CITY OF SELAH

PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS

HLA PROJECT NO. 23166

Construction Specifications & Bid Documents

JULY 2026

HLA

CITY OF SELAH, WASHINGTON

CONTRACT DOCUMENTS

FOR

PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS



HLA PROJECT NO. 23166

CONTRACTING AGENCY:

City of Selah
115 W. Naches Avenue
Selah, WA 98942

ENGINEER:

HLA Engineering and Land Surveying, Inc. (HLA)
2803 River Road
Yakima, WA 98902

FUNDING AGENCY:

Department of Commerce
State Appropriation
1011 Plum Street SE
Olympia, WA 98504

JULY 2026

CITY OF SELAH
YAKIMA COUNTY, WASHINGTON

CONTRACT DOCUMENTS
FOR

PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS

HLA PROJECT NO. 23166

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SECTION 1 - ADVERTISEMENT FOR BIDS

ADVERTISEMENT FOR BIDS

City of Selah
115 W. Naches Avenue
Selah, WA 98942

The City of Selah invites separate sealed BIDS for the construction of the Phase 2 - Wastewater Treatment Plant Improvements, HLA Project No. 23166 including the following approximate major quantities of work:

> Modification and extension of Selah's wastewater treatment plant solids handling building including installation of new biosolids dewatering and drying equipment, new sludge and polymer feed pumps, and rerouting internal and site piping. Project also includes enclosing the existing truck loading bay, including a pre-engineered metal building, and constructing a new truck loading bay on south side of the solids handling building.

This contract has two-hundred and sixty (260) working days to complete the work.

Bids will be received by the City Clerk at City Hall, 115 W. Naches Avenue, Selah, WA 98942, until 1:00 p.m., July 30, 2026, and then shortly thereafter will be publicly opened and read aloud at the City Council Chambers located at 115 W. Naches Avenue.

CONTRACT DOCUMENTS may be obtained at the following website: https://www.hlacivil.com/bid/. Planholder list and addenda will be available on the website. Bidders are encouraged to register as planholders on the website, whom will be added to the Planholder list and will receive automatic addenda notification. All questions should be directed to Robert J. Scott, PE, at (509) 966-7000 or rscott@hlacivil.com.

A pre-bid conference will be held at the project site, 260 S. Rushmore Road, Selah WA 98942 at 10:00 a.m., July 16, 2026. Prospective bidders are encouraged to attend the pre-bid conference, but bids may be submitted without attending the meeting.

Each bid or proposal must be accompanied by bond or a certified check, payable to the order of the Treasurer of the City of Selah for the sum of not less than 5% of said bid or proposal and none will be considered unless accompanied by such deposit, to be forfeited to the City of Selah in the event the successful bidder shall fail or refuse to enter into a Contract with the City for the making and construction of the aforesaid improvement. All bids or proposals must be in writing on the form bound in the Specifications, sealed and filed with the Clerk on or before the day and hour above mentioned.

The City of Selah, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

This project is subject to the apprentice utilization requirements of RCW 39.04.320. The successful bidder shall comply with all applicable apprenticeship requirements, including the utilization of registered apprentices for not less than fifteen percent (15%) of the labor hours worked by workers in apprenticeable occupations, unless otherwise exempted by law. Bidders are responsible for reviewing the Contract Documents for complete apprenticeship requirements and reporting obligations.

Attention is called to the fact that not less than the minimum salaries and wages as set forth in the Contract Documents must be paid on this project, and that the Contractor must ensure that employees and applicants for employment are not discriminated against because of their race, color, religion, sex, or national origin.

The City of Selah reserves the right to reject any and all bids and to waive technicalities or irregularities, and after careful consideration of all bids and factors involved, make the award to best serve the interests of the City of Selah.

Courtney McGarity
City Clerk

Publish: July 7, 2026

SECTION 2 - INFORMATION FOR BIDDERS

INFORMATION FOR BIDDERS

BIDS will be received by the City of Selah (herein called the "CONTRACTING AGENCY"), at City Hall, 115 W. Naches Avenue, Selah, WA 98942, until 1:00 p.m., July 30, 2026, and then at the City Council Chambers publicly opened and read aloud.

Each BID must be submitted in a sealed envelope, addressed to the City Clerk at 115 W. Naches Avenue, Selah, WA 98942. Each sealed envelope containing a BID must be plainly marked on the outside as BID for Phase 2 - Wastewater Treatment Plant Improvements, and the envelope should bear on the outside the BIDDER'S NAME, address, and license number if applicable, and the name of the project for which the BID is submitted. If forwarded by mail, the sealed envelope containing the BID must be enclosed in another envelope addressed to the CONTRACTING AGENCY at City Hall, 115 W. Naches Avenue, Selah, WA 98942.

All BIDS must be made on the required BID form. All blank spaces for BID prices must be filled in, in ink or typewritten, and the original BID form must be fully completed and executed when submitted. Only one copy of the BID form is required.

The CONTRACTING AGENCY may waive any informalities or minor defects or reject any and all BIDS. Any BID may be withdrawn prior to the above scheduled time for the opening of BIDS or authorized postponement thereof. Any BID received after the time and date specified shall not be considered. Should there be reasons why the Contract cannot be awarded within the specified period, the time may be extended by mutual agreement between the CONTRACTING AGENCY and the BIDDER.

BIDDERS must satisfy themselves of the accuracy of the estimated quantities in the BID SCHEDULE by examination of the site and a review of the Drawings and Specifications including ADDENDA. After BIDS have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the quantities of WORK or of the nature of the WORK to be done.

The CONTRACT DOCUMENTS contain the provisions required for the construction of the PROJECT. Information obtained from an officer, agent, or employee of the CONTRACTING AGENCY or any other person shall not affect the risks or obligations assumed by the CONTRACTOR nor relieve the CONTRACTOR from fulfilling any of the conditions of the Contract.

Each BID must be accompanied by an original BID BOND payable to the CONTRACTING AGENCY for five percent of the total amount of the BID. When the Agreement is executed, the bonds of the unsuccessful BIDDERS will be returned. The BID BOND of the successful BIDDER will be retained until the CONTRACT BOND has been executed and approved, after which it will be returned. A certified check may be used in lieu of a BID BOND.

A CONTRACT BOND in the amount of 100 percent of the CONTRACT PRICE, with a corporate Surety approved by the CONTRACTING AGENCY, will be required for the faithful performance of the Contract.

Attorneys-in-fact who sign BID BONDS or CONTRACT BONDS must file with each BOND a certified and effective dated copy of their Power of Attorney.

The party to whom the Contract is awarded will be required to execute the Agreement and obtain the CONTRACT BOND within ten (10) working days from the date when NOTICE OF AWARD is delivered to the BIDDER. The NOTICE OF AWARD shall be accompanied by the necessary Agreement and BOND forms. In case of failure of the BIDDER to execute the Agreement, the CONTRACTING AGENCY may consider the BIDDER in default, in which case the BID BOND accompanying the proposal shall become the property of the CONTRACTING AGENCY.

The CONTRACTING AGENCY may make such investigations as deemed necessary to determine the ability of the BIDDER to perform the WORK, and the BIDDER shall furnish to the CONTRACTING AGENCY all such information and data for this purpose as the CONTRACTING AGENCY may request. The CONTRACTING AGENCY reserves the right to reject any BID if the evidence submitted by, or investigation of, such BIDDER fails to satisfy the CONTRACTING AGENCY that such BIDDER is properly qualified to carry out the obligations of the Agreement and to complete the WORK contemplated therein.

A conditional or qualified BID will not be accepted.

Award will be made to the lowest responsive, responsible BIDDER or all bids will be rejected.

All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the PROJECT shall apply to the Contract throughout.

Each BIDDER is responsible for inspecting the site and for reading and being thoroughly familiar with the CONTRACT DOCUMENTS. The failure or omission of any BIDDER to do any of the foregoing shall in no way relieve any BIDDER from any obligation in respect to its BID.

The low BIDDER shall supply the names and addresses of major material SUPPLIERS and SUBCONTRACTORS when required to do so by the CONTRACTING AGENCY.

Contract time for this project is anticipated to begin by SEPTEMBER 8, 2026. However, a contract suspension for long-lead material procurement may be considered at the Engineer’s discretion.

The ENGINEER is HLA Engineering and Land Surveying, Inc. (HLA), represented by Robert J. Scott, PE. The ENGINEER'S address is 2803 River Road, Yakima, Washington 98902, PHONE: (509) 966-7000, EMAIL: rscott@hlacivil.com..

SECTION 3 - BID PACKAGE

BIDDER'S CHECKLIST

All forms listed below must be fully executed and submitted with the Bid:

1) BID PROPOSAL
2) UNIT PRICE BID PROPOSAL
3) MAJOR EQUIPMENT ITEMS AND PRODUCTS
4) BID PROPOSAL SIGNATURE PAGE - Executed by authorized signatory in accordance with 1-02.6.
5) AUTHORIZED SIGNATURES (DOT FORM 420-007)
6) BID DEPOSIT or BID BOND

   BID DEPOSIT - Sign the Bid Deposit in the space provided if the bid is accompanied by a certified check or cashier's check in the amount of not less than 5% of the total amount bid.

   OR

   BID BOND - This form is to be executed by the bidder and Surety Company. The amount of this bond shall be not less than 5% of the total amount bid and may be shown in dollars or on a percentage basis. Provide Power of Attorney for Surety's agent.

7) NON-COLLUSION AFFIDAVIT - Must be subscribed and sworn to before a Notary Public.
8) SURETY
9) SUBCONTRACTOR LIST
10) LIST OF REFERENCES
11) CERTIFICATION OF COMPLIANCE WITH WAGE PAYMENT STATUTES

The following form must be fully executed and submitted by 12:00 P.M. (noon) of the second business day following the bid submittal deadline.

1) SUPPLEMENTAL BIDDER RESPONSIBILITY CRITERIA STATEMENT - Provide supporting documentation as required.

The following forms are to be executed and/or submitted for approval to the Engineer after the Contract is awarded:

1) CONTRACT - To be executed by the successful bidder and the City of Selah.
2) CERTIFICATIONS
3) CONTRACT BOND - To be executed by the successful bidder and his Surety Company. Provide Power of Attorney.
4) SCHEDULE OF WORKING HOURS
5) CERTIFICATE OF PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE and contractually required endorsements must be provided by the successful bidder in accordance with the provisions of the Standard Specifications and Technical Specifications.
6) APPRENTICE UTILIZATION PLAN – For contracts subject to the apprentice utilization requirements of RCW 39.04.320, the successful bidder shall submit an Apprentice Utilization Plan to the Engineer and obtain approval from the Contracting Agency prior to issuance of the Notice to Proceed, in accordance with RCW 39.04.350(3)(a) and (b). The Plan shall be submitted on the form prescribed by the Washington State Department of Labor & Industries, when available.

BID PROPOSAL

A Proposal of _____ (hereinafter called "BIDDER"), organized and existing under the laws of the State of Washington doing business as _____[1]. To the City of Selah, Washington, (hereinafter called "CONTRACTING AGENCY").

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all work for the construction of the PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS, HLA Project No. 23166, in strict accordance with the CONTRACT DOCUMENTS, within the time set forth therein, and at the prices stated below.

By submission of this BID, each BIDDER certifies, in the case of a joint BID each party thereto certifies as to its own organization, that this BID has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this BID with any other BIDDER or with any competitor.

BIDDER hereby agrees to commence work under this Contract within ten (10) calendar days after NOTICE TO PROCEED and to fully complete the PROJECT within two hundred and sixty (260) working days of such NOTICE TO PROCEED.

BIDDER further agrees to pay as liquidated damages the sum specified for each working day thereafter as provided in Section 1-08.9 of the Standard Specifications.

BIDDER acknowledges receipt of the following ADDENDA:

_____

_____

_____

Addenda will be posted on the Engineer's website: https://www.hlacivil.com/bid/. Bidders are encouraged to register as planholders on the website, whom will be added to the Planholder list and will receive automatic addenda notification.

BIDDER agrees to perform all the work described in the CONTRACT DOCUMENTS for the following unit prices or lump sum amounts:

[1] Insert "a corporation," "a partnership," or "an individual" as applicable.

UNIT PRICE BID PROPOSAL

CITY OF SELAH
PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS
HLA PROJECT NO. 23166

ITEM NO.	ITEM DESCRIPTION	UNIT	QUAN-TITY		UNIT PRICE DOLLARS-CTS		AMOUNT DOLLARS-CTS
1	Minor Change	FA	Est.	X	$50,000.00	=	$50,000.00
2	Apprenticeship Incentive/Penalty	Calc	Est.	X	$2,000.00	=	$2,000.00
3	Mobilization	LS	---	X	---	=	
4	Indirect Dryer and Ancilliary Equipment - Installed	LS	---	X	---	=	
5	Centrifuge and Ancilliary Equipment - Installed	LS	---	X	---	=	
6	New Building	LS	---	X	---	=	
7	Building Modifications	LS	---	X	---	=	
8	Site Grading and Paving	LS	---	X	---	=	
9	Site Piping, Fittings, and Valves, Complete	LS	---	X	---	=	
10	Electrical and Control System	LS	---	X	---	=	
					BID SUBTOTAL		
					8.5% STATE SALES TAX		
					BID TOTAL		

MAJOR EQUIPMENT ITEMS AND PRODUCTS

CITY OF SELAH
PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS
HLA PROJECT NO. 23166

In connection with the major equipment items and products to be furnished and installed for this project, the Bidder expressly agrees to the provisions of Section 01 25 50 – Substitution of Major Equipment Items and Products and to the following:

1. That the TOTAL BID PRICE stated hereinbefore includes only the installed prices for major equipment items or products of manufacturers listed as “Basis of Bid” in Column 1 of Table 1.

2. That Bidders desiring to offer price quotes for substitute major equipment items or products may at their option fill in the name of one manufacturer on the line listed as “Alternate” in Column 2 of Table 1, and provide the installed price of each proposed “Alternate” major equipment item or product on an installed basis in the space provided.

3. That all installed prices stated in Both Column 1 and Column 2 of Table 1 include the preparation and submittal of detailed shop drawings showing all modifications, if any, to the Construction Plans necessary to accommodate such equipment and, furthermore, that all installed costs stated on Table 1 include a complete operating installation, and the furnishing and installing of any and all changes or additions in structures, piping, buildings, mechanical and electrical work, accessories, and controls necessary to accommodate the equipment or product.

4. That all proposed “Alternate” major equipment items or products listed in Table 1 are of equal quality and function to the identified “Basis of Bid” major equipment items and products, and that the proposed “Alternate” major equipment items or products will perform satisfactorily and continuously.

5. That the undersigned agrees to furnish and install such major equipment items or products for a contract price equal to the TOTAL BID PRICE, including tax, adjusted by the sum of the differences between the installed price as stated on Table 1 for each “Basis of Bid” major equipment item or product (Column 1) and the installed price for each “Alternate” major equipment item or product (Column 2) proposed by the Bidder and accepted as “or equal” by the Engineer.

6. That, if awarded a Contract on this project, all major equipment items or products be guaranteed by the undersigned and his Surety to meet the performance requirements of the Contract Documents.

TABLE 1 – TABULATION OF MAJOR EQUIPMENT ITEMS AND PRODUCTS

Spec Section	Description	Column 1		Column 2	
		“Basis of Bid” Manufacturer	Installed Price	“Alternate” Manufacturer	Installed Price
43 21 00	Positive Displacement Rotary Lobe Pumps	Vogelsang			
46 33 33	Polymer Blending and Feed Equipment	CleanWater1			
46 76 28	Dried Sludge Conveyors	JDV Equipment Corporation			
46 76 33	Centrifuge	Flottweg			
46 76 71	Indirect Biosolids Drying System	BCR			

NOTE: The installed prices of all “Basis of Bid” major equipment items or products must be written in the space provided. Failure to furnish the installed price for each “Basis of Bid” major equipment item or product may be cause for rejection of the bid. If the Bidder proposes to offer an “Alternate” major equipment item or product, both the manufacturer’s name and the installed price of the equipment must be written in the space provided. Where more than one “Basis of Bid” Manufacturer is listed, the Contractor shall circle the name of the manufacturer for which the installed price is submitted. The prices in Table 1 should not include state sales tax.

BID PROPOSAL SIGNATURE PAGE

CITY OF SELAH
PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS
HLA PROJECT NO. 23166

_____ _____, 2026
BIDDER (CONTRACTOR) DATE

BY _____ _____
AUTHORIZED OFFICIAL'S SIGNATURE TITLE

_____
(Please print or type name)

Mailing Address:

_____ Phone: _____

_____

E-mail address:_____

CONTRACTOR LICENSE NUMBER _____

CONTRACTOR UEI NUMBER _____

CONTRACTOR UBI NUMBER _____

CONTRACTOR FEDERAL TAX I.D. NUMBER _____

CONTRACTOR EMPLOYMENT SECURITY DEPARTMENT NUMBER _____

CONTRACTOR INDUSTRIAL INSURANCE ACCOUNT NUMBER _____

The names of the principal officers of the corporation submitting this Proposal, or of the partnership, or of all persons interested in this Proposal as principals are as follows:

_____

_____

PROJECT MANAGER _____ CELL PHONE:_____

NOTES:

1) If the bidder is a co-partnership, so state, giving firm name under which business transacted. If the bidder is a corporation, this proposal must be executed by its duly authorized officials.

2) Bidders shall acknowledge receipt of all addenda, if any, in the space provided on the first page of this proposal.

Washington State Department of Transportation

Authorized Signatures

List the name and title of those individuals in your organization who are authorized to execute proposals, contracts, bonds and other documents and/or instruments on behalf of the organization. Specify if more than one signature is required.

NOTE: Signature must appear next to name

Name (Typed)	Signature	Title
Name (Typed)	Signature	Title
Name (Typed)	Signature	Title
Name (Typed)	Signature	Title
Name (Typed)	Signature	Title
Name (Typed)	Signature	Title
Name (Typed)	Signature	Title
Name (Typed)	Signature	Title
Name (Typed)	Signature	Title
Name (Typed)	Signature	Title
Name (Typed)	Signature	Title

The undersigned, being duly sworn, deposes and says that the foregoing is a true statement of facts concerning the individual, corpration, co-partnership or joint venture herein named, as of the date indicated:

Name of Firm - Be Exact

Sworn to before me this _____

day of _____ , _____

_____
Notary Public

Notary Seal

_____
Authorized Signature(s)

Corporate Seal(s)

BID DEPOSIT

CITY OF SELAH
PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS
HLA PROJECT NO. 23166

Herewith find deposit in the form of a certified check or cashier's check in the amount of $_____, which amount is not less than five percent (5%) of our total bid for this project.

Sign Here _____

OR

BID BOND

KNOW ALL PERSONS BY THESE PRESENTS:

That we _____, as Principal, and _____, as Surety, are held and firmly bound unto the CITY OF SELAH, as Obligee, in the penal sum of _____ Dollars, for the payment of which the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by these presents.

The condition of this obligation is such that if the Obligee shall make any award to the Principal for PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS, HLA Project No. 23166, according to the terms of the proposal or bid made by the Principal therefor, and the Principal shall duly make and enter into a Contract with the Obligee in accordance with 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 _____, 2026.

_____
Principal

_____
Surety

_____, 2026

NON-COLLUSION AFFIDAVIT

CITY OF SELAH
PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS
HLA PROJECT NO. 23166

STATE OF WASHINGTON)
) ss. NON-COLLUSION AFFIDAVIT
COUNTY OF _____)

_____, being first duly sworn, on oath says that the bid above submitted is a genuine and not a sham or collusive bid, or made in the interest or on behalf of any person not therein named; and the said bidder further says that the said bidder has not directly or indirectly induced or solicited any bidder on the above work or supplies to put in a sham bid, or any other person or corporation to refrain from bidding; and that said bidder has not in any manner sought by collusion to secure to themselves an advantage over any other bidder or bidders.

_____
(Contractor's Signature)

Signed and sworn to (or affirmed) before me on _____, 2026, by

_____.
Notary Public Name

_____
Notary Public Signature

My Appointment Expires _____

SURETY

CITY OF SELAH
PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS
HLA PROJECT NO. 23166

If the Bidder is awarded a construction Contract on this bid, the Surety who provides the Contract Bond will be

_____ whose address is:

_____

Street City State ZIP

SUBCONTRACTOR LIST

CITY OF SELAH
PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS
HLA PROJECT NO. 23166

To be Submitted with the Bid Proposal

Failure to list subcontractors with whom the bidder, if awarded the contract, will directly subcontract for performance of the work of structural steel installation, rebar installation, heating, ventilation and air conditioning, plumbing, as described in Chapter 18.106 RCW, and electrical, as described in Chapter 19.28 RCW or naming more than one subcontractor to perform the same work will result in your bid being non-responsive and therefore void.

Subcontractor(s) with whom the bidder will directly subcontract that are proposed to perform the work of structural steel installation, rebar installation, heating, ventilation and air conditioning, plumbing, as described in Chapter 18.106 RCW, and electrical as described in Chapter 19.28 RCW must be listed below. The work to be performed is to be listed below the subcontractor(s) name.

To the extent the Project includes one or more categories of work referenced in RCW 39.30.060, and no subcontractor is listed below to perform such work, the bidder certifies that the work will either (i) be performed by the bidder itself, or (ii) be performed by a lower tier subcontractor who will not contract directly with the bidder.

Subcontractor Name _____
Work to be performed _____
_____
_____
_____

Subcontractor Name _____
Work to be performed _____
_____
_____
_____

Subcontractor Name _____
Work to be performed _____
_____
_____
_____

Subcontractor Name _____
Work to be performed _____
_____
_____
_____

Subcontractor Name _____
Work to be performed _____
_____
_____
_____

* Bidder's are notified that it is the opinion of the enforcement agency that PVC or metal conduit, junction boxes, etc, are considered electrical equipment and therefore considered part of electrical work, even if the installation is for future use and no wiring or electrical current is connected during the project.

LIST OF REFERENCES

CITY OF SELAH
PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS
HLA PROJECT NO. 23166

List all projects of a similar nature completed by the BIDDER during the previous five (5) years. Similar projects are considered to be those projects with a contract amount of not less than 50 percent of the amount bid on this project with the type of construction, materials, and methods necessary for completion of this project. Provide name of contact person and phone number. Failure to complete this List of References may be cause for rejection of the BID.

Previous Similar Projects	Contact Person	Phone Number
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

CERTIFICATION OF COMPLIANCE WITH WAGE PAYMENT STATUTES

CITY OF SELAH
PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS
HLA PROJECT NO. 23166

Failure to return this certification as part of the Bid Proposal package will make this Bid nonresponsive and ineligible for Award.

I hereby certify, under penalty of perjury under the laws of the State of Washington, on behalf of the firm identified below that, to the best of my knowledge and belief, this firm has NOT been determined by a final and binding citation and notice of assessment issued by the Washington State Department of Labor and Industries or through a civil judgment entered by a court of limited or general jurisdiction to have willfully violated, as defined in RCW 49.48.082, any provision of RCW chapters 49.46, 49.48, or 49.52 within three (3) years prior to the date of the Call for Bids.

OFFICIAL AUTHORIZED TO SIGN FOR BIDDER:

Bidder Name: _____
Name of Contractor/Bidder – Print full legal entity name of firm

_____ _____
Signature of Authorized Person *Date*

_____ _____
Print Name and Title *Location or Place Executed (City, State)*

SUPPLEMENTAL BIDDER RESPONSIBILITY CRITERIA STATEMENT

CITY OF SELAH
PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS
HLA PROJECT NO. 23166

This form shall be completed in its entirety and submitted by the apparent low Bidder to the Contracting Agency by 12:00 P.M. (noon) of the second business day following the bid submittal deadline.

Bidder will be deemed not responsible if Bidder does not meet the mandatory bidder responsibility criteria in RCW 39.04.350(1), as amended, or supplemental bidder responsibility criteria listed in Section 1-02.14 of the Special Provisions, including submission of further documentation as may be requested by the Contracting Agency.

Contractor:

Name: _____

Address: _____

Phone: _____

Contact Person: _____

1. **Delinquent State Taxes:**

   Instruction to Bidders: Check the appropriate box

   ☐ The undersigned certifies that the Bidder does not owe delinquent taxes to the Washington State Department of Revenue without a payment plan approved by the Department of Revenue.

   ☐ Alternatively, the undersigned certifies that the Bidder does owe delinquent taxes to the Washington State Department of Revenue with a payment plan approved by the Department of Revenue.

   If the Bidder does owe delinquent taxes to the Washington State Department of Revenue, the Bidder must submit a written payment plan approved by the Department of Revenue, to the Contracting Agency by the deadline listed above.

2. **Federal Debarment:** The Bidder shall not currently be debarred or suspended by the Federal government. 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).

3. **Subcontractor Responsibility:** The undersigned certifies that the Bidder's standard subcontract form includes the subcontractor responsibility language required by RCW 39.06.020, and the Bidder has an established procedure it utilizes to validate the responsibility of each of its subcontractors.

4. **Apprenticeship:** Apprentice utilization is required for all project bids having an engineer's estimate of more than $1,500,000.00. For public works project subject to the apprenticeship utilization requirements in RCW 39.04.320, the Bidder shall not have been found out of compliance by the Washington state apprenticeship and training council for working apprentices out of ratio, without appropriate supervision, or outside their approved work processes as outlined in their standards of apprenticeship under chapter 49.04 RCW for the one-year period immediately preceding the date of the bid solicitation.

5. **Claims Against Retainage and Bonds:**

Instruction to Bidders: Check the appropriate box

- ☐ The undersigned certifies that the Bidder has not had claims against retainage or payment bonds for public works projects in the three (3) years prior to the bid submittal date.
- ☐ Alternatively, the undersigned certifies that the Bidder has had claims against retainage or payment bonds for public works projects in the three (3) years prior to the bid submittal date.

If the Bidder has had claims against retainage and payment bonds for public works projects in the three (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 payment bonds and include name of Project, Owner and 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.

6. **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 five (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 five (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.

7. **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 five (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 five (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 five (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.

8. **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 five (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 lawsuits with judgments entered against the Bidder in the five (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 five (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)

SECTION 4 - CONTRACT AND RELATED MATERIALS

CONTRACT

THIS AGREEMENT, made and entered into in triplicate, this _____ day of _____, 2026, by and between the City of Selah, hereinafter called the CONTRACTING AGENCY, and _____, hereinafter called the CONTRACTOR,

WITNESSETH:

That in consideration of the terms and conditions contained herein and attached and made a part of this Agreement, the parties hereto covenant and agree as follows:

I. The CONTRACTOR shall do all work and furnish all tools, materials, and equipment for the bid amount of $_____, for PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS, in accordance with and as described in the attached Plans and Specifications and the Standard Specifications for Road, Bridge, and Municipal Construction, which are by this reference incorporated herein and made a part hereof, and shall perform any alterations in or additions to the work provided under this Contract and every part thereof.

Contract time shall begin on the first working day following the Notice to Proceed Date and shall be completed within two hundred and sixty (260) working days of the date of such Notice to Proceed (see SPECIAL PROVISIONS - Section 1-08.5).

If said work is not completed within the time specified, the CONTRACTOR agrees to pay to the CONTRACTING AGENCY for each and every working day said work remains uncompleted after expiration of the specified time, liquidated damages as determined in Section 1-08.9.

