor and note which items are owned by the Contractor and which are to be leased or rented from others:

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iv. Number of superintendents on Bidder's staff:

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B. Experience

i. General character of work performed by firm:

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ii. Identify who will be the superintendent on this project and years of experience. Also, list the number of years this person has been with your firm.

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iii. Similar Size and Scope Projects Completed in the Past 5 Years

#1 Owner's Name and Contact Information: \_\_\_\_\_

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Owner is a Government Agency? \_\_\_ Yes \_\_\_ No

Superintendent's Name: \_\_\_\_\_

Project Name: \_\_\_\_\_

Awarded Contract Amount: \_\_\_\_\_

Final Contract Amount: \_\_\_\_\_

Completion Date: \_\_\_\_\_

Project Description: \_\_\_\_\_

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#2 Owner's Name and Contact Information: \_\_\_\_\_

\_\_\_\_\_

Owner is a Government Agency? \_\_\_ Yes \_\_\_ No

Superintendent's Name: \_\_\_\_\_

Project Name: \_\_\_\_\_

Awarded Contract Amount: \_\_\_\_\_

Final Contract Amount: \_\_\_\_\_

Completion Date: \_\_\_\_\_

Project Description: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

#3 Owner's Name and Contact Information: \_\_\_\_\_

\_\_\_\_\_

Owner is a Government Agency? \_\_\_ Yes \_\_\_ No

Superintendent's Name: \_\_\_\_\_

Project Name: \_\_\_\_\_

Awarded Contract Amount: \_\_\_\_\_

Final Contract Amount: \_\_\_\_\_

Completion Date: \_\_\_\_\_

Project Description: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_