The CONTRACTOR shall provide and bear the expense of all equipment, work, and labor of any sort whatsoever that may be required for the transfer of materials and for constructing and completing the work provided for in this Contract and every part thereof, except such as are mentioned in the Specifications to be furnished by the CONTRACTING AGENCY.

II. The CONTRACTING AGENCY hereby promises and agrees with the CONTRACTOR to employ, and does employ the CONTRACTOR to provide the materials and to do and cause to be done the above described work and to complete and finish the same according to the attached Plans and Specifications and the terms and conditions herein contained; and hereby contracts to pay for the same according to the attached Specifications and the schedule of unit or itemized prices hereto attached, at the time and in the manner and upon the conditions provided for in this Contract.

III. The CONTRACTOR for himself, and for his/her heirs, executors, administrators, successors, and assigns does hereby agree to the full performance of all the covenants herein upon the part of the CONTRACTOR.

IV. It is further provided that no liability shall attach to the CONTRACTING AGENCY by reason of entering into this Contract, except as expressly provided herein.

V. CONTRACTOR is an independent contractor and not an employee of the CONTRACTING AGENCY. The CONTRACTING AGENCY has designated the Contract performance and the CONTRACTOR shall be responsible for the details of that work. The parties recognize the CONTRACTOR has unique skills not otherwise available to the CONTRACTING AGENCY to accomplish the purpose of the Contract. The CONTRACTOR shall supply all equipment and supplies necessary to accomplish the Contract. The parties recognize that the purpose of the Contract is not within the regular course of business of the CONTRACTING AGENCY. The parties state that the right of control over the activities necessary to perform the Contract are with the CONTRACTOR.

IN WITNESS WHEREOF the parties hereto have caused this Agreement to be executed the day and year first herein above written.

CONTRACTING AGENCY:

Name: Roger Bell

Title: Mayor

Name: Courtney McGarity

Title: City Clerk

CONTRACTOR:

(CONTRACTOR NAME)

By: (SEAL)
AUTHORIZED OFFICIAL'S SIGNATURE

Name: ATTEST:
(Please Print or Type)

Address:

Phone:

Email:

Name:
(Please Print or Type)

CERTIFICATIONS

CITY OF SELAH
PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS
HLA PROJECT NO. 23166

_____
Name of Certified Testing Laboratory for Material Testing

Phone: _____

Email: _____

CONTRACT BOND

CITY OF SELAH
PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS
HLA PROJECT NO. 23166

BOND TO CITY OF SELAH

KNOW ALL PERSONS BY THESE PRESENTS:

That we, the undersigned, _____,

as principal, and _____,

a corporation organized and existing under the laws of the State of _____, as a Surety corporation, and qualified under the laws of the State of Washington to become Surety upon bonds of contractors with municipal corporations, as Surety, are jointly and severally held and firmly bound to the City of Selah in the penal sum of $ _____ for the payment of which sum we bind ourselves and our successors, heirs, administrators, or personal representatives, as the case may be.

This obligation is entered into in pursuance of the statutes of the State of Washington and the Ordinances of the City of Selah.

Dated at _____, Washington, this _____ day of _____, 2026.

Nevertheless, the conditions of the above obligation are such that:

WHEREAS, under and pursuant to action of the City of Selah, on _____, 2026, the Mayor of said City of Selah, has let or is about to let to the said _____, the above bounden Principal, a certain Contract, the said Contract being numbered HLA Project No. 23166, and providing for the construction of PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS which Contract is referred to herein and is made a part hereof as though attached hereto, and

WHEREAS, the said Principal has accepted, or is about to accept, the said Contract, and undertake to perform the work therein provided for in the manner and within the time set forth;

NOW, THEREFORE, if the said _____ shall faithfully perform all the provisions of said Contract in the manner and within the time therein set forth, or within such extensions of time as may be granted under said Contract, and shall pay all laborers, mechanics, subcontractors and material men and all industrial insurance premiums, and all persons who shall supply said principal or subcontractors with provisions and supplies for the carrying on of said work, and shall indemnify and hold the City of Selah harmless from any damage or expense by reason of failure of performance as specified in said Contract, then and in that event this obligation shall be void; but otherwise it shall be and remain in full force and effect.

SURETY:_____

By: _____
(Attorney-in-fact)

Name: _____
(Please Print or Type)

Agent: _____

Address: _____

_____

Surety Representative Name:

_____

Surety Representative Phone:

_____

Surety Representative Email:

_____

CONTRACTOR:

_____
CONTRACTOR NAME

By: _____
AUTHORIZED OFFICIAL'S SIGNATURE

Name: _____
(Please Print or Type)

SCHEDULE OF WORKING HOURS

CITY OF SELAH
PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS
HLA PROJECT NO. 23166

In accordance with Section 1-08.0(2) Hours of Work, the normal straight time working hours for this project will be from _____ a.m. to _____ p.m., _____ days per week. It is understood that normal straight time working hours shall not exceed 40 hours per week, regardless of the number of days worked per week. All hours worked in excess of 40 hours per week shall be considered as overtime hours subject to the reimbursement provisions of Section 1-08.0(2) Hours of Work and Section 1-08.0(3) Reimbursement for Overtime Work of Contracting Agency Employees.

Overtime hours are defined as any hours in excess of or outside of the above normal straight time working hours when the Contractor and/or his subcontractors are on the project site performing work.

I hereby certify that my subcontractors have been notified of the normal straight time working hours provisions of this project and understand that Engineer/Contracting Agency costs for overtime hours will be deducted from amounts due to me for work performed on the project.

_____
Contractor

_____
Signature

_____
Date

SECTION 5 - LABOR STANDARDS AND WAGE RATE CONDITIONS

PREVAILING WAGE RATES

The prevailing rate of wages to be paid to all workmen, laborers, or mechanics employed in the performance of any part of this Contract shall be in accordance with the provisions of Chapter 39.12 RCW, as amended. The rules and regulations of the Department of Labor and Industries and the schedule of prevailing wage rates for the locality or localities where this Contract will be performed as determined by the Industrial Statistician of the Washington State Department of Labor and Industries, are by reference made a part of this Contract. A schedule of prevailing wage rates is included in these Specifications.

Inasmuch as the CONTRACTOR will be held responsible for paying this schedule of wages, it is imperative that all contractors and subcontractors familiarize themselves with the current wage rates before submitting bids based on these Specifications.

Before any payment is made by the local government body of any sums due under this Contract, the local government body must receive from the Contractor and each subcontractor a copy of the "Statement of Intent to Pay Prevailing Wages" approved by the Washington State Department of Labor and Industries. Prior to acceptance of the project, the Contracting Agency must receive from the Contractor and each subcontractor a copy of "Affidavit of Wages Paid" and, in addition, from the prime contractor a copy of "Release for the Protection of Property Owners and General Contractor," all approved by the Washington State Department of Labor and Industries. Forms may be obtained from the Department of Labor and Industries. The Contractor and each subcontractor shall pay all fees associated with and make all applications directly to the Department of Labor and Industries. These affidavits will be required before any funds retained, according to the provisions of RCW 60.28.011, are released to the Contractor. Payment by the Contractor and subcontractor of any fees shall be considered incidental to the construction and all costs shall be included in other pay items of the project.

Pursuant to RCW 39.12.120, a contractor, subcontractor, or employer shall file a copy of its certified payroll records using the Washington State Department of Labor and Industries (L&I) online system at least once per month. If the L&I online system is not used, a contractor, subcontractor, or employer shall file a copy of its certified payroll records directly with L&I in a format approved by L&I at least once per month. A contractor, subcontractor, or employer's noncompliance with this reporting constitutes a violation of RCW 39.12.050.

Submission of certified payrolls to the Engineer is not required during the project, unless specifically requested by the Engineer or Contracting Agency. Certified payrolls submitted to the Engineer or Contracting Agency without a request will not be reviewed and will be returned to the Contractor. Contractors must keep accurate payroll records for three years following the date of acceptance of the project by the Contracting Agency. Payroll records must show the name, address, Social Security number, trade or occupation, straight time rate, hourly rate of usual benefits and overtime hours worked each day and week, including agreements to work up to 10-hour days, and the actual rate of wages. Upon receiving a written request by any interested party, the Contractor must, within ten days, submit Certified Payroll records to the Contracting Agency and the Department of Labor.

State of Washington
Department of Labor & Industries
Prevailing Wage Section - Telephone 360-902-5335
PO Box 44540, Olympia, WA 98504-4540

Washington State Prevailing Wage
The PREVAILING WAGES listed here include both the hourly wage rate and the hourly rate of fringe benefits. On public works projects, worker's wage and benefit rates must add to not less than this total. A brief description of overtime calculation requirements are provided on the Benefit Code Key.

Journey Level Prevailing Wage Rates for the Effective Date: 07/30/2026

Yakima County

Trade	Job Classification	Wage	Holiday	Overtime	Note	Risk Class
Asbestos Abatement Workers	Journey Level	$55.11	**5D**	**1H**		**View**
Boilermakers	Journey Level	$77.39	**5N**	**1C**		**View**
Brick Mason	Journey Level	$61.09	**5A**	**1M**		**View**
Building Service Employees	Janitor	$17.13		**1**		**View**
Building Service Employees	Shampooer	$17.13		**1**		**View**
Building Service Employees	Waxer	$17.13		**1**		**View**
Building Service Employees	Window Cleaner	$17.13		**1**		**View**
Cabinet Makers (In Shop)	Journey Level	$17.13		**1**		**View**
Carpenters	Acoustical Worker	$83.21	**15J**	**11U**		**View**
Carpenters	Bridge Dock and Wharf Carpenter	$84.81	**15J**	**11U**	**9L**	**View**
Carpenters	Bridge, Dock & Wharf Carpenter	$80.50	**15J**	**4C**		**View**
Carpenters	Floor Layer & Floor Finisher	$83.21	**15J**	**11U**		**View**

Carpenters	General Carpenter	$83.21	**15J**	**11U**		**View**
Carpenters	Scaffold Erector	$83.21	**15J**	**11U**		**View**
Cement Masons	Journey Level	$58.03	**7B**	**1N**		**View**
Divers & Tenders	Bell/Vehicle/Submersible Operator (not under pressure)	$144.72	**15J**	**11T**	**9I**	**View**
Divers & Tenders	Dive Supervisor	$146.22	**15J**	**11T**	**9I**	**View**
Divers & Tenders	Diver	$144.72	**15J**	**11T**	**9I**	**View**
Divers & Tenders	Diver Tender	$91.05	**15J**	**11T**	**9I**	**View**
Divers & Tenders	Hyperbaric Worker - Compressed Air Worker 0-30.00 PSI	$114.73	**15J**	**11U**		**View**
Divers & Tenders	Hyperbaric Worker - Compressed Air Worker 30.01-44.00 PSI	$124.28	**15J**	**11U**		**View**
Divers & Tenders	Hyperbaric Worker - Compressed Air Worker 44.01 - 54.00 PSI	$133.82	**15J**	**11U**		**View**
Divers & Tenders	Hyperbaric Worker - Compressed Air Worker 54.01 - 60.00 PSI	$143.37	**15J**	**11U**		**View**
Divers & Tenders	Hyperbaric Worker - Compressed Air Worker 60.01 - 64.00 PSI	$152.91	**15J**	**11U**		**View**
Divers & Tenders	Hyperbaric Worker - Compressed Air Worker 64.01 - 68.00 PSI	$162.46	**15J**	**11U**		**View**
Divers & Tenders	Hyperbaric Worker - Compressed Air Worker 68.01 - 70.00 PSI	$172.00	**15J**	**11U**		**View**
Divers & Tenders	Hyperbaric Worker - Compressed Air Worker 70.01 - 72.00 PSI	$181.55	**15J**	**11U**		**View**
Divers & Tenders	Hyperbaric Worker - Compressed Air Worker 72.01 - 74.00 PSI	$191.09	**15J**	**11U**		**View**
Divers & Tenders	Lead Diver (Dive Master)	$105.51	**15J**	**11T**	**9I**	**View**

Divers & Tenders	Manifold Operator (Life Support Technician)	$96.05	**15J**	**11U**	**9I**	**View**
Divers & Tenders	Remote Operated Vehicle Operator/Technician	$91.05	**15J**	**11T**	**9I**	**View**
Divers & Tenders	Remote Operated Vehicle Operator/Technician	$91.05	**15J**	**11U**	**9I**	**View**
Divers & Tenders	Remote Operated Vehicle Tender	$84.75	**15J**	**11T**	**9I**	**View**
Divers & Tenders	Stand-by Diver	$100.51	**15J**	**11T**	**9I**	**View**
Dredge Workers	Assistant Engineer	$89.47	**5D**	**3F**		**View**
Dredge Workers	Assistant Mate (Deckhand)	$88.78	**5D**	**3F**		**View**
Dredge Workers	Boatmen	$89.47	**5D**	**3F**		**View**
Dredge Workers	Engineer Welder	$91.20	**5D**	**3F**		**View**
Dredge Workers	Leverman, Hydraulic	$93.03	**5D**	**3F**		**View**
Dredge Workers	Mates	$89.47	**5D**	**3F**		**View**
Dredge Workers	Oiler	$88.78	**5D**	**3F**		**View**
Drywall Applicator	Journey Level	$81.71	**15O**	**11S**		**View**
Drywall Tapers	Journey Level	$81.71	**15O**	**11S**		**View**
Electrical Fixture Maintenance Workers	Journey Level	$43.32		**1**		**View**
Electricians - Inside	Cable Splicer	$91.45	**5A**	**11F**		**View**
Electricians - Inside	Journey Level	$88.34	**5A**	**11F**		**View**
Electricians - Inside	Welder	$103.90	**5A**	**11F**		**View**
Electricians - Motor Shop	Craftsman	$17.13		**1**		**View**
Electricians - Motor Shop	Journey Level	$17.13		**1**		**View**

Electricians - Powerline Construction	Cable Splicer	$107.31	5A	4D		View
Electricians - Powerline Construction	Certified Line Welder	$98.45	5A	4D		View
Electricians - Powerline Construction	Groundperson	$61.75	5A	4D		View
Electricians - Powerline Construction	Heavy Line Equipment Operator	$98.45	5A	4D		View
Electricians - Powerline Construction	Journey Level Lineperson	$98.45	5A	4D		View
Electricians - Powerline Construction	Line Equipment Operator	$84.18	5A	4D		View
Electricians - Powerline Construction	Meter Installer	$61.75	5A	4D	8W	View
Electricians - Powerline Construction	Pole Sprayer	$98.45	5A	4D		View
Electricians - Powerline Construction	Powderperson	$72.81	5A	4D		View
Electronic Technicians	Journey Level	$53.13	5I	1B		View
Elevator Constructors	Mechanic	$119.17	7D	4A		View
Elevator Constructors	Mechanic In Charge	$128.95	7D	4A		View
Fabricated Precast Concrete Products	Craftsman - In-Factory Work Only	$17.13		1		View
Fabricated Precast Concrete Products	Journey Level	$17.13		1		View
Fabricated Precast Concrete Products	Journey Level - In-Factory Work Only	$17.13		1		View
Fence Erectors	Fence Erector	$51.98	15J	11P	8Y	View
Fence Erectors	Fence Laborer	$51.98	15J	11P	8Y	View

Flaggers	Journey Level	$51.98	**15J**	**11P**	**8Y**	**View**
Glaziers	Journey Level	$48.20	**7L**	**4L**		**View**
Heat & Frost Insulators And Asbestos Workers	Journey Level	$96.42	**15H**	**11C**		**View**
Heating Equipment Mechanics	Journey Level	$81.31	**5A**	**1X**		**View**
Hod Carriers & Mason Tenders	Journey Level	$58.36	**15J**	**11P**	**8Y**	**View**
Industrial Power Vacuum Cleaner	Journey Level	$17.13		**1**		**View**
Inland Boatmen	Journey Level	$17.13		**1**		**View**
Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	Cleaner Operator	$54.56	**15M**	**11O**		**View**
Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	Foamer Operator	$54.56	**15M**	**11O**		**View**
Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	Grout Truck Operator	$54.56	**15M**	**11O**		**View**
Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	Head Operator	$52.40	**15M**	**11O**		**View**
Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	Technician	$45.97	**15M**	**11O**		**View**
Inspection/Cleaning/Sealing Of Sewer & Water Systems By Remote Control	TV Truck Operator	$49.20	**15M**	**11O**		**View**
Insulation Applicators	Journey Level	$83.21	**15J**	**11U**		**View**
Ironworkers	Journeyman	$78.44	**15K**	**11N**		**View**
Laborers	Erosion Control Worker	$55.11	**15J**	**11P**	**8Y**	**View**

Laborers	Air, Gas Or Electric Vibrating Screed	$55.11	15J	11P	8Y	View
Laborers	Airtrac Drill Operator	$56.64	15J	11P	8Y	View
Laborers	Ballast Regular Machine	$55.11	15J	11P	8Y	View
Laborers	Batch Weighman	$51.98	15J	11P	8Y	View
Laborers	Brick Pavers	$55.11	15J	11P	8Y	View
Laborers	Brush Cutter	$55.11	15J	11P	8Y	View
Laborers	Brush Hog Feeder	$55.11	15J	11P	8Y	View
Laborers	Burner	$55.11	15J	11P	8Y	View
Laborers	Caisson Worker	$56.64	15J	11P	8Y	View
Laborers	Carpenter Tender	$55.11	15J	11P	8Y	View
Laborers	Cement Dumper-paving	$56.64	15J	11P	8Y	View
Laborers	Cement Finisher Tender	$55.11	15J	11P	8Y	View
Laborers	Change House Or Dry Shack	$55.11	15J	11P	8Y	View
Laborers	Chipping Gun (30 Lbs. And Over)	$56.00	15J	11P	8Y	View
Laborers	Chipping Gun (Under 30 Lbs.)	$55.11	15J	11P	8Y	View
Laborers	Choker Setter	$55.11	15J	11P	8Y	View
Laborers	Chuck Tender	$55.11	15J	11P	8Y	View
Laborers	Clary Power Spreader	$56.00	15J	11P	8Y	View
Laborers	Clean-up Laborer	$55.11	15J	11P	8Y	View
Laborers	Concrete Dumper/Chute Operator	$56.64	15J	11P	8Y	View
Laborers	Concrete Form Stripper	$55.11	15J	11P	8Y	View

Laborers	Concrete Placement Crew	$56.64	**15J**	**11P**	**8Y**	**View**
Laborers	Concrete Saw Operator/Core Driller	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Crusher Feeder	$51.98	**15J**	**11P**	**8Y**	**View**
Laborers	Curing Laborer	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Demolition: Wrecking & Moving (Incl. Charred Material)	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Ditch Digger	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Diver	$56.64	**15J**	**11P**	**8Y**	**View**
Laborers	Drill Operator (Hydraulic, Diamond)	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Dry Stack Walls	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Dump Person	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Epoxy Technician	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Faller & Bucker Chain Saw	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Fine Graders	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Firewatch	$51.98	**15J**	**11P**	**8Y**	**View**
Laborers	Form Setter	$56.64	**15J**	**11P**	**8Y**	**View**
Laborers	Gabian Basket Building	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Gaurdrail Erector	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	General Laborer	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Grade Checker & Transit Person	$58.36	**15J**	**11P**	**8Y**	**View**
Laborers	Grinders	$55.11	**15J**	**11P**	**8Y**	**View**

Laborers	Grout Machine Tender	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Groutmen (Pressure) Including Post Tension Beams	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Hazardous Waste Worker (Level A)	$56.64	**15J**	**11P**	**8Y**	**View**
Laborers	Hazardous Waste Worker (Level B)	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Hazardous Waste Worker (Level C)	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	High Scaler	$56.64	**15J**	**11P**	**8Y**	**View**
Laborers	Jackhammer	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Laserbeam Operator	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Maintenance Person	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Manhole Builder-Mudman	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Material Yard Person	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Miner	$58.46	**15J**	**11P**	**8Y**	**View**
Laborers	Mold Abatement Worker	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Motorman-Dinky Locomotive	$58.46	**15J**	**11P**	**8Y**	**View**
Laborers	Nozzleman (Concrete Pump, Green Cutter When Using Combination Of High Pressure Air & Water On Concrete & Rock, Sandblast, Gunite, Shotcrete, Water Blaster, Vacuum Blaster)	$58.36	**15J**	**11P**	**8Y**	**View**
Laborers	Pavement Breaker	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Pilot Car	$51.98	**15J**	**11P**	**8Y**	**View**

Laborers	Pipe Layer (Lead)	$58.36	**15J**	**11P**	**8Y**	**View**
Laborers	Pipe Layer/Tailor	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Pipe Pot Tender	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Pipe Reliner	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Pipe Wrapper	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Pot Tender	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Powderman	$56.64	**15J**	**11P**	**8Y**	**View**
Laborers	Powderman's Helper	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Power Jacks	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Power Washer	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Railroad Spike Puller - Power	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Raker - Asphalt	$58.36	**15J**	**11P**	**8Y**	**View**
Laborers	Re-timberman	$56.64	**15J**	**11P**	**8Y**	**View**
Laborers	Remote Equipment Operator	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Rigger/Signal Person	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Rip Rap Person	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Rivet Buster	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Rodder	$56.64	**15J**	**11P**	**8Y**	**View**
Laborers	Scaffold Erector	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Scale Person	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Sloper (Over 20")	$56.00	**15J**	**11P**	**8Y**	**View**

Laborers	Sloper Sprayer	$55.11	15J	11P	8Y	View
Laborers	Spreader (Concrete)	$56.64	15J	11P	8Y	View
Laborers	Stake Hopper	$55.11	15J	11P	8Y	View
Laborers	Stock Piler	$55.11	15J	11P	8Y	View
Laborers	Swinging Stage/Boatswain Chair	$51.98	15J	11P	8Y	View
Laborers	Tamper & Similar Electric, Air & Gas Operated Tools	$56.00	15J	11P	8Y	View
Laborers	Tamper (Multiple & Self-propelled)	$56.00	15J	11P	8Y	View
Laborers	Timber Person - Sewer (Lagger, Shorer & Cribber)	$56.00	15J	11P	8Y	View
Laborers	Toolroom Person (at Jobsite)	$55.11	15J	11P	8Y	View
Laborers	Topper	$55.11	15J	11P	8Y	View
Laborers	Track Laborer	$55.11	15J	11P	8Y	View
Laborers	Track Liner (Power)	$56.00	15J	11P	8Y	View
Laborers	Traffic Control Laborer	$54.89	15J	11P	9C	View
Laborers	Traffic Control Supervisor	$58.32	15J	11P	9C	View
Laborers	Truck Mounted Attenuator	$54.89	15J	11P	9C	View
Laborers	Truck Spotter	$55.11	15J	11P	8Y	View
Laborers	Tugger Operator	$56.00	15J	11P	8Y	View
Laborers	Tunnel Work-Guage and Lock Tender	$58.46	15J	11P	8Y	View
Laborers	Tunnel Work-Guage and Lock Tender	$58.46	15J	11P	8Y	View
Laborers	Vibrator	$56.64	15J	11P	8Y	View

Laborers	Vinyl Seamer	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers	Watchmen	$47.72	**15J**	**11P**	**8Y**	**View**
Laborers	Welder	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Well Point Laborer	$56.00	**15J**	**11P**	**8Y**	**View**
Laborers	Window Washer/Cleaner	$47.72	**15J**	**11P**	**8Y**	**View**
Laborers - Underground Sewer & Water	General Laborer & Topman	$55.11	**15J**	**11P**	**8Y**	**View**
Laborers - Underground Sewer & Water	Pipe Layer	$56.00	**15J**	**11P**	**8Y**	**View**
Landscape Construction	Landscape Construction/landscaping Or Planting Laborers	$47.72	**15J**	**11P**	**8Y**	**View**
Landscape Construction	Landscape Operator	$88.60	**15J**	**11G**	**8X**	**View**
Landscape Maintenance	Groundskeeper	$17.13		**1**		**View**
Lathers	Journey Level	$81.71	**15O**	**11S**		**View**
Marble Setters	Journey Level	$61.09	**5A**	**1M**		**View**
Metal Fabrication (In Shop)	Fitter	$17.13		**1**		**View**
Metal Fabrication (In Shop)	Laborer	$17.13		**1**		**View**
Metal Fabrication (In Shop)	Machine Operator	$17.13		**1**		**View**
Metal Fabrication (In Shop)	Painter	$17.13		**1**		**View**
Metal Fabrication (In Shop)	Welder	$17.13		**1**		**View**
Millwright	Journey Level	$80.28	**15J**	**4C**		**View**
Modular Buildings	Journey Level	$17.13		**1**		**View**
Painters	Commercial Painter	$49.90	**15P**	**11V**		**View**

Painters	Industrial Painter	$57.22	**15P**	**11V**	**9D**	**View**
Pile Driver	Crew Tender	$80.50	**15J**	**11U**	**9L**	**View**
Pile Driver	Journey Level	$84.81	**15J**	**11U**		**View**
Plasterers	Journey Level	$78.60	**7Q**	**1R**		**View**
Plasterers	Nozzleman	$82.70	**7Q**	**1R**		**View**
Playground & Park Equipment Installers	Journey Level	$17.13		**1**		**View**
Plumbers & Pipefitters	Journey Level	$100.41	**6Z**	**1Q**		**View**
Power Equipment Operators	Asphalt Plant Operators	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Assistant Engineer	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Barrier Machine (zipper)	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Batch Plant Operator: concrete	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Boat Operator	$88.20	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Bobcat	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Brokk - Remote Demolition Equipment	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Brooms	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Bump Cutter	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Cableways	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Chipper	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Compressor	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Concrete Finish Machine - Laser Screed	$84.69	**15J**	**11G**	**8X**	**View**

Power Equipment Operators	Concrete Pump - Mounted Or Trailer High Pressure Line Pump, Pump High Pressure	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Concrete Pump: Truck Mount With Boom Attachment Over 42 M	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Concrete Pump: Truck Mount With Boom Attachment Up To 42m	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Conveyors	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Cranes Friction: 200 tons and over	$90.88	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Cranes, A-frame: 10 tons and under	$82.95	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Cranes: 100 tons through 199 tons, or 150' of boom (including jib with attachments)	$89.09	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Cranes: 20 tons through 44 tons with attachments	$87.42	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Cranes: 200 tons- 299 tons, or 250' of boom including jib with attachments	$90.00	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Cranes: 300 tons and over or 300' of boom including jib with attachments	$90.88	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Cranes: 45 tons through 99 tons, under 150' of boom(including jib with attachments)	$88.20	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Cranes: Friction cranes through 199 tons	$90.00	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Cranes: through 19 tons with attachments, a-frame over 10 tons	$86.75	**7A**	**11H**	**8X**	**View**

Power Equipment Operators	Crusher	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Deck Engineer/Deck Winches (power)	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Derricks, On Building Work	$88.20	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Dozers D-9 & Under	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Drill Oilers: Auger Type, Truck Or Crane Mount	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Drilling Machine	$91.00	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Elevator and man-lift: permanent and shaft type	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Finishing Machine, Bidwell And Gamaco & Similar Equipment	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Forklift: 3000 lbs and over with attachments	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Forklifts: under 3000 lbs. with attachments	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Grade Engineer: Using Blue Prints, Cut Sheets, Etc	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Gradechecker/Stakeman	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Guardrail Punch	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Hard Tail End Dump Articulating Off- Road Equipment 45 Yards. & Over	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Hard Tail End Dump Articulating Off-road Equipment Under 45 Yards	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Horizontal/Directional Drill Locator	$88.60	**15J**	**11G**	**8X**	**View**

Power Equipment Operators	Horizontal/Directional Drill Operator	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Hydralifts/Boom Trucks Over 10 Tons	$86.75	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Hydralifts/boom trucks: 10 tons and under	$82.95	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Leverman	$91.94	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Loader, Overhead, 6 Yards. But Not Including 8 Yards	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Loaders, Overhead Under 6 Yards	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Loaders, Plant Feed	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Loaders: Elevating Type Belt	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Locomotives, All	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Material Transfer Device	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Mechanics: All (Leadmen - $0.50 per hour over mechanic)	$91.00	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Motor Patrol Graders	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Mucking Machine, Mole, Tunnel Drill, Boring, Road Header And/or Shield	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Oil Distributors, Blower Distribution & Mulch Seeding Operator	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Outside Hoists (Elevators and Manlifts), Air Tuggers, Strato	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Overhead, bridge type Crane: 20 tons through 44 tons	$87.42	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Overhead, bridge type: 100 tons and over	$89.09	**7A**	**11H**	**8X**	**View**

Power Equipment Operators	Overhead, bridge type: 45 tons through 99 tons	$88.20	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Pavement Breaker	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Pile Driver (other Than Crane Mount)	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Plant Oiler - Asphalt, Crusher	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Posthole Digger, Mechanical	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Power Plant	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Pumps - Water	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Quad 9, Hd 41, D10 And Over	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Quick Tower: no cab, under 100 feet in height base to boom	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Remote Control Operator On Rubber Tired Earth Moving Equipment	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Rigger and Bellman	$82.95	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Rigger/Signal Person, Bellman(Certified)	$86.75	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Rollagon	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Roller, Other Than Plant Mix	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Roller, Plant Mix Or Multi-lift Materials	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Roto-mill, Roto-grinder	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Saws - Concrete	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Scraper, Self Propelled Under 45 Yards	$89.28	**15J**	**11G**	**8X**	**View**

Power Equipment Operators	Scrapers - Concrete & Carry All	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Scrapers, Self-propelled: 45 Yards And Over	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Service Engineers: Equipment	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Shotcrete/Gunite Equipment	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Shovel, Excavator, Backhoe, Tractors Under 15 Metric Tons	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Shovel, Excavator, Backhoe: Over 30 Metric Tons To 50 Metric Tons	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Shovel, Excavator, Backhoes, Tractors: 15 To 30 Metric Tons	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Shovel, Excavator, Backhoes: Over 50 Metric Tons To 90 Metric Tons	$91.00	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Shovel, Excavator, Backhoes: Over 90 Metric Tons	$91.94	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Slipform Pavers	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Spreader, Topsider & Screedman	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Subgrader Trimmer	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Tower Bucket Elevators	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Tower Crane: over 175' through 250' in height, base to boom	$90.00	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Tower crane: up to 175' in height base to boom	$89.09	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Tower Cranes: over 250' in height from base to boom	$90.88	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Transporters, All Track Or Truck Type	$90.09	**15J**	**11G**	**8X**	**View**

Power Equipment Operators	Trenching Machines	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Truck Crane Oiler/Driver: 100 tons and over	$87.42	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Truck crane oiler/driver: under 100 tons	$86.75	**7A**	**11H**	**8X**	**View**
Power Equipment Operators	Truck Mount Portable Conveyor	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Vac Truck (Vactor Guzzler, Hydro Excavator)	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Welder	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Wheel Tractors, Farmall Type	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators	Yo Yo Pay Dozer	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Asphalt Plant Operators	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Assistant Engineer	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Barrier Machine (zipper)	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Batch Plant Operator, Concrete	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Boat Operator	$88.20	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Bobcat	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Brokk - Remote Demolition Equipment	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Brooms	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Bump Cutter	$89.28	**15J**	**11G**	**8X**	**View**

Power Equipment Operators-Underground Sewer & Water	Cableways	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Chipper	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Compressor	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Concrete Finish Machine - Laser Screed	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Concrete Pump - Mounted Or Trailer High Pressure Line Pump, Pump High Pressure	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Concrete Pump: Truck Mount With Boom Attachment Over 42 M	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Concrete Pump: Truck Mount With Boom Attachment Up To 42m	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Conveyors	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Cranes Friction: 200 tons and over	$90.88	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Cranes, A-frame: 10 tons and under	$82.95	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Cranes: 100 tons through 199 tons, or 150' of boom (including jib with attachments)	$89.09	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Cranes: 20 tons through 44 tons with attachments	$87.42	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Cranes: 200 tons- 299 tons, or 250' of boom including jib with attachments	$90.00	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Cranes: 300 tons and over or 300' of boom including jib with	$90.88	**7A**	**11H**	**8X**	**View**

	attachments					
Power Equipment Operators-Underground Sewer & Water	Cranes: 45 tons through 99 tons, under 150' of boom(including jib with attachments)	$88.20	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Cranes: Friction cranes through 199 tons	$90.00	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Cranes: through 19 tons with attachments, a-frame over 10 tons	$86.75	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Crusher	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Deck Engineer/Deck Winches (power)	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Derricks, On Building Work	$88.20	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Dozers D-9 & Under	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Drill Oilers: Auger Type, Truck Or Crane Mount	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Drilling Machine	$91.00	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Elevator and man-lift: permanent and shaft type	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Finishing Machine, Bidwell And Gamaco & Similar Equipment	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Forklift: 3000 lbs and over with attachments	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Forklifts: under 3000 lbs. with attachments	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Grade Engineer: Using Blue Prints, Cut Sheets, Etc	$89.28	**15J**	**11G**	**8X**	**View**

Power Equipment Operators-Underground Sewer & Water	Gradechecker/Stakeman	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Guardrail Punch	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Hard Tail End Dump Articulating Off- Road Equipment 45 Yards. & Over	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Hard Tail End Dump Articulating Off-road Equipment Under 45 Yards	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Horizontal/Directional Drill Locator	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Horizontal/Directional Drill Operator	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Hydralifts/boom trucks: 10 tons and under	$82.95	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Hydralifts/boom trucks: over 10 tons	$86.75	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Leverman	$91.94	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Loader, Overhead, 6 Yards. But Not Including 8 Yards	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Loaders, Overhead Under 6 Yards	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Loaders, Plant Feed	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Loaders: Elevating Type Belt	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Locomotives, All	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Material Transfer Device	$89.28	**15J**	**11G**	**8X**	**View**

Power Equipment Operators-Underground Sewer & Water	Mechanics: All (Leadmen - $0.50 per hour over mechanic)	$91.00	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Motor Patrol Graders	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Mucking Machine, Mole, Tunnel Drill, Boring, Road Header And/or Shield	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Oil Distributors, Blower Distribution & Mulch Seeding Operator	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Outside Hoists (Elevators and Manlifts), Air Tuggers, Strato	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Overhead, bridge type Crane: 20 tons through 44 tons	$87.42	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Overhead, bridge type: 100 tons and over	$89.09	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Overhead, bridge type: 45 tons through 99 tons	$88.20	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Pavement Breaker	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Pile Driver (other Than Crane Mount)	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Plant Oiler - Asphalt, Crusher	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Posthole Digger, Mechanical	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Power Plant	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Pumps - Water	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Quad 9, Hd 41, D10 And Over	$90.09	**15J**	**11G**	**8X**	**View**

Power Equipment Operators-Underground Sewer & Water	Quick Tower: no cab, under 100 feet in height base to boom	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Remote Control Operator On Rubber Tired Earth Moving Equipment	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Rigger and Bellman	$82.95	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Rigger/Signal Person, Bellman(Certified)	$86.75	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Rollagon	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Roller, Other Than Plant Mix	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Roller, Plant Mix Or Multi-lift Materials	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Roto-mill, Roto-grinder	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Saws - Concrete	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Scraper, Self Propelled Under 45 Yards	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Scrapers - Concrete & Carry All	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Scrapers, Self-propelled: 45 Yards And Over	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Shotcrete/Gunite Equipment	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Shovel, Excavator, Backhoe, Tractors Under 15 Metric Tons	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Shovel, Excavator, Backhoe: Over 30 Metric Tons To 50 Metric Tons	$90.09	**15J**	**11G**	**8X**	**View**

Power Equipment Operators-Underground Sewer & Water	Shovel, Excavator, Backhoes, Tractors: 15 To 30 Metric Tons	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Shovel, Excavator, Backhoes: Over 50 Metric Tons To 90 Metric Tons	$91.00	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Shovel, Excavator, Backhoes: Over 90 Metric Tons	$91.94	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Slipform Pavers	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Spreader, Topsider & Screedman	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Subgrader Trimmer	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Tower Bucket Elevators	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Tower Crane: over 175' through 250' in height, base to boom	$90.00	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Tower crane: up to 175' in height base to boom	$89.09	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Tower Cranes: over 250' in height from base to boom	$90.88	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Transporters, All Track Or Truck Type	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Trenching Machines	$88.60	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Truck Crane Oiler/Driver: 100 tons and over	$87.42	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Truck crane oiler/driver: under 100 tons	$86.75	**7A**	**11H**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Truck Mount Portable Conveyor	$89.28	**15J**	**11G**	**8X**	**View**

Power Equipment Operators-Underground Sewer & Water	Vac Truck (Vactor Guzzler, Hydro Excavator)	$89.28	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Welder	$90.09	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Wheel Tractors, Farmall Type	$84.69	**15J**	**11G**	**8X**	**View**
Power Equipment Operators-Underground Sewer & Water	Yo Yo Pay Dozer	$89.28	**15J**	**11G**	**8X**	**View**
Power Line Clearance Tree Trimmers	Journey Level In Charge	$69.62	**5A**	**4A**		**View**
Power Line Clearance Tree Trimmers	Spray Person	$65.89	**5A**	**4A**		**View**
Power Line Clearance Tree Trimmers	Tree Equipment Operator	$69.62	**5A**	**4A**		**View**
Power Line Clearance Tree Trimmers	Tree Trimmer	$62.19	**5A**	**4A**		**View**
Power Line Clearance Tree Trimmers	Tree Trimmer Groundperson	$45.93	**5A**	**4A**		**View**
Refrigeration & Air Conditioning Mechanics	Journey Level	$100.41	**6Z**	**1Q**		**View**
Residential Brick Mason	Journey Level	$37.47		**1**		**View**
Residential Carpenters	Journey Level	$56.28		**1**		**View**
Residential Cement Masons	Journey Level	$28.00		**1**		**View**
Residential Drywall Applicators	Journey Level	$39.60		**1**		**View**
Residential Drywall Tapers	Journey Level	$32.94		**1**		**View**
Residential Electricians	Journey Level	$28.40		**1**		**View**
Residential Glaziers	Journey Level	$26.00		**1**		**View**
Residential Insulation Applicators	Journey Level	$21.74		**1**		**View**

Residential Laborers	Journey Level	$17.13		1	View
Residential Marble Setters	Journey Level	$37.47		1	View
Residential Painters	Journey Level	$21.59		1	View
Residential Plumbers & Pipefitters	Journey Level	$28.62		1	View
Residential Refrigeration & Air Conditioning Mechanics	Journey Level	$37.30	5A	11R	View
Residential Sheet Metal Workers	Journey Level (Field or Shop)	$58.36	5A	1X	View
Residential Soft Floor Layers	Journey Level	$30.83		1	View
Residential Sprinkler Fitters (Fire Protection)	Journey Level	$18.40		1	View
Residential Stone Masons	Journey Level	$18.19		1	View
Residential Terrazzo Workers	Journey Level	$17.13		1	View
Residential Terrazzo/Tile Finishers	Journey Level	$21.96		1	View
Residential Tile Setters	Journey Level	$19.07		1	View
Roofers	Irritable Bituminous Roofer	$53.53	7G	4I	View
Roofers	Journeyman Roofer, Waterproofer, Kettleman	$50.53	7G	4I	View
Sheet Metal Workers	Journey Level (Field or Shop)	$81.31	5A	1X	View
Sign Makers & Installers (Electrical)	Journey Level	$17.13		1	View
Sign Makers & Installers (Non-Electrical)	Journey Level	$17.13		1	View
Soft Floor Layers	Journey Level	$62.66	7C	3J	View
Solar Controls For Windows	Journey Level	$17.13		1	View

Sprinkler Fitters (Fire Protection)	Journey Level	$76.94	7J	1R		View
Stage Rigging Mechanics (Non Structural)	Journey Level	$17.13		1		View
Stone Masons	Journey Level	$61.09	5A	1M		View
Street And Parking Lot Sweeper Workers	Journey Level	$17.13		1		View
Surveyors	Assistant Construction Site Surveyor	$86.75	7A	11H	8X	View
Surveyors	Chainman	$82.95	7A	11H	8X	View
Surveyors	Construction Site Surveyor	$88.20	7A	11H	8X	View
Surveyors	Drone Operator (when used in conjunction with survey work only)	$82.95	7A	11H	8X	View
Surveyors	Ground Penetrating Radar Operator	$82.95	7A	11H	8X	View
Telecommunication Technicians	Journey Level	$53.13	5I	1B		View
Telephone Line Construction - Outside	Cable Splicer	$42.62	5A	2B		View
Telephone Line Construction - Outside	Hole Digger/Ground Person	$27.97	5A	2B		View
Telephone Line Construction - Outside	Telephone Equipment Operator (Light)	$35.60	5A	2B		View
Telephone Line Construction - Outside	Telephone Lineperson	$40.28	5A	2B		View
Terrazzo Workers	Journey Level	$43.81	5A	1M		View
Tile Setters	Journey Level	$43.81	5A	1M		View
Tile, Marble & Terrazzo Finishers	Journey Level	$35.93	5A	1M		View

Traffic Control Stripers	All cleanup required in connection with traffic control stripers work (Group 1)	$95.41	**15L**	**1K**	**View**
Traffic Control Stripers	Handling, painting and installing of all car stops, stop signs and any other type sign (Group 2)	$55.54	**15L**	**1K**	**View**
Traffic Control Stripers	Installation of guard rail and posts and similar protective devices (Group 2)	$55.54	**15L**	**1K**	**View**
Traffic Control Stripers	Installation of parking gates, ticket spitters and other mechanical and automatic control devices (Group 2)	$55.54	**15L**	**1K**	**View**
Traffic Control Stripers	Installation of plastic metal or composition button, or lines used instead of paint (Group 1)	$95.41	**15L**	**1K**	**View**
Traffic Control Stripers	Line removal; chemical sand and hydro-blast, paint and button (Group 1)	$95.41	**15L**	**1K**	**View**
Traffic Control Stripers	Manufacturing and installation of all car stops and control devices and similar traffic regulators (Group 2)	$55.54	**15L**	**1K**	**View**
Traffic Control Stripers	Manufacturing, painting, stenciling, servicing, repairing, placing and removal of traffic safety and control devices/barricades (Group 2)	$55.54	**15L**	**1K**	**View**
Traffic Control Stripers	Painting and installing lines, arrows, bumpers, curbs, etc., on parking lots, air fields, highways, game courts (Group 1)	$95.41	**15L**	**1K**	**View**
Traffic Control Stripers	Preparation and maintenance of all surfaces (Group 1)	$95.41	**15L**	**1K**	**View**

Traffic Control Stripers	Seal coating, slurry coating and other surface protection (Group 2)	$55.54	**15L**	**1K**		**View**
Truck Drivers	Asphalt Mix Over 20 Yards	$66.73	**5D**	**1V**	**8M**	**View**
Truck Drivers	Asphalt Mix To 20 Yards	$66.52	**5D**	**1V**	**8M**	**View**
Truck Drivers	Dump Truck	$66.52	**5D**	**1V**	**8M**	**View**
Truck Drivers	Dump Truck & Trailer	$66.73	**5D**	**1V**	**8M**	**View**
Truck Drivers	Other Trucks	$62.14	**5D**	**1V**	**8M**	**View**
Truck Drivers - Ready Mix	Transit Mixers 20 yards and under	$66.73	**5D**	**1V**	**8M**	**View**
Truck Drivers - Ready Mix	Transit Mixers over 20 yards	$67.10	**5D**	**1V**	**8M**	**View**
Well Drillers & Irrigation Pump Installers	Irrigation Pump Installer	$25.44		**1**		**View**
Well Drillers & Irrigation Pump Installers	Oiler	$17.13		**1**		**View**
Well Drillers & Irrigation Pump Installers	Well Driller	$18.00		**1**		**View**

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Overtime Codes

Overtime calculations are based on the hourly rate actually paid to the worker. On public works projects, the hourly rate must be not less than the prevailing rate of wage minus the hourly rate of the cost of fringe benefits actually provided for the worker.

1. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

B. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

C. The first two (2) hours after eight (8) regular hours Monday through Friday and the first ten (10) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other overtime hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

D. The first two (2) hours before or after a five-eight (8) hour workweek day or a four-ten (10) hour workweek day and the first eight (8) hours worked the next day after either workweek shall be paid at one and one-half times the hourly rate of wage. All additional hours worked and all worked on Sundays and holidays shall be paid at double the hourly rate of wage.

E. The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

F. The first two (2) hours after eight (8) regular hours Monday through Friday and the first ten (10) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other overtime hours worked, except Labor Day, shall be paid at double the hourly rate of wage. All hours worked on Labor Day shall be paid at three times the hourly rate of wage.

G. The first ten (10) hours worked on Saturdays and the first ten (10) hours worked on a fifth calendar weekday in a four-ten hour schedule, shall be paid at one and one-half times the hourly rate of wage. All hours worked in excess of ten (10) hours per day Monday through Saturday and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

H. All hours worked on Saturdays (except makeup days if work is lost due to inclement weather conditions or equipment breakdown) shall be paid at one and one-half times the hourly rate of wage. All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

I. All hours worked on Sundays and holidays shall also be paid at double the hourly rate of wage.

J. The first two (2) hours after eight (8) regular hours Monday through Friday and the first ten (10) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked over ten (10) hours Monday through Saturday, Sundays and holidays shall be paid at double the hourly rate of wage.

K. All hours worked on Saturdays and Sundays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at double the hourly rate of wage.

M. All hours worked on Saturdays (except makeup days if work is lost due to inclement weather conditions) shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

Overtime Codes Continued

1. N. All hours worked on Saturdays (except makeup days) shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

O. The first ten (10) hours worked on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays, holidays and after twelve (12) hours, Monday through Friday and after ten (10) hours on Saturday shall be paid at double the hourly rate of wage.

P. All hours worked on Saturdays (except makeup days if circumstances warrant) and Sundays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at double the hourly rate of wage.

Q. The first two (2) hours after eight (8) regular hours Monday through Friday and up to ten (10) hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked in excess of ten (10) hours per day Monday through Saturday and all hours worked on Sundays and holidays (except Christmas day) shall be paid at double the hourly rate of wage. All hours worked on Christmas day shall be paid at two and one-half times the hourly rate of wage.

R. All hours worked on Sundays and holidays shall be paid at two times the hourly rate of wage.

U. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays (except Labor Day) shall be paid at two times the hourly rate of wage. All hours worked on Labor Day shall be paid at three times the hourly rate of wage.

V. All hours worked on Sundays and holidays (except Thanksgiving Day and Christmas day) shall be paid at one and one-half times the hourly rate of wage. All hours worked on Thanksgiving Day and Christmas day shall be paid at double the hourly rate of wage.

X. The first four (4) hours after eight (8) regular hours Monday through Friday and the first twelve (12) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked over twelve (12) hours Monday through Saturday, Sundays and holidays shall be paid at double the hourly rate of wage. When holiday falls on Saturday or Sunday, the day before Saturday, Friday, and the day after Sunday, Monday, shall be considered the holiday and all work performed shall be paid at double the hourly rate of wage.

Y. All hours worked outside the hours of 5:00 am and 5:00 pm (or such other hours as may be agreed upon by any employer and the employee) and all hours worked in excess of eight (8) hours per day (10 hours per day for a 4 x 10 workweek) and on Saturdays and holidays (except labor day) shall be paid at one and one-half times the hourly rate of wage. (except for employees who are absent from work without prior approval on a scheduled workday during the workweek shall be paid at the straight-time rate until they have worked 8 hours in a day (10 in a 4 x 10 workweek) or 40 hours during that workweek.) All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and Labor Day shall be paid at double the hourly rate of wage.

Z. All hours worked on Saturdays and Sundays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid the straight time rate of pay in addition to holiday pay.

Overtime Codes Continued

2. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

   B. All hours worked on holidays shall be paid at one and one-half times the hourly rate of wage.

   F. The first eight (8) hours worked on holidays shall be paid at the straight hourly rate of wage in addition to the holiday pay. All hours worked in excess of eight (8) hours on holidays shall be paid at double the hourly rate of wage.

   M. This code appears to be missing. All hours worked on Saturdays, Sundays and holidays shall be paid at double the hourly rate of wage.

   R. All hours worked on Sundays and holidays and all hours worked over sixty (60) in one week shall be paid at double the hourly rate of wage.

   U. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked over 12 hours in a day or on Sundays and holidays shall be paid at double the hourly rate of wage.

3. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

   F. All hours worked on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sunday shall be paid at two times the hourly rate of wage. All hours worked on paid holidays shall be paid at two and one-half times the hourly rate of wage including holiday pay.

   H. All work performed on Sundays between March 16th and October 14th and all Holidays shall be compensated for at two (2) times the regular rate of pay. Work performed on Sundays between October 15th and March 15th shall be compensated at one and one half (1-1/2) times the regular rate of pay.

   J. All hours worked between the hours of 10:00 pm and 5:00 am, Monday through Friday, and all hours worked on Saturdays shall be paid at a one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

   K. Work performed in excess of eight (8) hours of straight time per day, or ten (10) hours of straight time per day when four ten (10) hour shifts are established, or forty (40) hours of straight time per week, Monday through Friday, or outside the normal 5 am to 6pm shift, and all work on Saturdays shall be paid at one and one-half times the hourly rate of wage. All work performed after 6:00 pm Saturday to 5:00 am Monday and Holidays, and all hours worked in excess of twelve (12) hours in a single shift shall be paid at double the hourly rate of wage.

   After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of eight (8) hours or more. When an employee returns to work without at least eight (8) hours time off since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until he/she shall have the eight (8) hours rest period.

Overtime Codes Continued

4. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

A. All hours worked in excess of eight (8) hours per day or forty (40) hours per week shall be paid at double the hourly rate of wage. All hours worked on Saturdays, Sundays and holidays shall be paid at double the hourly rate of wage

C. On Monday through Friday, the first four (4) hours of overtime after eight (8) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay, unless a four (4) day ten (10) hour workweek has been established. On a four (4) day ten (10) hour workweek scheduled Monday through Thursday, or Tuesday through Friday, the first two (2) hours of overtime after ten (10) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay. On Saturday, the first twelve (12) hours of work shall be paid at one and one half (1-1/2) times the straight time rate of pay, except that if the job is down on Monday through Friday due to weather conditions or other conditions outside the control of the employer, the first ten (10) hours on Saturday may be worked at the straight time rate of pay. All hours worked over twelve (12) hours in a day and all hours worked on Sunday and Holidays shall be paid at two (2) times the straight time rate of pay.

D. All hours worked in excess of eight (8) hours per day or forty (40) hours per week shall be paid at double the hourly rate of wage. All hours worked on Saturday, Sundays and holidays shall be paid at double the hourly rate of pay. Rates include all members of the assigned crew.

EXCEPTION:
On all multipole structures and steel transmission lines, switching stations, regulating, capacitor stations, generating plants, industrial plants, associated installations and substations, except those substations whose primary function is to feed a distribution system, will be paid overtime under the following rates:

The first two (2) hours after eight (8) regular hours Monday through Friday of overtime on a regular workday, shall be paid at one and one-half times the hourly rate of wage. All hours in excess of ten (10) hours will be at two (2) times the hourly rate of wage. The first eight (8) hours worked on Saturday will be paid at one and one-half (1-1/2) times the hourly rate of wage. All hours worked in excess of eight (8) hours on Saturday, and all hours worked on Sundays and holidays will be at the double the hourly rate of wage.

All overtime eligible hours performed on the above described work that is energized, shall be paid at the double the hourly rate of wage.

E. The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

On a four-day, ten-hour weekly schedule, either Monday thru Thursday or Tuesday thru Friday schedule, all hours worked after ten shall be paid at double the hourly rate of wage. The Monday or Friday not utilized in the normal four-day, ten hour work week, and Saturday shall be paid at one and one half (1½) times the regular shift rate for the first eight (8) hours. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

G. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

I. The First eight (8) hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked in excess of eight (8) per day on Saturdays shall be paid at double the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

Overtime Codes Continued

4. J. The first eight (8) hours worked on a Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked in excess of eight (8) hours on a Saturday shall be paid at double the hourly rate of wage. All hours worked over twelve (12) in a day, and all hours worked on Sundays and Holidays shall be paid at double the hourly rate of wage.

K. All hours worked on a Saturday shall be paid at one and one-half times the hourly rate of wage, so long as Saturday is the sixth consecutive day worked. All hours worked over twelve (12) in a day Monday through Saturday, and all hours worked on Sundays and Holidays shall be paid at double the hourly rate of wage.

L. The first twelve (12) hours worked on a Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked on a Saturday in excess of twelve (12) hours shall be paid at double the hourly rate of pay. All hours worked over twelve (12) in a day Monday through Friday, and all hours worked on Sundays shall be paid at double the hourly rate of wage. All hours worked on a holiday shall be paid at one and one-half times the hourly rate of wage, except that all hours worked on Labor Day shall be paid at double the hourly rate of pay.

S. On a four (4) day ten (10) hour workweek scheduled Monday through Thursday, or Tuesday through Friday, work performed in excess of (10) hours shall be paid at one and one half (1-1/2) times the hourly rate of pay. On Monday through Friday, work performed outside the normal work hours of 6:00 a.m. and 6:00 p.m. shall be paid at one and one-half (1-1/2) times the straight time rate, (except for special shifts or multiple shift operations).

All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All work performed on Sundays and holidays shall be paid at double the hourly rate of wage. When an employee returns to work without at least eight (8) hours time off since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

Multiple Shift Operations: When the first shift of a multiple shift (a two or three shift) operation is started at the basic straight time rate or at a specific overtime rate, all shifts of that day's operation shall be completed at that rate. Special Shifts: The Special Shift Premium is the basic hourly rate of pay plus $2.00 an hour. When due to conditions beyond the control of the employer or when an owner (not acting as the contractor), a government agency or the contract specifications require more than four (4) hours of a special shift can only be performed outside the normal 6am to 6pm shift then the special shift premium will be applied to the basic straight time for the entire shift. When an employee works on a special shift, they shall be paid the special shift premium for each hour worked unless they are in overtime or double-time status. (For example, the special shift premium does not waive the overtime requirements for work performed on Saturday or Sunday).

U. The first four (4) hours after eight (8) regular hours Monday through Friday and the first twelve (12) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. (Except on makeup days if work is lost due to inclement weather, then the first eight (8) hours on Saturday may be paid the regular rate.) All hours worked over twelve (12) hours Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

Overtime Codes Continued

4. X. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage. Work performed outside the normal shift of 6 am to 6pm shall be paid at one and one-half the straight time rate, (except for special shifts or three shift operations). All work performed on Sundays and holidays shall be paid at double the hourly rate of wage. Shifts may be established when considered necessary by the Employer.

   The Employer may establish shifts consisting of eight (8) or ten (10) hours of work (subject to WAC 296-127-022), that shall constitute a normal forty (40) hour work week. The Employer can change from a 5-eight to a 4-ten hour schedule or back to the other. All hours of work on these shifts shall be paid for at the straight time hourly rate. Work performed in excess of eight hours (or ten hours per day (subject to WAC 296-127-022) shall be paid at one and one-half the straight time rate.

   When due to conditions beyond the control of the Employer, or when contract specifications require that work can only be performed outside the regular day shift, then by mutual agreement a special shift may be worked at the straight time rate, eight (8) hours work for eight (8) hours pay. The starting time shall be arranged to fit such conditions of work.

   When an employee returns to work without at a break of eight (8) hours since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

Overtime Codes Continued

11. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

   B After an employee has worked eight (8) hours, all additional hours worked shall be paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours or more.

   C The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other overtime hours worked, except Labor Day, and all hours on Sunday shall be paid at double the hourly rate of wage. All hours worked on Labor Day shall be paid at three times the hourly rate of wage. All non-overtime and non-holiday hours worked between 4:00 pm and 5:00 am, Monday through Friday, shall be paid at a premium rate of 15% over the hourly rate of wage.

   D. All hours worked on Saturdays and holidays shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays shall be paid at double the hourly rate of wage.

   After an employee has worked eight (8) hours, all additional hours worked shall be paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours or more.

   E. The first two (2) hours after eight (8) regular hours Monday through Friday, the first ten (10) hours on Saturday, and the first ten (10) hours worked on Holidays shall be paid at one and one-half times the hourly rate of wage. All hours worked over ten (10) hours Monday through Saturday, and Sundays shall be paid at double the hourly rate of wage.

   After an employee has worked eight (8) hours, all additional hours worked shall be paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours or more.

Overtime Codes Continued

11. F. The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

On a four-day, ten-hour weekly schedule, either Monday thru Thursday or Tuesday thru Friday schedule, all hours worked after ten shall be paid at double the hourly rate of wage. The Monday or Friday not utilized in the normal four-day, ten hour work week, and Saturday shall be paid at one-half times the hourly rate of wage for the first eight (8) hours. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

G. Work performed in excess of eight (8) hours of straight time per day, or ten (10) hours of straight time per day when four ten (10) hour shifts are established, or forty (40) hours of straight time per week, Monday through Friday, or outside the normal 5 am to 6pm shift, and all work on Saturdays shall be paid at one and one-half times the hourly rate of wage.

All work performed after 6:00 pm Saturday to 5:00 am Monday and Holidays, and all hours worked in excess of twelve (12) hours in a single shift shall be paid at double the hourly rate of wage.

After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of nine (9) hours or more. When an employee returns to work without at least nine (9) hours time off since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until he/she shall have the nine (9) hours rest period.

H. Work performed in excess of eight (8) hours of straight time per day, or ten (10) hours of straight time per day when four ten (10) hour shifts are established, or forty (40) hours of straight time per week, Monday through Friday, or outside the normal 5 am to 6pm shift, and all work on Saturdays shall be paid at one and one-half times the hourly rate of wage.

All work performed after 6:00 pm Saturday to 5:00 am Monday and Holidays, and all hours worked in excess of twelve (12) hours in a single shift shall be paid at double the hourly rate of wage.

After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of ten (10) hours or more. When an employee returns to work without at least ten (10) hours time off since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until he/she shall have the ten (10) hours rest period.

J. All hours worked on holidays shall be paid at double the hourly rate of wage.

K. On Monday through Friday hours worked outside 4:00 am and 5:00 pm, and the first two (2) hours after eight (8) hours worked shall be paid at one and one-half times the hourly rate. All hours worked over 10 hours per day Monday through Friday, and all hours worked on Saturdays, Sundays, and Holidays worked shall be paid at double the hourly rate of wage.

L. An employee working outside 5:00 am and 5:00 pm shall receive an additional two dollar ($2.00) per hour for all hours worked that shift. All hours worked on holidays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at one and one-half times the hourly rate of wage.

Overtime Codes Continued

11. M. On Monday through Friday, the first four (4) hours of overtime after eight (8) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay, unless a four (4) day ten (10) hour workweek has been established. On a four (4) day ten (10) hour workweek scheduled Monday through Thursday, or Tuesday through Friday, the first two (2) hours of overtime after ten (10) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay.

Work performed outside the normal work hours of 5:00 a.m. and 6:00 p.m. shall be paid at one and one-half (1-1/2) times the straight time rate, (except for special shifts or multiple shift operations). When the first shift of a multiple shift (a two or three shift) operation is started at the basic straight time rate or at a specific overtime rate, all shifts of that day's operation shall be completed at that rate. When due to conditions beyond the control of the Employer or when contract specifications require that work can only be performed outside the regular day shift of 5:00 am to 6:00 pm, then a special shift may be worked at the straight time rate, plus the shift pay premium when applicable. The starting time of work will be arranged to fit such conditions of work. Such shift shall consist of eight (8) hours work for eight (8) hours pay or ten (10) hours work for ten (10) hours pay for four ten shifts.

On Saturday, the first twelve (12) hours of work shall be paid at one and one half (1-1/2) times the straight time rate of pay. All work performed after 6:00 pm Saturday to 5:00 am Monday, all work performed over twelve (12) hours, and all work performed on holidays shall be paid at double the straight time rate of pay.

Shift Pay Premium: In an addition to any overtime already required, all hours worked between the hours of 6:00 pm and 5:00 am shall receive an additional two dollars ($2.00) per hour.

N. All work performed over twelve hours in a shift and all work performed on Sundays and Holidays shall be paid at double the straight time rate.

Any time worked over eight (8) hours on Saturday shall be paid double the straight time rate, except employees assigned to work six 10-hour shifts per week shall be paid double the straight time rate for any time worked on Saturday over 10 hours.

O. All work performed on Saturdays, Sundays, and Holidays shall be paid at one and one half (1-1/2) times the straight time rate of pay.

Overtime Codes Continued

11. P. Work performed in excess of ten (10) hours of straight time per day when four ten (10) hour shifts are established and all work on Saturdays, except for make-up days shall be paid at time and one-half (1 ½) the straight time rate.

Work performed outside the normal work hours of 5:00 a.m. and 6:00 p.m. shall be paid at one and one-half (1-1/2) times the straight time rate, (except for special shifts or multiple shift operations). When the first shift of multiple shift (a two or three shift) operation is started at the basic straight time rate or at a specific overtime rate, all shifts of that day's operation shall be completed at that rate. When due to conditions beyond the control of the Employer or when contract specifications require that work can only be performed outside the regular day shift of 5:00 a.m. to 6:00 p.m., then a special shift may be worked at the straight time rate, plus the shift pay premium when applicable. The starting time of work will be arranged to fit such conditions of work. Such shifts shall consist of eight (8) hours work for eight (8) hours pay or ten (10) hours work for ten (10) hours pay for four ten-hour shifts.

In the event the job is down due to weather conditions, then Saturday may, be worked as a voluntary make-up day at the straight time rate. However, Saturday shall not be utilized as a make-up day when a holiday falls on Friday. All work performed on Sundays and holidays and work in excess of twelve (12) hours per day shall be paid at double (2x) the straight time rate of pay.

After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

When an employee returns to work without a break of eight (8) hours since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

Q. All hours worked between the hours of 6:00 pm and 6:00 am, Monday through Saturday, shall be paid at a premium rate of 35% over the hourly rate of wage. Work performed on Sundays shall be paid at double time. All hours worked on holidays shall be paid at double the hourly rate of wage.

R On Monday through Saturday hours worked outside 6:00 am and 7:00 pm, and all hours after eight (8) hours worked shall be paid at one and one-half times the hourly rate. All hours worked on Sundays and Holidays shall be paid at double the hourly rate of wage.

When a holiday falls on a Saturday, the Friday before shall be the observed holiday. When a holiday falls on a Sunday, the following Monday shall be the observed holiday.

S. The first ten (10) hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. In the event the job is down due to weather conditions, or other conditions beyond the control of the Employer, then Saturday may be worked at the straight time rate, for the first eight (8) hours, or the first ten (10) hours when a four day ten hour workweek has been established.

All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

When an employee returns to work without a break of eight (8) hours since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

Overtime Codes Continued

11. T. On Monday through Friday, the first four (4) hours of overtime after eight (8) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay, unless a four (4) day ten (10) hour workweek has been established. On a four (4) day ten (10) hour workweek scheduled Monday through Thursday, or Tuesday through Friday, the first two (2) hours of overtime after ten (10) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay.

On Saturday, the first twelve (12) hours of work shall be paid at one and one half (1-1/2) times the straight time rate of pay, except that if the job is down on Monday through Friday due to weather conditions or other conditions outside the control of the employer, the first ten (10) hours on Saturday may be worked at the straight time rate of pay.

All hours worked over twelve (12) hours in a day and all hours worked on Sunday and Holidays shall be paid at two (2) times the straight time rate of pay.

U. On Monday through Friday, the first four (4) hours of overtime after eight (8) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay, unless a four (4) day ten (10) hour workweek has been established. On a four (4) day ten (10) hour workweek scheduled Monday through Thursday, or Tuesday through Friday, the first two (2) hours of overtime after ten (10) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay.

On Saturday, the first twelve (12) hours of work shall be paid at one and one half (1-1/2) times the straight time rate of pay, except that if the job is down on Monday through Friday due to weather conditions or other conditions outside the control of the employer, the first ten (10) hours on Saturday may be worked at the straight time rate of pay.

All hours worked over twelve (12) hours in a day and all hours worked on Sunday and Holidays shall be paid at two (2) times the straight time rate of pay.

If, due to conditions beyond the control of the Employer or when contract specifications require that work can only be performed outside the regular day shift, then a Special Shift may be worked, Monday through Friday, at the straight-time rate. The starting time of work for the Special Shift will be arranged to fit such conditions of work. Such Special Shift shall consist of eight (8) hours of work for eight (8) hours of pay or ten (10) hours of work for ten(10) hours of pay on a four-ten workday schedule.

V. All hours worked on Saturdays and Sundays (except make-up days due to conditions beyond the control of the employer) shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at double the hourly rate of wage.

W. Work performed in excess of eight (8) hours of straight time per day, or ten (10) hours of straight time per day when four ten (10) hour shifts are established, or forty (40) hours of straight time per week, Monday through Friday, or outside the normal 6 am to 6pm shift, and all work on Saturdays shall be paid at one and one-half times the hourly rate of wage. All work performed on Sundays and Holidays shall be paid at double the hourly rate of wage.

After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of eight (8) hours or more.

When an employee returns to work without at least eight (8) hours time off since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until he/she shall have the eight (8) hours rest period.

Holiday Codes

5. A. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, and Christmas Day (7).

B. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, the day before Christmas, and Christmas Day (8).

C. Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8).

D. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8).

H. Holidays: New Year's Day, Memorial Day, Independence Day, Thanksgiving Day, the Day after Thanksgiving Day, And Christmas (6).

I. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day (6).

K. Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday After Thanksgiving Day, The Day Before Christmas, And Christmas Day (9).

L. Holidays: New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, And Christmas Day (8).

N. Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, The Friday After Thanksgiving Day, And Christmas Day (9).

P. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday And Saturday After Thanksgiving Day, The Day Before Christmas, And Christmas Day (9). If A Holiday Falls On Sunday, The Following Monday Shall Be Considered As A Holiday.

Q. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day (6).

R. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Day After Thanksgiving Day, One-Half Day Before Christmas Day, And Christmas Day. (7 1/2).

S. Paid Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, And Christmas Day (7).

Z. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8).

Holiday Codes Continued

6. G. Paid Holidays: New Year's Day, Martin Luther King Jr. Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, and Christmas Eve Day (11).

H. Paid Holidays: New Year's Day, New Year's Eve Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday After Thanksgiving Day, Christmas Day, The Day After Christmas, And A Floating Holiday (10).

T. Paid Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, The Friday After Thanksgiving Day, The Last Working Day Before Christmas Day, And Christmas Day (9).

Z. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, And Christmas Day (7). If a holiday falls on Saturday, the preceding Friday shall be considered as the holiday. If a holiday falls on Sunday, the following Monday shall be considered as the holiday.

Holiday Codes Continued

7. A. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8). Any Holiday Which Falls On A Sunday Shall Be Observed As A Holiday On The Following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.

B. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

C. Holidays: New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

D. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8). Unpaid Holidays: President's Day. Any paid holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any paid holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

E. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

F. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, the last working day before Christmas day and Christmas day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

Holiday Codes Continued

7. G. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day (6). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.

H. Holidays: New Year's Day, Martin Luther King Jr. Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, the Last Working Day before Christmas Day and Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

I. Holidays: New Year's Day, President's Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, The Friday After Thanksgiving Day, The Day Before Christmas Day And Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

J. Holidays: New Year's Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day and Christmas Day (6). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

K. Holidays: New Year's Day, Memorial Day, Independence Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

L. Holidays: New Year's Day, Memorial Day, Labor Day, Independence Day, Thanksgiving Day, the Last Work Day before Christmas Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

N. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. When Christmas falls on a Saturday, the preceding Friday shall be observed as a holiday.

P. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.

Q. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, the Last Working Day before Christmas Day and Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.

S. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, Christmas Day, the Day after Christmas, and A Floating Holiday (9). If any of the listed holidays falls on a Sunday, the day observed by the Nation shall be considered a holiday and compensated accordingly.

V. Holidays: New Year's Day, President's Birthday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, the day before or after Christmas, and the day before or after New Year's Day. If any of the above listed holidays falls on a Sunday, the day observed by the Nation shall be considered a holiday and compensated accordingly.

W. Holidays: New Year's Day, Day After New Year's, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Eve Day, Christmas Day, the day after Christmas, the day before New Year's Day, and a Floating Holiday.

Holiday Codes Continued

7. X. Holidays: New Year's Day, Day before or after New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, and the day before or after Christmas day. If a holiday falls on a Saturday or on a Friday that is the normal day off, then the holiday will be taken on the last normal workday. If the holiday falls on a Monday that is the normal day off or on a Sunday, then the holiday will be taken on the next normal workday.

Y. Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day. (8) If the holiday falls on a Sunday, then the day observed by the federal government shall be considered a holiday and compensated accordingly.

Z. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, Christmas Eve, and Christmas Day (9). Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday. Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.

Holiday Codes Continued

15. G. New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, The Friday After Thanksgiving Day, the last scheduled workday before Christmas, and Christmas Day (9). If any of the listed holidays falls on a Sunday, the day observed by the Nation shall be considered a holiday and compensated accordingly.

H. Holidays: New Year's Day, Martin Luther King Jr. Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, the Last Working Day before Christmas Day and Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

I. Holidays: New Year's Day, President's Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, The Friday After Thanksgiving Day, The Day Before Christmas Day And Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

J. Holidays: New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, and Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.

K. Holidays: New Year's Day, Memorial Day, Independence Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

L. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.

M. Holidays: New Year's Day, Martin Luther King Jr. Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Eve Day and Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.

Holiday Codes Continued

15. N. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.

O. Holidays: New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, the day before Christmas day, and Christmas Day (10). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.

P. Holidays: New Year's Day, Memorial Day, Labor Day, Independence Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Eve Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

Note Codes

8. D. Workers working with supplied air on hazmat projects receive an additional $1.00 per hour.

L. Workers on hazmat projects receive additional hourly premiums as follows -Level A: $0.75, Level B: $0.50, And Level C: $0.25.

M. Workers on hazmat projects receive additional hourly premiums as follows: Levels A & B: $1.00, Levels C & D: $0.50.

N. Workers on hazmat projects receive additional hourly premiums as follows -Level A: $1.00, Level B: $0.75, Level C: $0.50, And Level D: $0.25.

S. Effective August 31, 2012 – A Traffic Control Supervisor shall be present on the project whenever flagging or spotting or other traffic control labor is being utilized. Flaggers and Spotters shall be posted where shown on approved Traffic Control Plans or where directed by the Engineer. All flaggers and spotters shall possess a current flagging card issued by the State of Washington, Oregon, Montana, or Idaho. This classification is only effective on or after August 31, 2012.

T. Effective August 31, 2012 – A Traffic Control Laborer performs the setup, maintenance and removal of all temporary traffic control devices and construction signs necessary to control vehicular, bicycle, and pedestrian traffic during construction operations. Flaggers and Spotters shall be posted where shown on approved Traffic Control Plans or where directed by the Engineer. All flaggers and spotters shall possess a current flagging card issued by the State of Washington, Oregon, Montana, or Idaho. This classification is only effective on or after August 31, 2012.

U. Workers on hazmat projects receive additional hourly premiums as follows – Class A Suit: $2.00, Class B Suit: $1.50, And Class C Suit: $1.00. Workers performing underground work receive an additional $0.40 per hour for any and all work performed underground, including operating, servicing and repairing of equipment. The premium for underground work shall be paid for the entire shift worked. Workers who work suspended by a rope or cable receive an additional $0.50 per hour. The premium for work suspended shall be paid for the entire shift worked. Workers who do "pioneer" work (break open a cut, build road, etc.) more than one hundred fifty (150) feet above grade elevation receive an additional $0.50 per hour.

Note Codes Continued

8. V. In addition to the hourly wage and fringe benefits, the following depth and enclosure premiums shall be paid. The premiums are to be calculated for the maximum depth and distance into an enclosure that a diver reaches in a day. The premiums are to be paid one time for the day and are not used in calculating overtime pay.

   Depth premiums apply to depths of fifty feet or more. Over 50' to 100' - $2.00 per foot for each foot over 50 feet. Over 101' to 150' - $3.00 per foot for each foot over 101 feet. Over 151' to 220' - $4.00 per foot for each foot over 220 feet. Over 221' - $5.00 per foot for each foot over 221 feet.

   Enclosure premiums apply when divers enter enclosures (such as pipes or tunnels) where there is no vertical ascent and is measured by the distance travelled from the entrance. 25’ to 300’ - $1.00 per foot from entrance. 300’ to 600’ - $1.50 per foot beginning at 300’. Over 600’ - $2.00 per foot beginning at 600’.

   W. Meter Installers work on single phase 120/240V self-contained residential meters. The Lineman/Groundmen rates would apply to meters not fitting this description.

   X. Workers on hazmat projects receive additional hourly premiums as follows - Class A Suit: $2.00, Class B Suit: $1.50, Class C Suit: $1.00, and Class D Suit: $0.50. Special Shift Premium: Basic hourly rate plus $2.00 per hour.

   When due to conditions beyond the control of the Employer or when an owner (not acting as the contractor), a government agency or the contract specifications requires that work can only be performed outside the normal 5 am to 6pm shift, then the special shift premium will be applied to the basic hourly rate. When an employee works on a special shift, they shall be paid a special shift premium for each hour worked unless they are in OT or Double-time status. (For example, the special shift premium does not waive the overtime requirements for work performed on Saturday or Sunday.)

   Y. Tide Work: When employees are called out between the hours of 6:00 p.m. and 6:00 a.m. to work on tide work (work located in the tide plane) all time worked shall be at one and one-half times the hourly rate of pay.

   Swinging Stage/Boatswains Chair: Employees working on a swinging state or boatswains chair or under conditions that require them to be tied off to allow their hands to be free shall receive seventy-five cents ($0.75) per hour above the classification rate.

   Z. Workers working with supplied air on hazmat projects receive an additional $1.00 per hour.

   Special Shift Premium: Basic hourly rate plus $2.00 per hour. When due to conditions beyond the control of the Employer or when an owner (not acting as a contractor), a government agency or the contract specifications require that more than (4) hours of a special shift can only be performed outside the normal 6 am to 6pm shift, then the special shift premium will be applied to the basic straight time for the entire shift. When an employee works on a special shift, they will be paid a special shift premium for each hour worked unless they are in overtime or double-time status. (For example, the special shift premium does not waive the overtime requirements for work performed on Saturday or Sunday.)

Note Codes Continued

9. A. Workers working with supplied air on hazmat projects receive an additional $1.00 per hour.

Special Shift Premium: Basic hourly rate plus $2.00 per hour. When due to conditions beyond the control of the Employer or when an owner (not acting as the contractor), a government agency or the contract specifications require that more than four (4) hours of a special shift can only be performed outside the normal 6 am to 6pm shift, then the special shift premium will be applied to the basic straight time for the entire shift. When an employee works on a special shift, they shall be paid a special shift premium for each hour worked unless they are in overtime or double-time status. (For example, the special shift premium does not waive the overtime requirements for work performed on Saturday or Sunday.)

Certified Crane Operator Premium: Crane operators requiring certifications shall be paid $0.50 per hour above their classification rate.

Boom Pay Premium: All cranes including tower shall be paid as follows based on boom length:

(A) – 130’ to 199’ – $0.50 per hour over their classification rate.
(B) – 200’ to 299’ – $0.80 per hour over their classification rate.
(C) – 300’ and over – $1.00 per hour over their classification rate.

B. The highest pressure registered on the gauge for an accumulated time of more than fifteen (15) minutes during the shift shall be used in determining the scale paid.

Tide Work: When employees are called out between the hours of 6:00 p.m. and 6:00 a.m. to work on tide work (work located in the tide plane) all time worked shall be at one and one-half times the hourly rate of pay. Swinging Stage/Boatswains Chair: Employees working on a swinging stage or boatswains chair or under conditions that require them to be tied off to allow their hands to be free shall receive seventy-five cents ($0.75) per hour above the classification rate.

C. Tide Work: When employees are called out between the hours of 6:00 p.m. and 6:00 a.m. to work on tide work (work located in the tide plane) all time worked shall be at one and one-half times the hourly rate of pay. Swinging Stage/Boatswains Chair: Employees working on a swinging stage or boatswains chair or under conditions that require them to be tied off to allow their hands to be free shall receive seventy-five cents ($0.75) per hour above the classification rate.

Effective August 31, 2012 – A Traffic Control Supervisor shall be present on the project whenever flagging or spotting or other traffic control labor is being utilized. A Traffic Control Laborer performs the setup, maintenance and removal of all temporary traffic control devices and construction signs necessary to control vehicular, bicycle, and pedestrian traffic during construction operations. Flaggers and Spotters shall be posted where shown on approved Traffic Control Plans or where directed by the Engineer. All flaggers and spotters shall possess a current flagging card issued by the State of Washington, Oregon, Montana, or Idaho. These classifications are only effective on or after August 31, 2012.

D. Industrial Painter wages are required for painting within industrial facilities such as treatment plants, pipelines, towers, dams, bridges, power generation facilities and manufacturing facilities such as chemical plants, etc., or anywhere abrasive blasting is necessary to prepare surfaces, or hazardous materials encapsulation is required.

E. Heavy Construction includes construction, repair, alteration or additions to the production, fabrication or manufacturing portions of industrial or manufacturing plants, hydroelectric or nuclear power plants and atomic reactor construction. Workers on hazmat projects receive additional hourly premiums as follows -Level A: $1.00, Level B: $0.75, Level C: $0.50, And Level D: $0.25.

Note Codes Continued

9. F. Industrial Painter wages are required for painting within industrial facilities such as treatment plants, pipelines, towers, dams, power generation facilities and manufacturing facilities such as chemical plants, etc., or anywhere abrasive blasting is necessary to prepare surfaces, or hazardous materials encapsulation is required.

H. One (1) person crew shall consist of a Party Chief. (Total Station or similar one (1) person survey system). Two (2) person survey party shall consist of a least a Party Chief and a Chain Person. Three (3) person survey party shall consist of at least a Party Chief, an Instrument Person, and a Chain Person.

I. In addition to the hourly wage and fringe benefits, the following depth and enclosure premiums shall be paid. The premiums are to be calculated for the maximum depth and distance into an enclosure that a diver reaches in a day. The premiums are to be paid one time for the day and are not used in calculating overtime pay.

Depth premiums apply to depths of fifty feet or more. Over 50' to 100' - $2.00 per foot for each foot over 50 feet. Over 101' to 150' - $3.00 per foot for each foot over 101 feet. Over 151' to 220' - $4.00 per foot for each foot over 220 feet. Over 221' - $5.00 per foot for each foot over 221 feet.

Enclosure premiums apply when divers enter enclosures (such as pipes or tunnels) where there is no vertical ascent and is measured by the distance travelled from the entrance. 25’ to 300’ - $1.00 per foot from entrance. 300’ to 600’ - $1.50 per foot beginning at 300’. Over 600’ - $2.00 per foot beginning at 600’.

Employees may be required to perform any combination of work within the Diving team/crew, (with the exception of dive Supervisor) provided they are paid at the highest rate at which he/she has worked for the shift.

L. Workers on hazmat projects receive additional hourly premiums as follows -Level A: $0.75, Level B: $0.50, And Level C: $0.25.

Tide Work: When employees are called out between the hours of 6:00 p.m. and 6:00 a.m. to work on tide work (work located in the tide plane) all time worked shall be at one and one-half times the hourly rate of pay.

Swinging Stage/Boatswains Chair: Employees working on a swinging stage or boatswains chair or under conditions that require them to be tied off to allow their hands to be free shall receive seventy-five cents ($0.75) per hour above the classification rate.

M. Certified Crane Operator Premium: Crane operators requiring certifications shall be paid $1.50 per hour above their classification rate.

Workers on hazmat projects receive additional hourly premiums as follows - Class A Suit: $2.00, Class B Suit: $1.50, Class C Suit: $1.00, and Class D Suit: $0.50.

Special Shift Premium: Basic hourly rate plus $2.00 per hour. When due to conditions beyond the control of the Employer or when an owner (not acting as the contractor), a government agency or the contract specifications requires that work can only be performed outside the normal 6 am to 6pm shift, then the special shift premium will be applied to the basic hourly rate. When an employee works on a special shift, they shall be paid a special shift premium for each hour worked unless they are in OT or Double-time status. (For example, the special shift premium does not waive the overtime requirements for work performed on Saturday or Sunday.)

Washington State Department of Labor and Industries
Policy Statement
(Regarding the Production of "Standard" or "Non-standard" Items)

Below is the department's (State L&I's) list of criteria to be used in determining whether a prefabricated item is "standard" or "non-standard". For items not appearing on WSDOT's predetermined list, these criteria shall be used by the Contractor (and the Contractor's subcontractors, agents to subcontractors, suppliers, manufacturers, and fabricators) to determine coverage under RCW 39.12. The production, in the State of Washington, of non-standard items is covered by RCW 39.12, and the production of standard items is not. The production of any item outside the State of Washington is not covered by RCW 39.12.

1. Is the item fabricated for a public works project? If not, it is not subject to RCW 39.12. If it is, go to question 2.

2. Is the item fabricated on the public works jobsite? If it is, the work is covered under RCW 39.12. If not, go to question 3.

3. Is the item fabricated in an assembly/fabrication plant set up for, and dedicated primarily to, the public works project? If it is, the work is covered by RCW 39.12. If not, go to question 4.

4. Does the item require any assembly, cutting, modification or other fabrication by the supplier? If not, the work is not covered by RCW 39.12. If yes, go to question 5.

5. Is the prefabricated item intended for the public works project typically an inventory item which could reasonably be sold on the general market? If not, the work is covered by RCW 39.12. If yes, go to question 6.

6. Does the specific prefabricated item, generally defined as standard, have any unusual characteristics such as shape, type of material, strength requirements, finish, etc? If yes, the work is covered under RCW 39.12.

Any firm with questions regarding the policy, WSDOT's Predetermined List, or for determinations of covered and non-covered workers shall be directed to State L&I at (360) 902-5330.

WSDOT's
Predetermined List for
Suppliers - Manufactures - Fabricator

Below is a list of potentially prefabricated items, originally furnished by WSDOT to Washington State Department of Labor and Industries, that may be considered non-standard and therefore covered by the prevailing wage law, RCW 39.12. Items marked with an X in the "YES" column should be considered to be non-standard and therefore covered by RCW 39.12. Items marked with an X in the "NO" column should be considered to be standard and therefore not covered. Of course, exceptions to this general list may occur, and in that case shall be evaluated according to the criteria described in State and L&I's policy statement.

	ITEM DESCRIPTION	YES	NO
1.	Metal rectangular frames, solid metal covers, herringbone grates, and bi-directional vaned grates for Catch Basin Types 1, 1L, 1P, and 2 and Concrete Inlets. See Std. Plans		X
2.	Metal circular frames (rings) and covers, circular grates, and prefabricated ladders for Manhole Types 1, 2, and 3, Drywell Types 1, 2, and 3 and Catch Basin Type 2. See Std. Plans		X
3.	Prefabricated steel grate supports and welded grates, metal frames and dual vaned grates, and Type 1, 2, and 3 structural tubing grates for Drop Inlets. See Std. Plans.		X
4.	Concrete Pipe - Plain Concrete pipe and reinforced concrete pipe Class 2 to 5 sizes smaller than 60 inch diameter.		X
5.	Concrete Pipe - Plain Concrete pipe and reinforced concrete pipe Class 2 to 5 sizes larger than 60 inch diameter.		X
6.	Corrugated Steel Pipe - Steel lock seam corrugated pipe for culverts and storm sewers, sizes 30 inch to 120 inches in diameter. May also be treated, 1 thru 5.		X
7.	Corrugated Aluminum Pipe - Aluminum lock seam corrugated pipe for culverts and storm sewers, sizes 30 inch to 120 inches in diameter. May also be treated, #5.		X

	ITEM DESCRIPTION	YES	NO
8.	Anchor Bolts & Nuts - Anchor Bolts and Nuts, for mounting sign structures, luminaries and other items, shall be made from commercial bolt stock. See Contract Plans and Std. Plans for size and material type.		X
9.	Aluminum Pedestrian Handrail - Pedestrian handrail conforming to the type and material specifications set forth in the contract plans. Welding of aluminum shall be in accordance with Section 9-28.14(3).	X	
10.	Major Structural Steel Fabrication - Fabrication of major steel items such as trusses, beams, girders, etc., for bridges.	X	
11.	Minor Structural Steel Fabrication - Fabrication of minor steel Items such as special hangers, brackets, access doors for structures, access ladders for irrigation boxes, bridge expansion joint systems, etc., involving welding, cutting, punching and/or boring of holes. See Contact Plans for item description and shop drawings.	X	
12.	Aluminum Bridge Railing Type BP - Metal bridge railing conforming to the type and material specifications set forth in the Contract Plans. Welding of aluminum shall be in accordance with Section 9-28.14(3).		X
13.	Concrete Piling--Precast-Prestressed concrete piling for use as 55 and 70 ton concrete piling. Concrete to conform to Section 9-19.1 of Std. Spec..	X	
14.	Precast Manhole Types 1, 2, and 3 with cones, adjustment sections and flat top slabs. See Std. Plans.		X
15.	Precast Drywell Types 1, 2, and with cones and adjustment Sections. See Std. Plans.		X
16.	Precast Catch Basin - Catch Basin type 1, 1L, 1P, and 2 With adjustment sections. See Std. Plans.		X

	ITEM DESCRIPTION	YES	NO
17.	Precast Concrete Inlet - with adjustment sections, See Std. Plans		X
18.	Precast Drop Inlet Type 1 and 2 with metal grate supports. See Std. Plans.		X
19.	Precast Grate Inlet Type 2 with extension and top units. See Std. Plans		X
20.	Metal frames, vaned grates, and hoods for Combination Inlets. See Std. Plans		X
21.	Precast Concrete Utility Vaults - Precast Concrete utility vaults of various sizes. Used for in ground storage of utility facilities and controls. See Contract Plans for size and construction requirements. Shop drawings are to be provided for approval prior to casting.		X
22.	Vault Risers - For use with Valve Vaults and Utilities Vaults.		X
23.	Valve Vault - For use with underground utilities. See Contract Plans for details.		X
24.	Precast Concrete Barrier - Precast Concrete Barrier for use as new barrier or may also be used as Temporary Concrete Barrier. Only new state approved barrier may be used as permanent barrier.		X
25.	Reinforced Earth Wall Panels – Reinforced Earth Wall Panels in size and shape as shown in the Plans. Fabrication plant has annual approval for methods and materials to be used. See Shop Drawing. Fabrication at other locations may be approved, after facilities inspection, contact HQ. Lab.	X	
26.	Precast Concrete Walls - Precast Concrete Walls - tilt-up wall panel in size and shape as shown in Plans. Fabrication plant has annual approval for methods and materials to be used	X	

	ITEM DESCRIPTION	YES	NO
27.	Precast Railroad Crossings - Concrete Crossing Structure Slabs.	X	
28.	12, 18 and 26 inch Standard Precast Prestressed Girder – Standard Precast Prestressed Girder for use in structures. Fabricator plant has annual approval of methods and materials To be used. Shop Drawing to be provided for approval prior to casting girders. See Std. Spec. Section 6-02.3(25)A	X	
29.	Prestressed Concrete Girder Series 4-14 - Prestressed Concrete Girders for use in structures. Fabricator plant has annual approval of methods and materials to be used. Shop Drawing to be provided for approval prior to casting girders. See Std. Spec. Section 6-02.3(25)A.	X	
30.	Prestressed Tri-Beam Girder - Prestressed Tri-Beam Girders for use in structures. Fabricator plant has annual approval of methods and materials to be used. Shop Drawing to be provided for approval prior to casting girders. See Std. Spec. Section 6-02.3(25)A	X	
31.	Prestressed Precast Hollow-Core Slab – Precast Prestressed Hollow-core slab for use in structures. Fabricator plant has Annual approval of methods and materials to be used. Shop Drawing to be provided for approval prior to casting girders. See Std. Spec. Section 6-02.3(25)A.	X	
32.	Prestressed-Bulb Tee Girder - Bulb Tee Prestressed Girder for use in structures. Fabricator plant has annual approval of methods and materials to be used. Shop Drawing to be provided for approval prior to casting girders. See Std. Spec. Section 6-02.3(25)A	X	
33.	Monument Case and Cover See Std. Plan.		X

	ITEM DESCRIPTION	YES	NO
34.	Cantilever Sign Structure - Cantilever Sign Structure fabricated from steel tubing meeting AASHTO-M-183. See Std. Plans, and Contract Plans for details. The steel structure shall be galvanized after fabrication in accordance with AASHTO-M-111.	X	
35.	Mono-tube Sign Structures - Mono-tube Sign Bridge fabricated to details shown in the Plans. Shop drawings for approval are required prior to fabrication.	X	
36.	Steel Sign Bridges - Steel Sign Bridges fabricated from steel tubing meeting AASHTO-M-138 for Aluminum Alloys. See Std. Plans, and Contract Plans for details. The steel Structure shall be galvanized after fabrication in accordance with AASHTO-M-111.	X	
37.	Steel Sign Post - Fabricated Steel Sign Posts as detailed in Std Plans. Shop drawings for approval are to be provided prior to fabrication		X
38.	Light Standard-Prestressed - Spun, prestressed, hollow concrete poles.	X	
39.	Light Standards - Lighting Standards for use on highway illumination systems, poles to be fabricated to conform with methods and materials as specified on Std. Plans. See Specia Provisions for pre-approved drawings.	X	
40.	Traffic Signal Standards - Traffic Signal Standards for use on highway and/or street signal systems. Standards to be fabricated to conform with methods and material as specified on Std. Plans. See Special Provisions for pre-approved drawings	X	
41.	Precast Concrete Sloped Mountable Curb (Single and Dual Faced) See Std. Plans.		X

	ITEM DESCRIPTION	YES	NO
42.	Traffic Signs - Prior to approval of a Fabricator of Traffic Signs, the sources of the following materials must be submitted and approved for reflective sheeting, legend material, and luminum sheeting. **NOTE:** *** Fabrication inspection required. Only signs tagged "Fabrication Approved" by WSDOT Sign Fabrication Inspector to be installed.	X	X
		Custom Message	Std Signing Message
43.	Cutting & bending reinforcing steel		X
44.	Guardrail components	X	X
		Custom End Sec	Standard Sec
45.	Aggregates/Concrete mixes	Covered by WAC 296-127-018	
46.	Asphalt	Covered by WAC 296-127-018	
47.	Fiber fabrics		X
48.	Electrical wiring/components		X
49.	treated or untreated timber pile		X
50.	Girder pads (elastomeric bearing)	X	
51.	Standard Dimension lumber		X
52.	Irrigation components		X

ITEM DESCRIPTION	YES	NO
53. Fencing materials		X
54. Guide Posts		X
55. Traffic Buttons		X
56. Epoxy		X
57. Cribbing		X
58. Water distribution materials		X
59. Steel "H" piles		X
60. Steel pipe for concrete pile casings, standard		X
Steel pipe for concrete pile casings, custom	X	
61. Steel pile tips, standard		X
62. Steel pile tips, custom	X	

Prefabricated items specifically produced for public works projects that are prefabricated in a county other than the county wherein the public works project is to be completed, the wage for the offsite prefabrication shall be the applicable prevailing wage for the county in which the actual prefabrication takes place.

It is the manufacturer of the prefabricated product to verify that the correct county wage rates are applied to work they perform.

See RCW 39.12.010
(The definition of "locality" in RCW 39.12.010(2) contains the phrase "wherein the physical work is being performed." The department interprets this phrase to mean the actual work site.

WSDOT's List of State Occupations not applicable to Heavy and Highway Construction Projects

This project is subject to the state hourly minimum rates for wages and fringe benefits in the contract provisions, as provided by the state Department of Labor and Industries.
The following list of occupations, is comprised of those occupations that are not normally used in the construction of heavy and highway projects.
When considering job classifications for use and / or payment when bidding on, or building heavy and highway construction projects for, or administered by WSDOT, these Occupations will be excepted from the included "Washington State Prevailing Wage Rates For Public Work Contracts" documents.

- Building Service Employees
- Electrical Fixture Maintenance Workers
- Electricians - Motor Shop
- Heating Equipment Mechanics
- Industrial Engine and Machine Mechanics
- Industrial Power Vacuum Cleaners
- Inspection, Cleaning, Sealing of Water Systems by Remote Control
- Laborers - Underground Sewer & Water
- Machinists (Hydroelectric Site Work)
- Modular Buildings
- Playground & Park Equipment Installers
- Power Equipment Operators - Underground Sewer & Water
- Residential *** ALL ASSOCIATED RATES ***
- Sign Makers and Installers (Non-Electrical)
- Sign Makers and Installers (Electrical)
- Stage Rigging Mechanics (Non Structural)

The following occupations may be used only as outlined in the preceding text concerning "WSDOT's list for Suppliers - Manufacturers - Fabricators"

- Fabricated Precast Concrete Products
- Metal Fabrication (In Shop)

Definitions for the Scope of Work for prevailing wages may be found at the Washington State Department of Labor and Industries web site and in WAC Chapter 296-127.

Washington State Department of Labor and Industries
Policy Statements
(Regarding Production and Delivery of Gravel, Concrete, Asphalt, etc.)

WAC 296-127-018 Agency filings affecting this section

Coverage and exemptions of workers involved in the production and delivery of gravel, concrete, asphalt, or similar materials.

(1) The materials covered under this section include but are not limited to: Sand, gravel, crushed rock, concrete, asphalt, or other similar materials.

(2) All workers, regardless of by whom employed, are subject to the provisions of chapter 39.12 RCW when they perform any or all of the following functions:

(a) They deliver or discharge any of the above-listed materials to a public works project site:

(i) At one or more point(s) directly upon the location where the material will be incorporated into the project; or

(ii) At multiple points at the project; or

(iii) Adjacent to the location and coordinated with the incorporation of those materials.

(b) They wait at or near a public works project site to perform any tasks subject to this section of the rule.

(c) They remove any materials from a public works construction site pursuant to contract requirements or specifications (e.g., excavated materials, materials from demolished structures, clean-up materials, etc.).

(d) They work in a materials production facility (e.g., batch plant, borrow pit, rock quarry, etc.,) which is established for a public works project for the specific, but not necessarily exclusive, purpose of supplying materials for the project.

(e) They deliver concrete to a public works site regardless of the method of incorporation.

(f) They assist or participate in the incorporation of any materials into the public works project.

(3) All travel time that relates to the work covered under subsection (2) of this section requires the payment of prevailing wages. Travel time includes time spent waiting to load, loading, transporting, waiting to unload, and delivering materials. Travel time would include all time spent in travel in support of a public works project whether the vehicle is empty or full. For example, travel time spent returning to a supply source to obtain another load of material for use on a public works site or returning to the public works site to obtain another load of excavated material is time spent in travel that is subject to prevailing wage. Travel to a supply source, including travel from a public works site, to obtain materials for use on a private project would not be travel subject to the prevailing wage.

(4) Workers are not subject to the provisions of chapter 39.12 RCW when they deliver materials to a stockpile.

(a) A "stockpile" is defined as materials delivered to a pile located away from the site of incorporation such that the stockpiled materials must be physically moved from the stockpile and transported to another location on the project site in order to be incorporated into the project.

(b) A stockpile does not include any of the functions described in subsection (2)(a) through (f) of this section; nor does a stockpile include materials delivered or distributed to multiple locations upon the project site; nor does a stockpile include materials dumped at the place of incorporation, or adjacent to the location and coordinated with the incorporation.

(5) The applicable prevailing wage rate shall be determined by the locality in which the work is performed. Workers subject to subsection (2)(d) of this section, who produce such materials at an off-site facility shall be paid the applicable prevailing wage rates for the county in which the off-site facility is located. Workers subject to subsection (2) of this section, who deliver such materials to a public works project site shall be paid the applicable prevailing wage rates for the county in which the public works project is located.

[Statutory Authority: Chapter 39.12 RCW, RCW 43.22.051 and 43.22.270. 08-24-101, § 296-127-018, filed 12/2/08, effective 1/2/09. Statutory Authority: Chapters 39.04 and 39.12 RCW and RCW 43.22.270. 92-01-104 and 92-08-101, § 296-127-018, filed 12/18/91 and 4/1/92, effective 8/31/92.]

SECTION 6 - SPECIAL PROVISIONS AND TECHNICAL SPECIFICATIONS

CITY OF SELAH
YAKIMA COUNTY, WASHINGTON

SPECIAL PROVISIONS AND TECHNICAL SPECIFICATIONS
FOR

PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS

HLA PROJECT NO. 23166

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DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 11 00 – SUMMARY OF WORK

Work on this project includes, but is not necessarily limited to, the following approximate major quantities and facility components:

Project will include modification and extension of Selah's wastewater treatment plant solids handling building including installation of new biosolids dewatering and drying equipment, new sludge and polymer feed pumps, and rerouting internal and site piping. Project also includes enclosing the existing truck loading bay and constructing a new truck loading bay, including a pre-engineered building, on south side of the solids handling building.

Refer to 1-09.3(1) of Section 01 11 50 – Special Provisions for further descriptions of unit price bid items of the proposal.

The quantities of work indicated in the proposal are to be considered as estimates and are for comparative bidding purposes only. All payments will be made on the basis of actual field measurement of Contract work completed.

The work on this project shall be accomplished in accordance with the *Standard Specifications for Road, Bridge and Municipal Construction*, 2026 edition, as issued by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA), Washington State Chapter (hereafter “Standard Specifications”). The Standard Specifications, as modified or supplemented by these Special Provisions, all of which are made a part of the Contract Documents, shall govern all of the Work.

Also incorporated into the Contract Documents by reference are:

- *Manual on Uniform Traffic Control Devices for Streets and Highways*, currently adopted edition, with Washington State modifications, if any
- *Standard Plans for Road, Bridge and Municipal Construction*, WSDOT Manual M21-01, current edition

Contractor shall obtain copies of these publications, at Contractor’s own expense.

END OF SECTION 01 11 00

SECTION 01 11 50 – SPECIAL PROVISIONS

INTRODUCTION

These Special Provisions are made up of both General Special Provisions (GSPs) from various sources, which may have project-specific fill-ins; and project-specific Special Provisions. Each Provision either supplements, modifies, or replaces the comparable Standard Specification, or is a new Provision. The deletion, amendment, alteration, or addition to any subsection or portion of the Standard Specifications is meant to pertain only to that particular portion of the section, and in no way should it be interpreted that the balance of the section does not apply.

The GSPs are labeled under the headers of each GSP, with the effective date of the GSP and its source. For example:

(March 8, 2013 APWA GSP)
(April 1, 2013 WSDOT GSP)

Project specific special provisions are labeled without a date as such:
(*****)

1-01 DEFINITIONS AND TERMS

1-01.3 Definitions
(January 19, 2022 APWA GSP)

Delete the heading **Completion Dates** and the three paragraphs that follow it, and replace them with the following:

Dates
Bid Opening Date
The date on which the Contracting Agency publicly opens and reads the Bids.

Award Date
The date of the formal decision of the Contracting Agency to accept the lowest responsible and responsive Bidder for the Work.

Contract Execution Date
The date the Contracting Agency officially binds the Agency to the Contract.

Notice to Proceed Date
The date stated in the Notice to Proceed on which the Contract time begins.

Substantial Completion Date
The day the Engineer determines the Contracting Agency has full and unrestricted use and benefit of the facilities, both from the operational and safety standpoint, any remaining traffic disruptions will be rare and brief, and only minor incidental work, replacement of temporary substitute facilities, plant establishment periods, or correction or repair remains for the Physical Completion of the total Contract.

Physical Completion Date
The day all of the Work is physically completed on the project. All documentation required by the Contract and required by law does not necessarily need to be furnished by the Contractor by this date.

Completion Date
The day all the Work specified in the Contract is completed and all the obligations of the Contractor under the contract are fulfilled by the Contractor. All documentation required by the Contract and required by law must be furnished by the Contractor before establishment of this date.

Final Acceptance Date
The date on which the Contracting Agency accepts the work as complete.

Supplement this Section with the following:

All references in the Standard Specifications or WSDOT General Special Provisions, to the terms "Department of Transportation", "Washington State Transportation Commission", "Commission", "Secretary of Transportation", "Secretary", "Headquarters", and "State Treasurer" shall be revised to read "Contracting Agency".

All references to the terms "State" or "state" shall be revised to read "Contracting Agency" unless the reference is to an administrative agency of the State of Washington, a State statute or regulation, or the context reasonably indicates otherwise.

All references to "State Materials Laboratory" shall be revised to read "Contracting Agency designated location".

All references to "final contract voucher certification" shall be interpreted to mean the Contracting Agency form(s) by which final payment is authorized, and final completion and acceptance granted.

Additive
A supplemental unit of work or group of bid items, identified separately in the Bid Proposal, which may, at the discretion of the Contracting Agency, be awarded in addition to the base bid.

Alternate
One of two or more units of work or groups of bid items, identified separately in the Bid Proposal, from which the Contracting Agency may make a choice between different methods or material of construction for performing the same work.

Business Day
A business day is any day from Monday through Friday except holidays as listed in Section 1-08.5.

Contract Bond
The definition in the Standard Specifications for "Contract Bond" applies to whatever bond form(s) are required by the Contract Documents, which may be a combination of a Payment Bond and a Performance Bond.

Contract Documents
See definition for "Contract".

Contract Time
The period of time established by the terms and conditions of the Contract within which the Work must be physically completed.

Notice of Award
The written notice from the Contracting Agency to the successful Bidder signifying the Contracting Agency's acceptance of the Bid Proposal.

Notice to Proceed
The written notice from the Contracting Agency or Engineer to the Contractor authorizing and directing the Contractor to proceed with the Work and establishing the date on which the Contract time begins.

Traffic
Both vehicular and non-vehicular traffic, such as pedestrians, bicyclists, wheelchairs, and equestrian traffic.

(*****)
Further supplement this section with the following:

Agent(s)
Any and all representatives or delegates, who, on behalf of the Contracting Agency, represent the Contracting Agency's interests, including but not limited to employees, consultants and subconsultants.

(*****)
The terms defined in Section 1-01.3 of the Standard Specifications shall be further described by the following:

Contracting Agency
City of Selah
115 W. Naches Avenue
Selah, WA 98942

The terms "Contracting Agency", "Agency" and "Owner" are interchangeable.

Engineer
HLA Engineering and Land Surveying, Inc. (HLA)
2803 River Road
Yakima, WA 98902

Working Drawings
Working drawings are further defined as electrical diagrams, catalog cut sheets, manufacturer's informational sheets describing salient features, performance curves, or samples of fabricated and manufactured items (including mechanical and electrical equipment) required for the construction project.

1-02 BID PROCEDURES AND CONDITIONS

1-02.1 Prequalification of Bidders

Delete this section and replace it with the following:

1-02.1 Qualifications of Bidder
(February 17, 2026 APWA GSP, Option A)

Before award of a public works contract, a Bidder must meet at least the minimum qualifications of RCW 39.04.350(1) to be considered a responsible bidder and qualified to be awarded a public works project.

1-02.2 Plans and Specifications

Delete this section and replace it with the following:

Information as to where Bid Documents can be obtained or reviewed will be found in the Call for Bids (Advertisement for Bids) for the work. During the bid period, electronic PDF plans and specifications, including any addenda will be available to download at https://hlacivil.com/bid. Following bid period, electronic PDF plans and specifications will only be available upon request. No paper copies will be provided.

1-02.4 Examination of Plans, Specifications, and Site of Work

1-02.4(1) General
(December 30, 2022 APWA GSP Option B)

The first sentence of the ninth paragraph, beginning with "Prospective Bidder desiring…", is revised to read:

> Prospective Bidders desiring an explanation or interpretation of the Bid Documents, shall request the explanation or interpretation in writing by close of business four (4) business days preceding the bid opening to allow a written reply to reach all prospective Bidders before the submission of their Bids.

(*****)
Add the following paragraph:

> No pre-bid approval on any proposed substitute equipment shall be granted prior to the bid opening unless specified otherwise in these Specifications.

1-02.5 Proposal Forms
(February 17, 2026 APWA GSP)

Delete this section and replace it with the following:

> The Proposal Form will identify the project and its location and describe the work. It will also list estimated quantities, units of measurement, the items of work, and the materials to be furnished at the unit bid prices. The bidder shall complete spaces on the proposal form that call for, but are not limited to, unit prices; extensions; summations; the total bid amount; signatures; date; and, where applicable, retail sales taxes and acknowledgment of addenda; the bidder's name, address, telephone number, and signature. Bids shall be in legible figures (not words) written in ink or typed and expressed in U.S. dollars. The required certifications are included as part of the Proposal Form.
>
> The Contracting Agency reserves the right to arrange the proposal forms with alternates and additives, if such be to the advantage of the Contracting Agency. The bidder shall bid on all alternates and additives set forth in the Proposal Form unless otherwise specified.

1-02.6 Preparation of Proposal
(February 17, 2026 APWA GSP, Option A)

Revise the fourth paragraph to read:

> **Subcontractor's List**
> The Bidder shall submit with the Bid the completed Subcontractor List included in the Contracting Agency Proposal Package. If a Subcontractor List Form is not included in the package, use DOT Form 271-015. The Form shall contain the following:
>
> 1. Subcontractors who will perform the Work of structural steel installation, rebar installation, heating, ventilation, air conditioning, and plumbing as described in RCW 18.106 and electrical as described in RCW 19.28,
>
> 2. The Work those subcontractors will perform on the Contract and the proof of license when required as described in RCW 39.04.350(1), and
>
> 3. No more than one subcontractor for each category of Work identified, except, when subcontractors vary with Bid alternates, in which case the Bidder shall identify which subcontractor will be used for which alternate.

(February 17, 2026 APWA GSP, Option C)

The first sentence of the second paragraph is revised to read as follows:

All prices shall be in legible figures (not words) written in ink or typed, and expressed in U.S. dollars.

Supplement the second paragraph with the following:

1. If a minimum bid amount has been established for any item, the unit or lump sum price must equal or exceed the minimum amount stated.

Delete the last two paragraphs, and replace them with the following:

The Bidder shall submit with their Bid a completed Contractor Certification Wage Law Compliance form, provided by the Contracting Agency. Failure to return this certification as part of the Bid Proposal package will make this Bid Nonresponsive and ineligible for Award. A Contractor Certification of Wage Law Compliance form is included in the Proposal Forms.

The Bidder shall make no stipulation on the Bid Form, nor qualify the bid in any manner.

A bid by a corporation shall be executed in the corporate name, by the president or a vice president (or other corporate officer accompanied by evidence of authority to sign).

A bid by a partnership shall be executed in the partnership name and signed by a partner.

A bid by a joint venture shall be executed in the joint venture name and signed by a member of the joint venture.

(*****)
Section 1-02.6 is supplemented with the following:

Any bid item which has a unit price but no extension column amount shall have the extension amount determined by multiplying the unit price times the unit quantity. Any bid item which does not have a unit price but does have an extension column amount shall have the unit price determined by dividing the extension amount by the unit quantity. Should both the unit price and the extension column amount be left blank, then the entire bid shall be considered non-responsive.

1-02.7 Bid Deposit
(*****)

Supplement this section with the following:

Bid bonds shall contain the following:

1. Contracting Agency-assigned number for the project;
2. Name of the project;
3. The Contracting Agency named as obligee;
4. The amount of the bid bond stated either as a dollar figure or as a percentage which represents five percent of the maximum bid amount that could be awarded;
5. Signature of the bidder's officer empowered to sign official statements. The signature of the person authorized to submit the bid should agree with the signature on the bond, and the title of the person must accompany the said signature;
6. The signature of the surety's officer empowered to sign the bond and the power of attorney.

If so stated in the Contract Provisions, bidder must use the bond form included in the Contract Provisions.

If so stated in the Contract Provisions, cash will not be accepted for a bid deposit.

1-02.9 Delivery of Proposal
(November 21, 2025 APWA GSP, Option C)

Delete this section and replace it with the following:

GENERAL

Each Proposal shall be submitted in a sealed envelope, with the Phase 2 - Wastewater Treatment Plant Improvements and Project Number as stated in the Call for Bids clearly marked on the outside of the envelope, or as otherwise required in the Bid Documents, to ensure proper handling and delivery.

Proposals that are received as required will be publicly opened and read as specified in Section 1-02.12. The Contracting Agency will not open or consider any Bid Proposal that is received after the time specified in the Call for Bids for receipt of Bid Proposals, or received in a location other than that specified in the Call for Bids. The Contracting Agency will not open or consider any "Supplemental Information" that is received after the time specified or received in a location other than that specified in the Call for Bids.

If an emergency or unanticipated event interrupts normal work processes of the Contracting Agency so that Proposals cannot be received at the office designated for receipt of bids as specified in Section 1-02.12 the time specified for receipt of the Proposal will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which the normal work processes of the Contracting Agency resume.

Supplemental bid information submitted after the Proposal submittal but within 48 hours of the time and date the Proposal is due, the document(s) shall be submitted as follows:

1. By e-mail to the following e-mail address: construction@hlacivil.com.

All other information required to be submitted with the Bid Proposal must be submitted with the Bid Proposal itself, at the time stated in the Call for Bids.

1-02.10 Withdrawing, Revising, or Supplementing Proposal
(February 17, 2026 APWA GSP)

Delete this section, and replace it with the following:

After submitting a physical or an electronic bid, if allowed under 1-02.9, Bid Proposal to the Contracting Agency, the Bidder may withdraw, revise, or supplement it if:

1. The Bidder submits a written request signed by an authorized person and physically delivers it to the place designated for receipt of Bid Proposals, if a physical Bid Proposal was submitted, or recalled electronically via electronic method described in 1-02.9 if an electronic Bid Proposal was submitted, and
2. The Contracting Agency receives the request before the time set for receipt of Bid Proposals, and
3. The revised or supplemented Bid Proposal (if any) is received by the Contracting Agency before the time set for receipt of Bid Proposals.

If the Bidder's request to withdraw, revise, or supplement its Bid Proposal is received before the time set for receipt of Bid Proposals, the Contracting Agency will return the unopened Proposal package to the Bidder. The Bidder must then submit the revised or supplemented package in its entirety. If the Bidder does not submit a revised or supplemented package before the time set for receipt of Bid Proposals, then its bid shall be considered withdrawn.

Late revised or supplemented Bid Proposals or late withdrawal requests will be date recorded by the Contracting Agency and returned unopened. Requests to withdraw, revise, or supplement a Bid Proposal may be submitted by the following methods:

In person
By e-mail to the following e-mail address: construction@hlacivil.com

1-02.13 Irregular Proposals
(November 21, 2025 APWA GSP)

Delete this section and replace it with the following:

1. A Proposal will be considered irregular and will be rejected if:
   a. The Bidder is not prequalified when so required;
   b. The Bidder adds provisions reserving the right to reject or accept the Award, or enter into the Contract;
   c. A price per unit cannot be determined from the Bid Proposal;
   d. The Proposal form is not properly executed;
   e. The Bidder fails to submit or properly complete a subcontractor list as required in Section 1-02.6;
   f. The Bidder fails to submit the Bidder Questionnaire, if applicable, as required by Section 1-02.6, or if the documentation that is submitted fails to meet the requirements of the Special Provisions; or
   g. The Bid Proposal does not constitute a definite and unqualified offer to meet the material terms of the Bid invitation.

2. A Proposal may be considered irregular and may be rejected if:
   a. The Proposal does not include a unit price for every Bid item;
   b. Any of the unit prices are excessively unbalanced (either above or below the amount of a reasonable Bid) to the potential detriment of the Contracting Agency;
   c. The authorized Proposal Form furnished by the Contracting Agency is not used or is altered;
   d. The completed Proposal form contains unauthorized additions, deletions, alternate Bids, or conditions;
   e. Receipt of Addenda is not acknowledged;
   f. A member of a joint venture or partnership and the joint venture or partnership submit Proposals for the same project (in such an instance, both Bids may be rejected); or
   g. If Proposal form entries are not made in ink.

1-02.14 Disqualification of Bidders
(May 17, 2018 APWA GSP, Option B)

Delete this section and replace it with the following:

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 1-7 listed in this Section.

The Contracting Agency will verify that the Bidder meets the mandatory bidder responsibility criteria in RCW 39.04.350(1), and Supplemental Criteria 1-2. Evidence that the Bidder meets Supplemental Criteria 3-7 shall be provided by the Bidder as stated later in this Section.

1. **Delinquent State Taxes**

   A. 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.

B. 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 does not owe delinquent taxes to the Washington State Department of Revenue, or if delinquent taxes are owed to the Washington State Department of Revenue, the Bidder must submit a written payment plan approved by the Department of Revenue, to the Contracting Agency by the deadline listed below.

2. **Federal Debarment**

A. Criterion: The Bidder shall not currently be debarred or suspended by the Federal government.

B. 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).

3. **Subcontractor Responsibility**

A. 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.

B. Documentation: The Bidder, if and when required as detailed below, shall submit a copy of its standard subcontract form for review by the Contracting Agency, and a written description of its procedure for validating the responsibility of subcontractors with which it contracts.

4. **Claims Against Retainage and Bonds**

A. Criterion: The Bidder shall not have a record of excessive claims filed against the retainage or payment bonds for public works projects in the three 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 Contracting Agency.

B. Documentation: The Bidder, if and when required as detailed below, shall submit a list of the public works projects completed in the three 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.

5. **Public Bidding Crime**

A. Criterion: The Bidder and/or its owners shall not have been convicted of a crime involving bidding on a public works contract in the five years prior to the bid submittal date.

B. 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 and/or its owners have not been convicted of a crime involving bidding on a public works contract.

6. **Termination for Cause / Termination for Default**

   A. Criterion: The Bidder shall not have had any public works contract terminated for cause or terminated for default by a government agency in the five years prior to the bid submittal date, unless there are extenuating circumstances and such circumstances are deemed acceptable to the Contracting Agency.

   B. 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 has not had any public works contract terminated for cause or terminated for default by a government agency in the five years prior to the bid submittal date; or if Bidder was terminated, describe the circumstances.

7. **Lawsuits**

   A. Criterion: The Bidder shall not have lawsuits with judgments entered against the Bidder in the five 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 Contracting Agency.

   B. 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 has not had any lawsuits with judgments entered against the Bidder in the five 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 five years prior to the bid submittal date, along with a written explanation of the circumstances surrounding each such lawsuit. The Contracting Agency shall evaluate these explanations to determine whether the lawsuits demonstrate a pattern of failing to meet of terms of construction related contracts.

As evidence that the Bidder meets the Supplemental Criteria stated above, the apparent low Bidder must submit to the Contracting Agency by 12:00 P.M. (noon) of the second business day following the bid submittal deadline, a written statement verifying that the Bidder meets the supplemental criteria together with supporting documentation (sufficient in the sole judgment of the Contracting Agency) demonstrating compliance with the Supplemental Criteria. The Contracting Agency 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 Contracting Agency 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 Contracting Agency 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 Contracting Agency (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 Contracting Agency from others for whom the Bidder has worked, or other public agencies or private enterprises; and (iii) any additional information obtained by the Contracting Agency which is believed to be relevant to the matter.

If the Contracting Agency determines the Bidder does not meet the bidder responsibility criteria above and is therefore not a responsible Bidder, the Contracting Agency 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 two (2) business days of the Contracting Agency's determination by presenting its appeal and any additional information to the Contracting Agency. The Contracting Agency 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 Contracting Agency will not execute a contract with any other Bidder until at least two business days after the Bidder determined to be not responsible has received the Contracting Agency's final determination.

Request to Change Supplemental Bidder Responsibility Criteria Prior To Bid: Bidders with concerns about the relevancy or restrictiveness of the Supplemental Bidder Responsibility Criteria may make or submit requests to the Contracting Agency to modify the criteria. Such requests shall be in writing, describe the nature of the concerns, and propose specific modifications to the criteria. Bidders shall submit such requests to the Contracting Agency no later than five (5) business days prior to the bid submittal deadline and address the request to the Project Engineer or such other person designated by the Contracting Agency in the Bid Documents.

1-03 AWARD AND EXECUTION OF CONTRACT

1-03.1 Consideration of Bids
(December 30, 2022 APWA GSP)

Revise the first paragraph to read:

After opening and reading proposals, the Contracting Agency will check them for correctness of extensions of the prices per unit and the total price. If a discrepancy exists between the price per unit and the extended amount of any bid item, the price per unit will control. If a minimum bid amount has been established for any item and the bidder's unit or lump sum price is less than the minimum specified amount, the Contracting Agency will unilaterally revise the unit or lump sum price, to the minimum specified amount and recalculate the extension. The total of extensions, corrected where necessary, including sales taxes where applicable and such additives and/or alternates as selected by the Contracting Agency, will be used by the Contracting Agency for award purposes and to fix the Awarded Contract Price amount and the amount of the contract bond.

1-03.2 Award of Contract
(*****)

Supplement this section with the following:

The Contract will be awarded to the apparent low bidder on the basis of the total of all bid items and schedules accepted by the Contracting Agency. The Contractor shall submit bids for all bid schedules, including all alternate and/or additive bid schedules as applicable, to be considered a responsive bidder. The Contracting Agency reserves the right to select any bid schedules for award, in no particular order.

1-03.3 Execution of Contract
(February 17, 2026 APWA GSP, Option A)

Revise this section to read:

Copies of the Contract Provisions, including the unsigned Form of Contract, will be available for signature by the successful bidder on the first business day following award. The number of copies to be executed by the Contractor will be determined by the Contracting Agency.

Within ten (10) calendar days after the award date, the successful Bidder shall return the signed Contracting Agency-prepared Contract, an insurance certification as required by Section 1-07.18, a satisfactory bond as required by law and Section 1-03.4, the Transfer of Coverage form for the Construction Stormwater General Permit with sections I, III, and VIII completed when provided. Before execution of the Contract by the Contracting Agency, the successful Bidder shall provide, if required, any of the following: pre-Award information required by the Contracting Agency as listed under Section 1-02.15, proof of licensure for electrical, HVAC, or plumbing subcontractors. If the Prime Contractor lists themselves as performing electrical, HVAC, or plumbing they are required to submit proof of licensure prior to execution.

Until the Contracting Agency executes a Contract, no Proposal shall bind the Contracting Agency nor shall any Work begin within the project limits or within Contracting Agency-furnished sites. The Contractor shall bear all risks for any Work begun outside such areas and for any materials ordered before the Contract is executed by the Contracting Agency.

If the Bidder experiences circumstances beyond their control that prevents return of the Contract documents within the calendar days after the Award date stated above, the Contracting Agency may grant up to a maximum of twenty (20) additional calendar days for return of the documents, provided the Contracting Agency deems the circumstances warrant it.

(*****)
Supplement this section with the following:

Failure to return the required documents within the allotted time shall be considered as non-responsive and shall result in forfeiture of the bid bond or deposit of the bidder in accordance with Section 1-03.5.

1-03.4 Contract Bond
(July 23, 2015 APWA GSP)

Delete the first paragraph and replace it with the following:

The successful bidder shall provide executed payment and performance bond(s) for the full contract amount. The bond may be a combined payment and performance bond; or be separate payment and performance bonds. In the case of separate payment and performance bonds, each shall be for the full contract amount. The bond(s) shall:

1. Be on a Contracting Agency-furnished form(s);

2. Be signed by an approved surety (or sureties) that:

    a. Is registered with the Washington State Insurance Commissioner, and

    b. Appears on the current Authorized Insurance List in the State of Washington published by the Office of the Insurance Commissioner;

3. Guarantee that the Contractor will perform and comply with all obligations, duties, and conditions under the Contract, including but not limited to the duty and obligation to indemnify, defend, and protect the Contracting Agency against all losses and claims related directly or indirectly from any failure:

    a. Of the Contractor (or any of the employees, subcontractors, or lower tier subcontractors of the Contractor) to faithfully perform and comply with all contract obligations, conditions, and duties or

    b. Of the Contractor (or the subcontractors or lower tier subcontractors of the Contractor) to pay all laborers, mechanics, subcontractors, lower tier subcontractors, material person, or any other person who provides supplies or provisions for carrying out the work;

4. Be conditioned upon the payment of taxes, increases, and penalties incurred on the project under titles 50, 51, and 82 RCW; and

5. Be accompanied by a power of attorney for the Surety’s officer empowered to sign the bond; and

6. Be signed by an officer of the Contractor empowered to sign official statements (sole proprietor or partner). If the Contractor is a corporation, the bond(s) must be signed by the president or vice president, unless accompanied by written proof of the authority of the individual signing the bond(s) to bind the corporation (i.e., corporate resolution, power of attorney, or a letter to such effect signed by the president or vice president).

(*****)
Supplement this section with the following:

The Contractor shall guarantee the material provided and workmanship performed under the Contract for a period of one year from and after the final acceptance thereof by the Contracting Agency. Repair and/or replacement of defective materials and workmanship shall be as specified in Section 1-05.12(1).

In addition to the requirements for the Contract Bond according to Section 1-03.4 of the Standard Specifications, the Bond shall further indemnify and hold the Contracting Agency harmless from defects appearing or developing in the material or workmanship provided or performed under the Contract within a period of one year after final acceptance by the Contracting Agency. The Contract Bond document is bound in these Specifications.

1-03.7 Judicial Review
(December 30, 2022 APWA GSP)

Revise this section to read:

All decisions made by the Contracting Agency regarding the Award and execution of the Contract or Bid rejection shall be conclusive subject to the scope of judicial review permitted under Washington Law. Such review, if any, shall be timely filed in the Superior Court of the county where the Contracting Agency headquarters is located, provided that where an action is asserted against a county, RCW 36.01.050 shall control venue and jurisdiction.

1-04 SCOPE OF THE WORK

1-04.1 Intent of the Contract

1-04.1(2) Bid Items Not Included in the Proposal
(*****)

Delete the first paragraph in its entirety and replace it with the following:

If work is required to complete the project according to the intent of the Plans and Specifications but no bid item is provided in the Bid Schedule, then the Contractor shall include the cost for providing the necessary work in the unit or lump sum price for the bid item most closely related to the work.

1-04.2 Coordination of Contract Documents, Plans, Special Provisions, Specifications, and Addenda
(December 30, 2022 APWA GSP)

Revise the second paragraph to read:

Any inconsistency in the parts of the contract shall be resolved by following this order of precedence (e.g., 1 presiding over 2, 2 over 3, 3 over 4, and so forth):

1. Addenda,
2. Proposal Form,
3. Special Provisions,
4. Contract Plans,
5. Standard Specifications,
6. Contracting Agency's Standard Plans or Details (if any), and
7. WSDOT Standard Plans for Road, Bridge, and Municipal Construction.

1-04.4 Changes
(January 19, 2022 APWA GSP)

The first two sentences of the last paragraph of Section 1-04.4 are deleted.

(*****)
Section 1-04.4 is supplemented with the following:

No changes in the work covered by the approved Contract Documents shall be made without having prior written or oral (as deemed appropriate due to urgency of change) approval of the Owner. If oral approval is granted, it shall be documented in writing shortly thereafter. Charges or credits for the work covered by the approved change shall be determined by one or more, or a combination of the following methods:

a. Unit bid prices previously approved.

b. An agreed lump sum.

c. The actual costs of:

(1) Labor, including foremen;

(2) Materials entering permanently into the work;

(3) The ownership or rental costs of construction plant and equipment during the time of use on the extra work;

(4) Power and consumable supplies for the operation of power equipment;

(5) Insurance;

(6) Social Security and Medicare and unemployment contributions.

Should authorized changes be made based upon the actual cost of material and labor, the costs thereof and costs allowed for overhead profit, bonds, insurance, etc., shall be determined via Section 1-09.6 Force Account of the Standard Specifications.

1-04.4(1) Minor Changes
(*****)

Delete the first paragraph and replace it with the following:

Payments or credits for changes may be made under the Bid item “Minor Change”. At the discretion of the Contracting Agency, this procedure for Minor Changes may be used in lieu of the more formal procedure as outlined in Section 1-04.4, Changes. All “Minor Change” work will be within the scope of the Contract Work and will not change Contract Time.

1-04.5 Procedure, Protest, and Dispute by the Contractor
(January 19, 2022 APWA GSP)

Revise item 1 of the first paragraph to read:

1. Give a signed written notice of protest to the Engineer or the Engineer’s field Inspectors within seven (7) calendar days of receiving a change order or an Engineer’s Written Determination.

1-04.6 Variation in Estimated Quantities
(*****)

Supplement this section with the following:

The quantities listed in the unit price Bid Proposal are estimates for bidding purposes only. There will be no adjustments in price due to increases or decreases in quantities regardless of the magnitude. The 25 percent provisions of this Section 1-04.6 shall not apply to: **All Bid Items.** Payment will be made at the unit contract price for actual quantities of work completed.

1-04.11 Final Cleanup
(*****)

Supplement this section with the following:

Partial cleanup shall be done by the Contractor when he feels it is necessary or when, in the opinion of the Contracting Agency, partial cleanup should be done prior to either final cleanup or final inspection. The cleanup work shall be done immediately upon written notification of the Engineer and other work shall not proceed until this partial cleanup is accomplished. Should the Contractor not conduct the cleanup as directed and in a timely manner, the Owner shall take action to have such cleanup work completed by others and will deduct such costs from any payment due the Contractor.

1-05 CONTROL OF WORK

1-05.1 Authority of the Engineer
(*****)

Supplement this section with the following:

Unless otherwise expressly provided in the Contract Drawings, Specifications, and Addenda, the means and methods of construction shall be such as the Contractor may choose; subject, however, to the Engineer's right to reject means and methods proposed by the Contractor which (1) will constitute or create a hazard to the work, or to persons or property; or (2) will not produce finished work in accordance with the terms of the Contract. The Engineer's approval of the Contractor's means and methods of construction or his failure to exercise his right to reject such means or methods shall not relieve the Contractor of the obligation to accomplish the result intended by the Contract; nor shall the exercise of such right to reject create a cause for action for damages.

At the Contractor's risk, the Engineer may suspend all or part of the work according to Section 1-08.6.

1-05.3 Working Drawings
(*****)

Supplement this section with the following:

Working Drawings shall be transmitted to HLA with the Submittal Transmittal sheet provided to the Contractor after project award. The Submittal Transmittal form includes certification language stating the submittal has been reviewed by the Contractor and complies with the Plans and Specifications. Catalog cuts shall include marks to indicate the specific item that is to be provided for the project and shall include applicable bid item number. If alternate items are submitted for approval, the Contractor shall indicate the proposed location and use of the item.

If PDF format is found to be unacceptable, the Contractor shall submit to the Engineer for review and approval a copy of all Working Drawings required in the project documents. The data shown on the Working Drawings will be complete with respect to dimensions, design criteria, products and materials of construction, and like information to enable the Engineer to review the submittal. At the time of submittal, the Contractor shall, in writing, call attention to any deviations that the item or material submitted may have from the requirements of the Contract Specifications. When the Contractor does call such deviations to the attention of the Engineer, the Contractor shall state in his letter whether or not such deviations involve any deduction or extra cost adjustment.

Unless otherwise approved by the Engineer, Working Drawings and samples shall be submitted only by the Prime Contractor, who shall indicate by a signed stamp on the Working Drawing, or other means, that he (the Prime Contractor) has checked the Working Drawing. The Contractor's stamp of approval on the Working Drawings shall constitute a representation to the Owner and Engineer that the Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, or similar data and assumes full responsibility for doing so, and that he has reviewed or coordinated each Working Drawing or sample with the requirements of the Contract Documents. Working Drawings submitted by subcontractors, directly to the Owner or sub-consultants, will be rejected for the purpose of approval.

The practice of submitting incomplete or unchecked Working Drawings for the Engineer to correct or finish will not be acceptable, and Working Drawings which, in the opinion of the Engineer, clearly indicate that they have not been checked by the Contractor will be considered as not complying with the intent of the Contract Documents and will be returned to the Contractor for resubmission in proper form.

The Engineer will review with reasonable promptness Working Drawings and samples, but the Engineer's review shall be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to the means, methods, sequences, techniques or procedures of construction, or to safety precautions or programs incidental thereto. The review by the Engineer of a separate item as such will not indicate review of the assembly in which the item functions.

When the Working Drawings have been reviewed by the Engineer, an electronic (.pdf) copy including a transmittal memo will be returned to the Contractor. No submittal or Working Drawing will be recognized without the Engineer’s review attached. In case of dispute, the Engineer’s electronic copy will be recognized as the accepted copy of record. If major changes or corrections are necessary, the Working Drawings may be rejected, and one set will be returned to the Contractor with such changes or corrections indicated. The Contractor shall make any corrections required by the Engineer and shall resubmit the required number of corrected Working Drawings or samples for review. No changes shall be made by the Contractor to resubmitted Working Drawings other than those changes indicated by the Engineer, unless such changes are clearly described in a letter accompanying the resubmitted Working Drawings.

Where a Working Drawing or sample is required by the Specifications, no related work shall be commenced until the submittal has been reviewed and approved by the Engineer.

1-05.4 Conformity With and Deviations From Plans and Stakes
(*****)

Supplement this section with the following:

Upon request, and as available, a surface model may be provided by the Contracting Agency for the Contractor’s use in utilizing GPS equipped construction equipment. Surface models are provided for the Contractor’s convenience, and if adjustments to grades are made by the Engineer during the project, no payment will be made to the Contractor to modify their model/data.

Add the following new sub-sections:

1-05.4(1) Roadway and Utility Surveys (New Section)
(*****)

The following new section shall be added to the Standard Specifications:

The Engineer shall furnish to the Contractor one time only all principal lines, grades, and measurements the Engineer deems necessary for completion of the work. These shall generally consist of one initial set of offset points to establish line and grade for underground utilities such as water, sewers, and storm drains.

The Engineer will establish the line and grade of proposed construction by offset stakes, the centerline for minor structures, and establish bench marks at convenient locations for use by the Contractor. The Contractor shall establish grades from the Engineer's stakes at suitable intervals in accordance with good practice and which meet with the approval of the Engineer. Where any information on the Plans is insufficient for establishing line and/or grade, the Contractor shall request additional information from the Engineer. Where new construction adjoins existing construction, the Contractor shall make such adjustments in grade as are directed by the Engineer. The Engineer will perform all surveying necessary to check compliance with the Specifications and as required for measuring the quantities of work as specified. The Contractor shall furnish assistance to the Engineer in checking depth and measuring quantities for payment purposes.

The Engineer will provide slope staking one time only in areas of significant sloping, establish the centerline for minor structures, and establish bench marks at convenient locations for use by the Contractor.

Any charges incurred by the Engineer to replace stakes, markers, and monumentation which were not to be disturbed, but were damaged by the Contractor's operations, shall be calculated on an hourly basis at the Engineer's normal hourly billing rates in effect at that time for the individuals and equipment required to do the work, including travel time and overtime. The Contractor does hereby authorize the Contracting Agency to deduct such costs from the amounts due or to become due to him.

Any claim by the Contractor for extra compensation by reason of alterations or reconstruction work allegedly due to error in the Engineer's line and grade, will not be allowed unless the original control points set by the Engineer still exist, or unless other satisfactory substantiating evidence to prove the error is furnished the Engineer. Three consecutive points set on line or grade shall be the minimum points used to determine any variation from a straight line or grade. Any such variation shall, upon discovery, be reported to the Engineer. In the absence of such report, the Contractor shall be liable for any error in alignment or grade.

1-05.4(2) Construction Staking Requests (New Section)
(*****)

The following new section shall be added to the Standard Specifications:

All staking requests shall be made on the "Construction Staking Request Form" found in Appendix A The form shall be emailed or delivered to the Engineer's office at least three (3) working days prior to the date requested for staking. The Contractor shall provide a brief description of the staking requested, the approximate location (station to station), when the staking will be required, and shall sign the form. Requests for re-stakes shall be marked boldly in the description.

1-05.7 Nonconforming Work
(February 17, 2026 APWA GSP)

Supplement this section with the following:

The rights exercised under the provisions of this Section shall not diminish the Contracting Agency's right to pursue any other avenue for additional remedy or damages with respect to the Contractor's failure to perform the Work as required. The Engineer has the right to reject all or part of the Nonconforming Work, and the Engineer's decision is final and not subject to protest.

No additional contract time or compensation will be allowed when the Contracting Agency exercises their rights provided by this Section.

1-05.7(1) Identification of Nonconforming Work

Replace this section with the following:

The Contractor is responsible for quality control and shall identify all Nonconforming Work. The Contracting Agency may also identify Nonconforming Work. However, failure by the Contracting Agency to identify Nonconforming Work shall not relieve the Contractor from their responsibility for the quality of the Work, nor shall it constitute acceptance or approval of the Nonconforming Work.

1-05.7(2) Reporting of Nonconforming Work

Replace this section with the following:

The Contractor shall immediately report all Nonconforming Work to the Engineer and shall include any relevant information known for suggested remediation of Nonconforming Work.

When the Contracting Agency identifies Nonconforming Work, the Engineer will notify the Contractor in writing specifying a time when a remedy must be complete. If the Contractor fails to remedy Nonconforming Work within the time specified in a written notice from the Engineer, or fails to perform any part of the Work required by the Contract Documents, the Engineer may correct and remedy such Work as may be identified in the written notice.

1-05.7(3) Remediation of Nonconforming Work

Supplement this section with the following:

The Contractor shall be responsible and bear all costs for remediating Nonconforming Work.

If the Contracting Agency remedies Nonconforming Work after the specified time when a remedy was to be completed, by any means deemed necessary, direct and indirect costs incurred by the Contracting Agency attributable to correcting and remedying Nonconforming Work not corrected by the time provided in the notice, or Work the Contractor failed or refused to perform, shall be paid by the Contractor.

If the Contractor fails to comply with a written order to remedy what the Engineer determines to be an emergency situation, the Engineer may have the Nonconforming Work corrected immediately, have the Work removed and replaced, or have Work the Contractor refuses to perform completed by using Contracting Agency or other forces. An emergency situation is any situation when, in the opinion of the Engineer, a delay in its remedy could be potentially unsafe, or might cause risk of loss or damage to the public.

When costs are incurred by the Contracting Agency, payment will be deducted by the Engineer from monies due, or to become due, to the Contractor. Such direct and indirect costs shall include in particular, but without limitation, compensation for additional professional services required, and compensation for removal, repair, replacement and/or correction of the Contractor's Nonconforming Work.

1-05.8 Survey Monuments (New Section)
(*****)

The following new section shall be added to the Standard Specifications:

The Contracting Agency will, at its own cost, reference all known existing monuments or markers relating to subdivisions, plats, roads, street centerline intersections, etc. The Contractor shall take special care to protect these monuments or markers and also the reference points. In the event the Contractor is negligent in preserving such monuments and markers, the points will be reset by a licensed surveyor at the Contractor's expense.

1-05.11 Final Inspection

Delete this section and replace it with the following:

1-05.11 Final Inspections and Operational Testing
(October 1, 2005 APWA GSP)

1-05.11(1) Substantial Completion Date

When the Contractor considers the work to be substantially complete, the Contractor shall so notify the Engineer, in writing, and request the Engineer establish the Substantial Completion Date. The Contractor's request shall list the specific items of work that remain to be completed in order to reach physical completion. The Engineer will schedule an inspection of the work with the Contractor to determine the status of completion. The Engineer may also establish the Substantial Completion Date unilaterally.

If, after this inspection, the Engineer concurs with the Contractor that the work is substantially complete and ready for its intended use, the Engineer, by written notice to the Contractor, will set the Substantial Completion Date. If, after this inspection the Engineer does not consider the work substantially complete and ready for its intended use, the Engineer will, by written notice, so notify the Contractor giving the reasons therefore.

Upon receipt of written notice concurring in or denying substantial completion, whichever is applicable, the Contractor shall pursue vigorously, diligently and without unauthorized interruption, the work necessary to reach Substantial and Physical Completion. The Contractor shall provide the Engineer with a revised schedule indicating when the Contractor expects to reach substantial and physical completion of the work.

The above process shall be repeated until the Engineer establishes the Substantial Completion Date and the Contractor considers the work physically complete and ready for final inspection.

(*****)
When a Project contains multiple locations, the Engineer may require all work to be completed prior to beginning work in another location. This may include completion of all work, including between substantial and physical completion, at the Engineer's discretion.

A Contractor's representative with authority shall be present during the final inspection.

1-05.11(2) Final Inspection and Physical Completion Date

When the Contractor considers the work physically complete and ready for final inspection, the Contractor by written notice, shall request the Engineer to schedule a final inspection. The Engineer will set a date for final inspection. The Engineer and the Contractor will then make a final inspection and the Engineer will notify the Contractor in writing of all particulars in which the final inspection reveals the work incomplete or unacceptable. The Contractor shall immediately take such corrective measures as are necessary to remedy the listed deficiencies. Corrective work shall be pursued vigorously, diligently, and without interruption until physical completion of the listed deficiencies. This process will continue until the Engineer is satisfied the listed deficiencies have been corrected.

If action to correct the listed deficiencies is not initiated within 7 days after receipt of the written notice listing the deficiencies, the Engineer may, upon written notice to the Contractor, take whatever steps are necessary to correct those deficiencies pursuant to Section 1-05.7.

The Contractor will not be allowed an extension of contract time because of a delay in the performance of the work attributable to the exercise of the Engineer's right hereunder.

Upon correction of all deficiencies, the Engineer will notify the Contractor and the Contracting Agency, in writing, of the date upon which the work was considered physically complete. That date shall constitute the Physical Completion Date of the contract but shall not imply acceptance of the work or that all the obligations of the Contractor under the contract have been fulfilled.

1-05.11(3) Operational Testing

It is the intent of the Contracting Agency to have at the Physical Completion Date a complete and operable system. Therefore, when the work involves the installation of machinery or other mechanical equipment; street lighting, electrical distribution or signal systems; irrigation systems; buildings; or other similar work it may be desirable for the Engineer to have the Contractor operate and test the work for a period of time after final inspection but prior to the physical completion date. Whenever items of work are listed in the Contract Provisions for operational testing they shall be fully tested under operating conditions for the time period specified to ensure their acceptability prior to the Physical Completion Date. During and following the test period, the Contractor shall correct any items of workmanship, materials, or equipment which prove faulty, or that are not in first class operating condition. Equipment, electrical controls, meters, or other devices and equipment to be tested during this period shall be tested under the observation of the Engineer, so that the Engineer may determine their suitability for the purpose for which they were installed. The Physical Completion Date cannot be established until testing and corrections have been completed to the satisfaction of the Engineer.

The costs for power, gas, labor, material, supplies, and everything else needed to successfully complete operational testing, shall be included in the unit contract prices related to the system being tested, unless specifically set forth otherwise in the proposal.

Operational and test periods, when required by the Engineer, shall not affect a manufacturer's guaranties or warranties furnished under the terms of the contract.

1-05.12 Final Acceptance

Add the following new section:

1-05.12(1) One-Year Guarantee Period
(March 8, 2013 APWA GSP)

The Contractor shall return to the project and repair or replace all defects in workmanship and material discovered within one year after Final Acceptance of the Work. The Contractor shall start work to remedy any such defects within 7 calendar days of receiving Contracting Agency's written notice of a defect and shall complete such work within the time stated in the Contracting Agency's notice. In case of an emergency, where damage may result from delay or where loss of services may result, such corrections may be made by the Contracting Agency's own forces or another contractor, in which case the cost of corrections shall be paid by the Contractor. In the event the Contractor does not accomplish corrections within the time specified, the work will be otherwise accomplished and the cost of same shall be paid by the Contractor.

When corrections of defects are made, the Contractor shall then be responsible for correcting all defects in workmanship and materials in the corrected work for one year after acceptance of the corrections by Contracting Agency.

This guarantee is supplemental to and does not limit or affect the requirements that the Contractor's work comply with the requirements of the Contract or any other legal rights or remedies of the Contracting Agency.

(*****)
Supplement this section with the following:

The Contractor agrees the above one-year limitation shall not exclude nor diminish the Contracting Agency's rights under any law to obtain damages and recover costs resulting from defective and unauthorized work discovered after one year.

1-05.13 Superintendents, Labor and Equipment of Contractor
(August 14, 2013 APWA GSP)

Delete the sixth and seventh paragraphs of this section.

1-05.16 Water and Power (New Section)
(*****)

The following new section shall be added to the Standard Specifications:

Water Supply: Water for use on this project shall be furnished by the Contracting Agency at no cost to the Contractor. The Contractor shall be required to follow Contracting Agency requirements to obtain a hydrant water meter and report use. The Contractor shall convey the water from the nearest convenient hydrant or other source at his own expense. The hydrants shall be used in accordance with the appropriate Water Department regulations. The Contracting Agency reserves the right to deny the use of fire hydrants where deemed inappropriate by the Contracting Agency.

Power Supply: The Contractor shall make necessary arrangements and shall bear the costs for power necessary for the performance of the work.

Measurement and Payment: No separate measurement and payment for water and power will be made. This pertains to water required for dust control, water settling trenches (when approved by the Engineer), and any other water as required by the Contract Documents. All costs for hauling, conveying, and applying water shall be included in the various bid items of the proposal.

1-06 CONTROL OF MATERIAL

1-06.1 Approval of Materials Prior to Use

1-06.1(1) Qualified Products List (QPL)
(*****)

Add the following to the third paragraph:

Should a QPL require sampling and/or testing, the Contractor shall be responsible for all coordination, deliveries, and costs for sampling and/or testing, in securing approvals from the WSDOT Materials Laboratory. The Contracting Agency will not coordinate with the WSDOT Materials Laboratory.

1-06.1(4) Fabrication Inspection Expense
(*****)

Delete this section in its entirety.

1-06.6 Recycled Materials

Delete this section, including its subsections, and replace it with the following:

The Contractor shall make their best effort to utilize recycled materials in the construction of this project. Approval of such material use shall be as detailed elsewhere in the Standard Specifications.

1-07 LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

1-07.1 Laws to be Observed
(October 1, 2005 APWA GSP)

Supplement this section with the following:

In cases of conflict between different safety regulations, the more stringent regulation shall apply.

The Washington State Department of Labor and Industries shall be the sole and paramount administrative agency responsible for the administration of the provisions of the Washington Industrial Safety and Health Act of 1973 (WISHA).

The Contractor shall maintain at the project site office, or other well-known place at the project site, all articles necessary for providing first aid to the injured. The Contractor shall establish, publish, and make known to all employees, procedures for ensuring immediate removal to a hospital, or doctor's care, persons, including employees, who may have been injured on the project site. Employees should not be permitted to work on the project site before the Contractor has established and made known procedures for removal of injured persons to a hospital or a doctor's care.

The Contractor shall have sole responsibility for the safety, efficiency, and adequacy of the Contractor's plant, appliances, and methods, and for any damage or injury resulting from their failure, or improper maintenance, use, or operation. The Contractor shall be solely and completely responsible for the conditions of the project site, including safety for all persons and property in the performance of the work. This requirement shall apply continuously, and not be limited to normal working hours. The required or implied duty of the Engineer to conduct construction review of the Contractor's performance does not, and shall not, be intended to include review and adequacy of the Contractor's safety measures in, on, or near the project site.

(*****)
Amend the second sentence of the first paragraph to read:

> The Contractor shall indemnify and save harmless the State (including the Commission, the Secretary, and any agents, officers, and employees) and the Contracting Agency (including any agents, officers, employees, and representatives) against any claims which may arise because the Contractor (or any employee of the Contractor or subcontractor or materialman) violated a legal requirement.

1-07.2 State Taxes

Delete this section, including its sub-sections, in its entirety and replace it with the following:

> **1-07.2 State Sales Tax**
> *(June 27, 2011 APWA GSP)*
>
> The Washington State Department of Revenue has issued special rules on the State sales tax. Sections 1-07.2(1) through 1-07.2(3) are meant to clarify those rules. The Contractor should contact the Washington State Department of Revenue for answers to questions in this area. The Contracting Agency will not adjust its payment if the Contractor bases a bid on a misunderstood tax liability.
>
> The Contractor shall include all Contractor-paid taxes in the unit bid prices or other contract amounts. In some cases, however, state retail sales tax will not be included. Section 1-07.2(2) describes this exception.
>
> The Contracting Agency will pay the retained percentage (or release the Contract Bond if a FHWA-funded Project) only if the Contractor has obtained from the Washington State Department of Revenue a certificate showing that all contract-related taxes have been paid (RCW 60.28.051). The Contracting Agency may deduct from its payments to the Contractor any amount the Contractor may owe the Washington State Department of Revenue, whether the amount owed relates to this contract or not. Any amount so deducted will be paid into the proper State fund.
>
> **1-07.2(1) State Sales Tax - Rule 171 (Now: State Sales Tax: WAC 458-20-171 Use Tax)**
>
> WAC 458-20-171, and its related rules, apply to building, repairing, or improving streets, roads, etc., which are owned by a municipal corporation, or political subdivision of the state, or by the United States, and which are used primarily for foot or vehicular traffic. This includes storm or combined sewer systems within and included as a part of the street or road drainage system and power lines when such are part of the roadway lighting system. For work performed in such cases, the Contractor shall include Washington State Retail Sales Taxes in the various unit bid item prices, or other contract amounts, including those that the Contractor pays on the purchase of the materials, equipment, or supplies used or consumed in doing the work.
>
> **1-07.2(2) State Sales Tax - Rule 170 (Now: State Sales Tax: WAC 458-20-170 Retail Sales Tax)**
>
> WAC 458-20-170, and its related rules, apply to the constructing and repairing of new or existing buildings, or other structures, upon real property. This includes, but is not limited to, the construction of streets, roads, highways, etc., owned by the state of Washington; water mains and their appurtenances; sanitary sewers and sewage disposal systems unless such sewers and disposal systems are within, and a part of, a street or road drainage system; telephone, telegraph, electrical power distribution lines, or other conduits or lines in or above streets or roads, unless such power lines become a part of a street or road lighting system; and installing or attaching of any article of tangible personal property in or to real property, whether or not such personal property becomes a part of the realty by virtue of installation.
>
> For work performed in such cases, the Contractor shall collect from the Contracting Agency, retail sales tax on the full contract price. The Contracting Agency will automatically add this sales tax to each payment to the Contractor. For this reason, the Contractor shall not include the retail sales tax in the unit bid item prices, or in any other contract amount subject to Rule 170, with the following exception.

Exception: The Contracting Agency will not add in sales tax for a payment the Contractor or a subcontractor makes on the purchase or rental of tools, machinery, equipment, or consumable supplies not integrated into the project. Such sales taxes shall be included in the unit bid item prices or in any other contract amount.

1-07.2(3) Services

The Contractor shall not collect retail sales tax from the Contracting Agency on any contract wholly for professional or other services (as defined in Washington State Department of Revenue Rules 138 and 244).

1-07.3 Fire Prevention and Merchantable Timber Requirements
(*****)

Delete this section and all submittal requirements.

1-07.6 Permits and Licenses
(*****)

Supplement this section with the following:

The Contractor and all subcontractors are responsible for obtaining and paying for business licenses in the City of Selah.

The Contractor is responsible for obtaining and paying for the building permit for this project. The estimated cost of the building permit is $10,000.

No hydraulic permits are required for this project unless the Contractor's operations use, divert, obstruct, or change the natural flow or bed of any river or stream, or utilize any of the waters of the State or materials from gravel or sand bars, or from stream beds.

All costs required to comply with this section shall be the responsibility of the Contractor.

1-07.7 Load Limits
(March 13, 1995 WSDOT GSP, Option 6)

Section 1-07.7 is supplemented with the following:

If the sources of materials provided by the Contractor necessitates hauling over roads other than State Highways, the Contractor shall, at the Contractor's expense, make all arrangements for the use of the haul routes.

1-07.9 Wages

1-07.9(3) Apprentices
(*****)

Supplement this section with the following:

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) or other form approved by the Contracting Agency within 30 calendar days of Contract 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 or other Contracting Agency representative.

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.

Subcontracts
The Contractor must not require subcontractors to attain more than 15% of a subcontract's proposed labor hours for the subcontract's scope of 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 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 one 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.

Measurement
Apprenticeship hours used to calculate the item "Apprentice Incentive/Penalty", by calculation, 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. The calculation of incentive/penalty will be assessed based on the Final Payment for Contractors who meet the Apprentice Utilization Requirement without a reduction by Good Faith Effort. The calculation will occur one month following the substantial completion date or at the physical completion date, whichever is earlier, such that the incentive/penalty will be included in the next Progress Estimate.

Payment
Payment will be made for the following Bid Items when included in the proposal:

"Apprenticeship Incentive/Penalty", by calculation.

When the Contractor meets the apprenticeship requirement of 15% an incentive will be assessed. When the Contractor fails to meet the apprenticeship requirement of 15%, a penalty will be assessed for each hour that is not achieved, unless a Good Faith Effort is approved by the Contracting Agency.

Apprenticeship Incentive/Penalty will be calculated as described below:

Apprentice Utilization (As reported by L&I PWIA System)	Incentive	Penalty of unmet requirement
15% or more	$2,000	N/A
14% to 14.99%	N/A	$2,000
12% to 13.99%	N/A	$3,000
10% to 11.99%	N/A	$4,000
0.01% to 9.99%	N/A	$6,000
0%	N/A	$10,000

For the purpose of providing a common proposal for all bidders, the Contracting Agency has entered an Incentive amount in the proposal to become a part of the total bid by the Contractor.

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.

1-07.9(5) Required Documents

1-07.9(5)A General
(February 17, 2026 APWA GSP, Option B)

Revise this section to read:

All Statements of Intent to Pay Prevailing Wages and Affidavits of Wages Paid shall be submitted to the Engineer through the State L&I online Prevailing Wage Intent & Affidavit (PWIA) system. When apprenticeship is a requirement of the Contract, include all apprentices in PWIA.

1-07.11 Requirements for Nondiscrimination

1-07.11(1) Regulatory Authorities

1-07.11(1)C Nondiscrimination Authorities

Section 1-07.11(1)C is revised to read:

(March 9, 2026 WSDOT GSP)
During the performance of this Contract, the Contractor, for itself, its assignees, and successors in interest agrees to comply with the following nondiscrimination statues and authorities; including but not limited to:

1. Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), and its implementing regulations and case law, prohibit discrimination on the basis of race, color, or national origin. 49 C.F.R. 21.5(b)(2) prohibits a recipient of federal funds from utilizing "criteria or methods of administration which have the effect of subjecting persons to discrimination because of their race, color, or national origin, or have the effect of defeating or substantially impairing accomplishment of the objectives of the program with respect to individuals of a particular race, color, or national origin." This includes taking reasonable steps to provide limited English proficiency (LEP) persons meaningful access to all programs, activities and services, where necessary to avoid discrimination on the basis of national origin.

2. The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C §4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects).

3. Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et. seq.), as amended, (prohibits discrimination on the basis of sex).

4. Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended (prohibits discrimination on the basis of disability); and 49 C.F.R. Part 27.

5. The Age Discrimination Act of 1975, as amended (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age).

6. Airport and Airway Improvement Act of 1982, (49 U.S.C. § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex).

7. The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age of Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition and terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not).

8. Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. § 12131-12189) as implemented by Department of Transportation regulations at 49 C.F.R. parts 37 and 38.

9. The Federal Aviation Administration's Nondiscrimination statute (49 3 U.S.C. § 47123), (prohibits discrimination on the basis of race, color 4 national origin, and sex).

10. Title IX of the Education Amendments of 1972, as amended, which 7 prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq.).

1-07.11(2) Contractual Requirements
(November 25, 2024 APWA GSP)

Delete item 11 of the first paragraph of Section 1-07.11(2).

1-07.12 Federal Agency Inspection

1-07.13 Contractor's Responsibility for Work

1-07.13(3) Relief of Responsibility for Damage by Public Traffic
(*****)

Delete this section and replace it with the following:

When it is necessary for public traffic to utilize the street and associated facilities during construction, the Contractor shall be responsible for damages to improvements. The Contractor shall provide all necessary protection and temporary facilities to accommodate both vehicular and pedestrian traffic during construction.

1-07.15 Temporary Water Pollution Prevention
(*****)

Delete this section and all submittal requirements.

1-07.17 Utilities and Similar Facilities
(*****)

Supplement this section with the following:

Public and private utilities, or their contractors, will furnish all work necessary to adjust, relocate, replace, or construct their facilities unless otherwise provided for in the Plans or these Special Provisions. Such adjustment, relocation, replacement, or construction will be done during the prosecution of the work for this project.

The following addresses and telephone number of utility companies known or suspected of having facilities within the project limits are supplied for the Contractor's convenience:

Utility Company	Address	Phone Number
City of Selah	222 South Rushmore Road, Selah, WA 98942	(509) 698-7365
Pacific Power	500 North Keys Road, Yakima, WA 98901	(509) 575-3158
Cascade Natural Gas	701 South First Avenue, Yakima, WA 98902	(509) 225-3709

Locations and dimensions shown on the Plans for existing facilities are in accordance with available information obtained without uncovering, measuring, or other verification. It shall be the Contractor's responsibility to investigate the presence and location of all utilities prior to bid opening and to assess their impacts on his construction activities.

The Contractor shall call the Utility Notification Center (One-Call Agency) for field location, not less than two or more than ten business days before the scheduled date for commencement of excavation which 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 Agency for this project is 1-800-424-5555. If no one-number locator service is available, notice shall be provided individually by the Contractor to those owners known to or suspected of having underground facilities within the area of proposed excavation.

It is the responsibility of the Contractor to verify pertinent locations and elevations of utility connection points and utility crossings. The Contractor shall field verify depths of utilities by potholing prior to beginning any new construction to allow for adjustment in grade or alignment. Potholing shall be considered incidental to other bid items and no additional compensation will be paid.

Utilities, new or old, may be renewed, relocated, or adjusted for the proposed construction. The Contractor shall, prior to beginning any work, meet with all utility organizations (public and private) in the field to familiarize himself with existing utility locations, along with familiarizing himself with plans and schedules for the installation of new, relocated, or adjusted utilities. Both public and private utility organizations, along with private contractors working for these organizations, may be doing utility installations within the area. The Contractor shall coordinate the proposed construction work with these utility installations. Additionally, the Contractor shall coordinate and bear the cost of any needs for supporting utility poles in place.

The Contractor shall arrange with the owners and operators of the respective utility systems to mark the locations and, if necessary or prudent, to expose the existing utilities prior to construction of the facilities contained in this Contract.

The Contractor shall coordinate his work with other contractors who may be working in the project area and cooperate with them.

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. In addition to the requirements of RCW 19.122, the Contractor shall use surface features and other evidence in determining the approximate utility location prior to excavation.

Where the location of the work is in proximity to overhead wires and power lines, the Contractor shall coordinate all work with the utility and shall provide for such measures as may be necessary for the protection of workmen.

1-07.18 Public Liability and Property Damage Insurance

Delete this section in its entirety, and replace it with the following:

1-07.18 Insurance
(February 17, 2026 APWA GSP)

1-07.18(1) General Requirements

A. The Contractor shall procure and maintain the insurance described in all subsections of section 1-07.18 of these Special Provisions, from insurers with a current A. M. Best rating of not less than A-: VII and licensed to do business in the State of Washington. The Contracting Agency reserves the right to approve or reject the insurance provided, based on the insurer’s financial condition.

B. The Contractor shall keep this insurance in force without interruption from the commencement of the Contractor’s Work through the term of the Contract and for thirty (30) days after the Physical Completion date, unless otherwise indicated below.

C. If any insurance policy is written on a claims-made form, its retroactive date, and that of all subsequent renewals, shall be no later than the effective date of this Contract. The policy shall state that coverage is claims made and state the retroactive date. Claims-made form coverage shall be maintained by the Contractor for a minimum of 36 months following the Completion Date or earlier termination of this Contract, and the Contractor shall annually provide the Contracting Agency with proof of renewal. If renewal of the claims made form of coverage becomes unavailable, or economically prohibitive, the Contractor shall purchase an extended reporting period ("tail") or execute another form of guarantee acceptable to the Contracting Agency to assure financial responsibility for liability for services performed.

D. The Contractor's Automobile Liability, Commercial General Liability and Excess or Umbrella Liability insurance policies shall be primary and non-contributory insurance as respects the Contracting Agency's insurance, self-insurance, or self-insured pool coverage. Any insurance, self-insurance, or self-insured pool coverage maintained by the Contracting Agency shall be excess of the Contractor's insurance and shall not contribute with it.

E. The Contractor shall provide the Contracting Agency and all additional insureds with written notice of any policy cancellation, within two business days of their receipt of such notice.

F. The Contractor shall not begin Work under the Contract until the required insurance has been obtained and approved by the Contracting Agency.

G. Failure on the part of the Contractor to maintain the insurance as required shall constitute a material breach of contract, upon which the Contracting Agency may, after giving five business days' notice to the Contractor to correct the breach, immediately terminate the Contract or, at its discretion, procure or renew such insurance and pay any and all premiums in connection therewith, with any sums so expended to be repaid to the Contracting Agency on demand, or at the sole discretion of the Contracting Agency, offset against funds due the Contractor from the Contracting Agency.

H. All costs for insurance shall be incidental to and included in the unit or lump sum prices of the Contract and no additional payment will be made.

I. Under no circumstances shall a wrap up policy be obtained, for either initiating or maintaining coverage, to satisfy insurance requirements for any policy required under this Section. A **"**wrap up policy**"** is defined as an insurance agreement or arrangement under which all the parties working on a specified or designated project are insured under one policy for liability arising out of that specified or designated project**.**

1-07.18(2) Additional Insured

All insurance policies, with the exception of Workers Compensation, and of Professional Liability and Builder's Risk (if required by this Contract) shall name the following listed entities as additional insured(s) using the forms or endorsements required herein:

- the Contracting Agency and its officers, elected officials, employees, agents, and volunteers
- HLA Engineering and Land Surveying, Inc. (HLA)
- Connetix Engineering, Inc.
- LSB Consulting Engineers

The above-listed entities shall be additional insured(s) for the full available limits of liability maintained by the Contractor, irrespective of whether such limits maintained by the Contractor are greater than those required by this Contract, and irrespective of whether the Certificate of Insurance provided by the Contractor pursuant to 1-07.18(4) describes limits lower than those maintained by the Contractor.

For Commercial General Liability insurance coverage, the required additional insured endorsements shall be at least as broad as ISO forms CG 20 10 10 01 for ongoing operations and CG 20 37 10 01 for completed operations.

1-07.18(3) Subcontractors
The Contractor shall cause each subcontractor of every tier to provide insurance coverage that complies with all applicable requirements of the Contractor-provided insurance as set forth herein, except the Contractor shall have sole responsibility for determining the limits of coverage required to be obtained by subcontractors.

The Contractor shall ensure that all subcontractors of every tier add all entities listed in 1-07.18(2) as additional insureds, and provide proof of such on the policies as required by that section as detailed in 1-07.18(2) using an endorsement as least as broad as ISO CG 20 10 10 01 for ongoing operations and CG 20 37 10 01 for completed operations.

Upon request by the Contracting Agency, the Contractor shall forward to the Contracting Agency evidence of insurance and copies of the additional insured endorsements of each subcontractor of every tier as required in 1-07.18(4) Verification of Coverage.

1-07.18(4) Verification of Coverage
The Contractor shall deliver to the Contracting Agency a Certificate(s) of Insurance and endorsements for each policy of insurance meeting the requirements set forth herein when the Contractor delivers the signed Contract for the Work. Failure of Contracting Agency to demand such verification of coverage with these insurance requirements or failure of Contracting Agency to identify a deficiency from the insurance documentation provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

Verification of coverage shall include:

1. An ACORD certificate or a form determined by the Contracting Agency to be equivalent.

2. Copies of all endorsements naming Contracting Agency and all other entities listed in 1-07.18(2) as additional insured(s), showing the policy number. The Contractor may submit a copy of any blanket additional insured clause from its policies instead of a separate endorsement.

3. Any other amendatory endorsements to show the coverage required herein.

4. A notation of coverage enhancements on the Certificate of Insurance shall not satisfy these requirements – actual endorsements must be submitted.

5. All insurance coverage maintained or procured pursuant to this agreement shall be endorsed to waive subrogation against the Contracting Agency, its elected or appointed officers, agents, officials, employees, and volunteers or shall specifically allow the Contractor or others providing insurance evidence in compliance with these Specifications to waive their right of subrogation prior to a loss. The Contractor hereby waives its own right of subrogation against the Contracting Agency and shall require similar written express waivers and insurance clauses from each of its subcontractors.

Upon request by the Contracting Agency, the Contractor shall forward to the Contracting Agency a full and certified copy of the insurance policy(s). If Builders Risk insurance is required on this Project, a full and certified copy of that policy is required when the Contractor delivers the signed Contract for the Work.

1-07.18(5) Coverages and Limits
The insurance shall provide the minimum coverages and limits set forth below. Contractor's maintenance of insurance, its scope of coverage, and limits as required herein shall not be construed to limit the liability of the Contractor to the coverage provided by such insurance, or otherwise limit the Contracting Agency's recourse to any remedy available at law or in equity.

All deductibles and self-insured retentions must be disclosed and are subject to approval by the Contracting Agency. The cost of any claim payments falling within the deductible or self-insured retention shall be the responsibility of the Contractor. In the event an additional insured incurs a liability subject to any policy's deductibles or self-insured retention, said deductibles or self-insured retention shall be the responsibility of the Contractor.

1-07.18(5)A Commercial General Liability
Commercial General Liability insurance shall be written on coverage forms at least as broad as ISO occurrence form CG 00 01, including but not limited to liability arising from premises, operations, stop gap liability, independent contractors, products-completed operations, personal and advertising injury, and liability assumed under an insured contract. There shall be no exclusion for liability arising from explosion, collapse or underground property damage.

The Commercial General Liability insurance shall be endorsed to provide a per project general aggregate limit, using ISO form CG 25 03 05 09 or an equivalent endorsement.

Contractor shall maintain Commercial General Liability Insurance arising out of the Contractor's completed operations for at least three years following Substantial Completion of the Work.

Such policy must provide the following minimum limits:

$2,000,000	Each Occurrence
$3,000,000	General Aggregate
$3,000,000	Products & Completed Operations Aggregate
$2,000,000	Personal & Advertising Injury each offence
$2,000,000	Stop Gap / Employers' Liability each accident

1-07.18(5)B Automobile Liability
Automobile Liability shall cover owned, non-owned, hired, and leased vehicles; and shall be written on a coverage form at least as broad as ISO form CA 00 01. If the Work involves the transport of pollutants, the automobile liability policy shall include MCS 90 and CA 99 48 endorsements.

Such policy must provide the following minimum limit:

$1,000,000 Combined single limit each accident

1-07.18(5)C Workers' Compensation
The Contractor shall comply with Workers' Compensation coverage as required by the Industrial Insurance laws of the State of Washington.

1-07.18(5)D Excess or Umbrella Liability
(January 4, 2016 APWA GSP)

The Contractor shall provide Excess or Umbrella Liability insurance with limits of not less than ten (10) million each occurrence and annual aggregate. This excess or umbrella liability coverage shall be excess over and at least as broad in coverage as the Contractor's Commercial General and Auto Liability insurance.

All entities listed under 1-07.18(2) of these Special Provisions shall be named as additional insureds on the Contractor's Excess or Umbrella Liability insurance policy.

This requirement may be satisfied instead through the Contractor's primary Commercial General and Automobile Liability coverages, or any combination thereof that achieves the overall required limits of insurance.

1-07.18(5)E Builder's Risk
(December 30, 2022 APWA GSP)

Contractor shall purchase and maintain Builder's Risk insurance covering interests of the Contracting Agency, the Contractor, and subcontractors of every tier, as Named Insureds, in the Work. An Installation Floater instead of Builder's Risk is acceptable for renovation projects. Builder's Risk insurance shall be on a special form policy, and shall insure against the perils of fire and extended coverage and physical loss or damage, theft, vandalism, malicious mischief and collapse; and flood and earthquake when shown below. The Builder's Risk insurance shall include coverage for temporary buildings, debris removal, and damage to materials in transit or stored off-site. Such insurance shall cover resulting "soft costs" including but not limited to design costs, licensing fees, architect's and engineer's fees, and costs due to delay in completion.

Builder's Risk insurance shall be written in the amount of the completed value of the project, with no coinsurance provisions. Such policy must provide coverage and deductibles that comply with the following:

Coverage:
Total Cost of Project to be Insured: $11,000,000
Soft Costs: $1,000,000
Flood: $2,000,000
Earthquake: $2,000,000

Deductibles not to exceed:
Flood: 2% of the Value at Time of Loss, subject to a $250,000 Minimum
Earthquake: 5% of the Value at Time of Loss, subject to a $250,000 Minimum
Earth Movement: 5% of the Value at Time of Loss, subject to a $250,000 Minimum
All Other Perils: $50,000
Soft Costs: $50,000, with no more than 7-day waiting period

The Builder's Risk insurance covering the work shall have maximum deductibles as listed above for each occurrence. The deductible(s) shall be the responsibility of the Contractor.

The Contractor shall provide the Contracting Agency with a full and certified copy of the insurance policy when the Contractor delivers the signed Contract for the work. Failure of Contracting Agency to demand such verification of coverage with these insurance requirements or failure of Contracting Agency to identify a deficiency from the insurance documentation provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

The Builder's Risk insurance shall be maintained until final acceptance of the Work by the Contracting Agency.

The Contractor and the Contracting Agency waive all rights against each other ad any of their subcontractors of every tier, agents, and employees, officers and officials, for damages caused by fire or other perils to the extent covered by Builder's Risk insurance or other property insurance applicable to the work. The policies shall provide such waivers by endorsement.

1-07.24 Rights of Way
(April 22, 2025 APWA GSP)

Delete this section, and replace it with the following:

Street Right of Way lines, limits of easements, and limits of construction permits are indicated in the Plans. The Contractor’s construction activities shall be confined within these limits unless arrangements for use of private property are made as described below.

Generally, the Contracting Agency will have obtained, prior to bid opening, all rights of way and easements, both permanent and temporary, necessary for carrying out the work. Exceptions to this are noted in the Bid Documents or will be brought to the Contractor’s attention by a duly issued Addendum.

Whenever any of the work is accomplished on or through property other than public Right of Way, the Contractor shall meet and fulfill all covenants and stipulations of any easement agreement obtained by the Contracting Agency from the owner of the private property. Copies of the easement agreements may be included in the Contract Provisions or made available to the Contractor as soon as practical after they have been obtained by the Engineer.

Whenever easements or rights of entry have not been acquired prior to advertising, these areas are so noted in the Plans. The Contractor shall not proceed with any portion of the work in areas where right of way, easements or rights of entry have not been acquired until the Engineer certifies to the Contractor that the right of way or easement is available or that the right of entry has been received. If the Contractor is delayed due to acts of omission on the part of the Contracting Agency in obtaining easements, rights of entry or right of way, the Contractor will be entitled to an extension of time. The Contractor agrees that such delay shall not be a breach of contract.

Each property owner shall be given 48 hours' notice prior to entry by the Contractor. This includes entry onto easements and private property where private improvements must be adjusted.

The Contractor shall be responsible for providing, without expense or liability to the Contracting Agency, any additional land and access thereto that the Contractor may desire for temporary construction facilities, storage of materials, or other Contractor needs. However, before using any private property, whether adjoining the work or not, the Contractor shall file with the Engineer a written permission of the private property owner, and, upon vacating the premises, a written release from the property owner of each property disturbed or otherwise interfered with by reasons of construction pursued under this contract. The statement shall be signed by the private property owner, or proper authority acting for the owner of the private property affected, stating that permission has been granted to use the property and all necessary permits have been obtained or, in the case of a release, that the restoration of the property has been satisfactorily accomplished. The statement shall include the parcel number, address, and date of signature. Written releases must be filed with the Engineer before the Completion Date will be established. Street right-of-way lines, limits of easements, and limits of construction permits are indicated in the Plans. The Contractor's construction activities shall be confined within these limits, unless arrangements for use of private property are made.

1-07.29 Safety Standards (New Section)
(*****)

The following new section shall be added to the Standard Specifications:

All work shall be performed in accordance with all applicable local, state, and federal health and safety codes, standards, regulations, and/or accepted industry standards. It shall be the responsibility of the Contractor to ensure that his work force and the public are adequately protected against any hazards.

The Contracting Agency shall have the authority at all times to issue a stop work order at no penalty to the Contracting Agency if, in its opinion, working conditions present an undue hazard to the public, property, or the work force. Such authority shall not, however, relieve the Contractor of responsibility for the maintenance of safe working conditions or assess any responsibility to the Contracting Agency or Engineer for the identification of any or all unsafe conditions.

1-08 PROSECUTION AND PROGRESS

Add the following new section:

1-08.0 Preliminary Matters
(May 25, 2006 APWA GSP)

Add the following new section:

1-08.0(1) Preconstruction Conference
(October 21, 2025 APWA GSP)

Prior to the Contractor beginning the work, a preconstruction conference will be held between the Contractor, the Engineer and such other interested parties as may be invited. The purpose of the preconstruction conference will be:

1. To review the initial progress schedule;
2. To establish a working understanding among the various parties associated or affected by the work;
3. To establish and review procedures for progress payment, notifications, approvals, submittals, etc.;
4. To review Training or Apprenticeship Plans, when applicable.
5. To discuss FSBE Goals when applicable.
6. To establish normal working hours for the work;
7. To review safety standards and traffic control; and
8. To discuss such other related items as may be pertinent to the work.

The Contractor shall prepare and submit at the preconstruction conference the following:

1. A breakdown of all lump sum items;
2. A preliminary schedule of working drawing submittals; and
3. A list of material sources for approval if applicable.

Add the following new section:

1-08.0(2) Hours of Work
(February 17, 2026 APWA GSP)

Except in the case of emergency or unless otherwise approved by the Engineer, the normal working hours for the Contract shall be any consecutive 8-hour period between 7:00 a.m. and 6:00 p.m. Monday through Friday, exclusive of a lunch break. If the Contractor desires different than the normal working hours stated above, the request must be submitted in writing prior to the preconstruction conference, subject to the provisions below. The working hours for the Contract shall be established at or prior to the preconstruction conference.

All working hours and days are also subject to local permit and ordinance conditions (such as noise ordinances).

If the Contractor wishes to deviate from the established working hours, the Contractor shall submit a written request to the Engineer for consideration. This request shall state what hours are being requested, and why. Requests shall be submitted for review no later than five (5) working days prior to the day(s) the Contractor is requesting to change the hours.

If the Contracting Agency approves such a deviation, such approval may be subject to certain other conditions, which will be detailed in writing. For example:

1. On non-Federal aid projects, requiring the Contractor to reimburse the Contracting Agency for the costs in excess of straight-time costs for Contracting Agency representatives who worked during such times. (The Engineer may require designated representatives to be present during the Work. Representatives who may be deemed necessary by the Engineer include, but are not limited to: survey crews; personnel from the Contracting Agency's

material testing lab; inspectors; and other Contracting Agency employees or third party consultants when, in the opinion of the Engineer, such Work necessitates their presence.)

2. Considering the Work performed on Saturdays, Sundays, and holidays as working days with regard to the contract time.

3. Considering multiple work shifts as multiple working days with respect to contract time even though the multiple shifts occur in a single 24-hour period.

4. If a 4-10 work schedule is requested and approved the non-working day for the week will be charged as a working day.

If Davis Bacon wage rates apply to this Contract, all requirements must be met and recorded properly on certified payroll.

1-08.0(3) Reimbursement for Overtime Work of Contracting Agency Employees (New Section)
(*****)

The following new section shall be added to the Standard Specifications:

Where the Contractor elects to work on a nonworking day, as defined in Section 1-08.5 of the Standard Specifications, or longer than the normal working hours specified in Section 1-08.0(2), such work shall be considered as overtime work. If a 4-10 schedule is approved and the Contractor elects to work the fifth day or works multiple shifts in a single 24-hour period, such work shall be considered overtime work, or the Contractor will be charged an additional working day, at his option. On all such overtime work, a Resident Engineer will be present and a survey crew may be required at the discretion of the Engineer. In all such cases, the Contracting Agency may deduct overtime costs of employees and/or representatives of the Contracting Agency from amounts due or to become due to the Contractor.

The Contractor by these specifications does hereby authorize the Engineer to deduct such costs from the amount due or to become due to the Contractor.

1-08.1 Subcontracting

1-08.1(7) Payments to Subcontractors and Lower-Tier Subcontractors

1-08.1(7)A Payment Reporting
(November 25, 2024 APWA GSP)

Delete this section and replace it with the following:

1-08.1(7)A Vacant

1-08.1(8) Required Subcontract Clauses

1-08.1(8)B Clauses Required in Subcontracts of All Tiers
(November 25, 2024 APWA GSP)

Delete item 8 of the second paragraph of Section 1-08.1(8)B.

1-08.1(9) Submittal of Executed Subcontracts
(April 22, 2025 APWA GSP, Option B)

Section 1-08.1(9) content and title are deleted and replaced with the following:

Vacant

1-08.3 Progress Schedule

1-08.3(2) General Requirements
(*****)

Supplement this section with the following:

Seasonal weather conditions shall be considered in the planning and scheduling of work influenced by high or low ambient temperature or precipitation to ensure the completion of the work within the Contract Time. No time extensions will be granted for the Contractor's failure to take into account such weather conditions for the location of the work and for the period of time in which the work is to be accomplished.

1-08.3(2)E Weekly Look-Ahead Schedule
(*****)

Supplement this section with the following:

In addition to submitting the schedule, the Contractor shall present the weekly look-ahead schedule at a weekly construction meeting. A deduction of $150 may be subtracted from the Progress Estimate, for every day the Contractor is late in supplying a weekly look-ahead schedule.

1-08.3(5) Payment
(*****)

Delete the second and third paragraph of this section.

1-08.4 Prosecution of Work

Delete this section and replace it with the following:

1-08.4 Notice to Proceed and Prosecution of Work
(February 17, 2026 APWA GSP)

Notice to Proceed will be given after the Contract has been executed and the contract bond and evidence of insurance have been approved and filed by the Contracting Agency. The Contractor shall not commence with the Work until the Notice to Proceed has been given by the Engineer. The Contractor shall commence construction activities on the project site within ten days of the Notice to Proceed Date, unless otherwise approved in writing. The Contractor shall diligently pursue the Work to the Physical Completion Date within the time specified in the Contract. Voluntary shutdown or slowing of operations by the Contractor shall not relieve the Contractor of the responsibility to complete the Work within the time(s) specified in the Contract.

When shown in the Plans, the first order of Work shall be the installation of high visibility fencing to delineate all areas for protection or restoration, as described in the Contract. Installation of high visibility fencing adjacent to the roadway shall occur after the placement of all necessary signs and traffic control devices in accordance with 2-04.3. Upon construction of the fencing, the Contractor shall request the Engineer to inspect the fence. No other Work shall be performed on the site until the Contracting Agency has accepted the installation of high visibility fencing, as described in the Contract.

(*****)
Supplement this section with the following:

Failure of the Contractor to begin work by the date set forth in the Notice to Proceed will be considered grounds for Termination for Default as specified under Section 1-08.10(1) of the Standard Specifications.

1-08.5 Time for Completion
(*****)

Add the following to the first paragraph:

Two hundred and sixty (260) working days after the date set forth in the Notice to Proceed shall be allowed for completion of all Contract work. This includes actual force account work up to those original force account contract amounts. If original force account amounts are exceeded, the Engineer may consider granting additional working day(s) for force account work.

Add the following paragraph after the second paragraph:

Inclement weather shall not be a prima facie reason for the granting of an extension of time, and the Contractor shall make every effort to continue work under prevailing conditions. The Owner may, however, grant an extension of time if an unavoidable delay as a result of inclement weather in fact occurs, and such shall then be classified as a "delay". An "inclement" weather delay day is defined as a day on which the Contractor is prevented by inclement weather or conditions resulting immediately therefrom adverse to the current controlling operation or critical path activity, as determined by the Resident Engineer, from proceeding with at least 75 percent of the normal labor and equipment force engaged on such operation for at least 60 percent of the total daily time being currently spent on the controlling operation or critical path activity.

(February 17, 2026 APWA GSP, Option A)

Revise the third and fourth paragraphs to read:

Contract time shall begin on the first working day following the Notice to Proceed Date.

Each working day shall be charged to the Contract as it occurs, until the Contract Work is physically complete. If substantial completion has been granted and all the authorized working days have been used, charging of working days will cease. Each week the Engineer will provide the Contractor a statement that shows the number of working days: (1) charged to the Contract the week before; (2) specified for the physical completion of the Contract; and (3) remaining for the physical completion of the Contract. The statement will also show the nonworking days and all partial or whole days the Engineer declares as unworkable. The statement will be identified as a Written Determination by the Engineer. If the Contractor does not agree with the Written Determination of working days, the Contractor shall pursue the protest procedures in accordance with Section 1-04.5. By failing to follow the procedures of Section 1-04.5, the Contractor shall be deemed as having accepted the statement as correct. If the Contractor is approved to work 10 hours a day and 4 days a week (a 4-10 schedule) and the fifth day of the week in which a 4-10 shift is worked would ordinarily be charged as a working day then the fifth day of that week will be charged as a working day whether or not the Contractor works on that day.

Revise the sixth paragraph to read:

The Engineer will give the Contractor written notice of the Completion Date of the Contract after all the Contractor's obligations under the Contract have been performed by the Contractor. The following events must occur before the Completion Date can be established:

1. The physical Work on the project must be complete; and
2. The Contractor must furnish all documentation required by the Contract and required by law, to allow the Contracting Agency to process final acceptance of the Contract. The following documents must be received by the Engineer prior to establishing a completion date:
    a. Material Acceptance Certification Documents
    b. Final Contract Voucher Certification
    c. Copies of the approved "Affidavit of Prevailing Wages Paid" for the Contractor and all subcontractors
    d. Property owner releases per Section 1-07.24

1-08.9 Liquidated Damages
(*****)

Replace Section 1-08.9 with the following:

Time is of the essence of the Contract. Delays inconvenience the public, interfere with public works staff operations and maintenance activities and increase risk to public infrastructure and utility users. Delays also cost taxpayers undue sums of money, adding time needed for administration, engineering, inspection, and supervision.

Accordingly, the Contractor agrees:

1. To pay liquidated damages in the amount of $3,500 for each working day beyond the number of working days established for Physical Completion.

2. To authorize the Engineer to deduct these liquidated damages from any money due or coming due to the Contractor.

When the Contract Work has progressed to Substantial Completion as defined in the Contract, the Engineer may determine the Contract Work is Substantially Complete. The Engineer will notify the Contractor in writing of the Substantial Completion Date. For overruns in Contract time occurring after the date so established, liquidated damages identified above will not apply. For overruns in Contract time occurring after the Substantial Completion Date, liquidated damages shall be assessed on the basis of direct engineering and related costs assignable to the project until the actual Physical Completion Date of all the Contract Work. For time between the Physical Completion Date and Completion Date for the Contractor to furnish all documentation required by the Contract and laws, liquidated damages may be assessed on the basis of direct engineering and related costs assignable to the project, or $150 per day, whichever is greater, until the actual Completion Date is reached. The Contractor shall complete the remaining Work as promptly as possible. Upon request by the Project Engineer, the Contractor shall furnish a written schedule for completing the physical Work on the Contract.

Liquidated damages will not be assessed for any days for which an extension of time is granted. No deduction or payment of liquidated damages will, in any degree, release the Contractor from further obligations and liabilities to complete the entire Contract.

1-09 MEASUREMENT AND PAYMENT

1-09.2 Weighing Equipment

1-09.2(1) General Requirements for Weighing Equipment
(November 25, 2024 APWA GSP, Option B)

Revise item 4 of the fifth paragraph to read:

4. Test results and scale weight records for each day's hauling operations are provided to the Engineer daily. Reporting shall utilize WSDOT form 422-027LP, Scaleman's Daily Report, unless the printed ticket contains the same information that is on the Scaleman's Daily Report Form. The scale operator must provide AM and/or PM tare weights for each truck on the printed ticket.

(*****)
Supplement this section with the following:

In lieu of E-tickets, the Contractor shall provide certified printed tickets. Certified weight tickets accompanying each truckload of material will be required to be delivered to the Resident Engineer at the site. Should the Resident Engineer or Material Receiver be unavailable, it shall be the responsibility of the Contractor's project superintendent to collect all said certified tickets for the day and deliver them to the Resident Engineer the morning following the day's construction. The certified tickets shall include the same information as required for E-tickets. Any certified weight tickets submitted later than the morning following the day materials are delivered to the site will not be considered for measurement and payment.

1-09.2(3) Specific Requirements for Platform Scales
(*****)

Supplement this section with the following:

The Contractor will furnish a person, at no cost to the Contracting Agency, who will operate the certified scales while the loading and hauling of materials is in progress. The Contractor shall provide the platform scales and any tickets required for self-printing scales.

1-09.2(5) Measurement
(December 30, 2022 APWA GSP)

Revise the first paragraph to read:

Scale Verification Checks – At the Engineer's discretion, the Engineer may perform verification checks on the accuracy of each batch, hopper, or platform scale used in weighing contract items of Work.

1-09.3 Scope of Payment
(*****)

Supplement this section with the following:

Payment for work performed under this Contract will be based on the items listed in the Unit Price Bid Proposal. Should a conflict exist between the item descriptions or the units of measurement and payment listed in the Unit Price Bid Proposal and the "Payment" clauses found in each section of the Standard Specifications, the Unit Price Bid Proposal items will prevail. If work is required to complete the project according to the intent of the Plans and Specifications, but no bid item is provided in the Unit Price Bid Proposal, then the Contractor shall include the cost for providing the necessary work in the unit or lump sum price for the bid item most closely related to the work.

1-09.3(1) Description of Bid Items (New Section)
(*****)

The following new section shall be added to the Standard Specifications:

1. Bid Item No.1 – "Minor Change", refer to Section 1-04.4(1) of the Special Provisions.

2. Bid Item No. 2 – "Apprenticeship Incentive/Penalty," refer to Section 1-07.9(3) of the Special Provisions.

3. Bid Item No. 3 – The lump sum price bid for "Mobilization," shall be full compensation for all labor, materials, tools, and equipment necessary to mobilize to the project site as defined in the Standard Specifications. Payment will be made in accordance with Standard Specifications.

4. Bid Item No. 4 – The lump sum price bid for “Indirect Dryer and Ancillary Equipment – Installed,” shall be full compensation for all labor, tools, materials, equipment, and incidentals necessary for a complete and operable sludge drying system, as specified and shown on the Plans. This bid item includes, but is not limited to, all costs for furnishing and installing equipment, conveyors, instrumentation, demolition, cast-in-place concrete construction, fabricated metal access platforms, bypass pumping (as necessary), piping and valves, pipe supports, related equipment, and appurtenances. Also included in this bid item is the cost for all required startup, testing, and commissioning services, training, and test reports. Provide all appurtenances required to provide a complete installation.

5. Bid Item No. 5 – The lump sum price bid for “Centrifuge and Ancillary Equipment – Installed,” shall be full compensation for all labor, tools, materials, equipment, and incidentals necessary for a complete and operable dewatering centrifuge, as specified and shown on the Plans. This bid item includes, but is not limited to, all costs for furnishing and installing equipment, conveyors, cranes, instrumentation, demolition, cast-in-place concrete construction, fabricated metal access platforms, bypass pumping (as necessary), piping and valves, pipe supports, related equipment, and appurtenances. Also included in this bid item is the cost for all required startup, testing, and commissioning services, training, and test reports. Provide all appurtenances required to provide a complete installation.

6. Bid Item No. 6 – The lump sum price bid for “New Building,” shall be full compensation for all labor, tools, materials, equipment, and incidentals necessary for a complete installation, as specified and shown on the Plans. This bid item includes, but is not limited to, all costs for modification or demolition of existing structures and pipe in the vicinity of the work; unclassified excavation, regardless of the material encountered; placement of piers or other foundational support; dewatering, hauling, screening, or sorting of excavated materials; structural concrete and compacted backfill, imported foundation gravel, pre-engineered metal building structure; sheet metal roofing and flashing, gutters and downspouts, and drain plumbing. Provide all other appurtenances required to make it a complete installation.

7. Bid Item No. 7 – The lump sum price bid for “Building Modification,” shall be full compensation for all labor, tools, materials, equipment, and incidentals necessary for a complete installation, as specified and shown on the Plans. This bid item includes, but is not limited to, all costs for modification or demolition of existing structures and pipe in the vicinity of the work including sawcutting; unclassified excavation, regardless of the material encountered; placement of piers or other foundational support; dewatering, hauling, screening, or sorting of excavated materials; structural concrete and compacted backfill, imported foundation gravel, pre-engineered metal building structure; fire alarm system, anchor bolts, piping, fittings, piping specialties (flow meters, pressure transmitters, pressure switches, gauges, etc.), pipe supports, restraints and thrust blocking, hose bibs, hose racks, wall hydrants and other miscellaneous plumbing connections; metal siding, hollow metal doors and frames, painting, glazing, door hardware, roll-up doors and operators, unit heaters, fans, dampers, louvers, duct work, insulation, thermostats, and speed controls. Also included in this bid item is the cost for all required startup, testing, and commissioning services, training, and test reports. Provide all other appurtenances required to make it a complete installation.

8. Bid Item No. 8 - The lump sum price bid for "Site Grading and Paving," shall be full compensation for all labor, tools, materials, equipment, and incidentals necessary to grade the site to finished subgrade elevations as shown on the Plans, including, but not limited to drainage piping, fittings, pipe zone bedding, connections to other drainage systems, compacted fill, crushed surfacing base course, concrete sidewalk, concrete equipment pads, and asphalt paving.

9. Bid Item No. 9 – The lump sum price bid for “Site Piping, Fittings, and Valves, Complete” shall be full compensation for all labor, materials, tools, equipment, and incidentals necessary to furnish and install all site potable water, utility/nonpotable water, sludge, gravity sewer, and drainage piping, drainage swale, fittings, and valves to 5 feet outside of structures; including, but not necessarily limited to, trench excavation, dewatering, laying and joining the pipe, pressure testing, disinfection, connections to existing pipe and structures, connection to new structures, backfill and compaction, imported gravel, pipe zone bedding, concrete thrust blocking, thrust restraints, mechanical joint restraints, grouting, field welding/field joints, painting, valve boxes and extensions, and cleanouts. This bid item also includes the cost for all temporary piping and pump systems needed to construct the improvements not identified in other bid items and all required trench surfacing repairs in areas where new surfacing is not called out.

10. Bid Item No. 10 – The lump sum price bid for “Electrical and Control System, Complete,” shall be full compensation for furnishing all labor, materials, tools, equipment, and incidentals necessary for installation of a complete and operational electrical supply and control system. Work shall include, but not necessarily be limited to, furnishing and installing electrical equipment and components, interior and exterior lighting, interior and remote site control panels and systems, fire alarm systems, installation of vendor-supplied panels, transformers, electrical vaults, pullholes, junction boxes, conduits, conduit banks, and connecting all equipment and facilities described under bid items within buildings and on-site. O&M manuals, installation of new underground service lines, temporary power and control systems and connections are required, and coordination with Pacific Power regarding temporary and electrical service, including utility poles, overhead lines, underground lines, transformers, etc.

1-09.4 Equitable Adjustment
(*****)

Replace Item 2.b. with the following:

2.b. Per Section 1-09.6, Force Account.

1-09.6 Force Account
(December 30, 2022 APWA GSP)

Supplement this section with the following:

The Contracting Agency has estimated and included in the Proposal, dollar amounts for all items to be paid per force account, only to provide a common proposal for Bidders. All such dollar amounts are to become a part of Contractor's total bid. However, the Contracting Agency does not warrant expressly or by implication, that the actual amount of work will correspond with those estimates. Payment will be made on the basis of the amount of work actually authorized by the Engineer.

(*****)
Add the following clarification:

The term “project overhead” shall include “jobsite overhead.” The term “general company overhead” shall include “home office overhead.”

Supplement paragraph one of Subsection 2 with the following:

Sales tax will be applied to payment made to the Contractor and shall not be included in the cost of materials provided to the Engineer.

1-09.9 Payments
(February 17, 2026 APWA GSP, Option B)

Delete the fourth paragraph and replace it with the following:

Progress payments for completed Work and material on hand will be based upon progress estimates prepared by the Engineer. A progress estimate cutoff date will be established at the preconstruction conference.

The initial progress estimate will be made not later than 30 days after the Contractor commences the Work, and successive progress estimates will be made every month thereafter until the Completion Date. Progress estimates made during progress of the Work are tentative, and made only for the purpose of determining progress payment. The progress estimates are subject to change at any time prior to the calculation of the Final Payment.

The value of the progress estimate will be the sum of the following:

1. Unit Price Items in the Bid Form — the approximate quantity of acceptable units of Work completed multiplied by the unit price.
2. Lump Sum Items in the Bid Form — based on the approved Contractor's lump sum breakdown for that item, or absent such a breakdown, based on the Engineer's determination.
3. Materials on Hand — 100 percent of invoiced cost of material delivered to Job site or other storage area approved by the Engineer.
4. Change Orders — entitlement for approved extra cost or completed extra Work as determined by the Engineer.

Progress payments will be made in accordance with the progress estimate less:

1. Retainage per Section 1-09.9(1), on non FHWA-funded projects;
2. The amount of Progress Payments previously made; and
3. Funds withheld by the Contracting Agency for disbursement in accordance with the Contract Documents.

Progress payments for Work performed shall not be evidence of acceptable performance or an admission by the Contracting Agency that any Work has been satisfactorily completed. The determination of payments under the Contract will be final in accordance with Section 1-05.1.

The sixth paragraph of Section 1-09.9 is deleted.

(*****)
Supplement this section with the following:

The progress estimate cutoff date established at the preconstruction conference shall be a minimum of ten (10) working days prior to a regularly scheduled meeting of the Contracting Agency governing body where payments may be authorized. Revisions to the agreed upon progress estimate cutoff date will only be made by written approval of the Contracting Agency. The Contractor shall submit a signed Application for Payment within three (3) working days after the progress estimate cutoff date. The Engineer shall have a minimum of five (5) working days to review the Contractor's Application for Payment. The Contractor shall supply any outstanding material and labor documentation within five (5) working days of the cutoff date, or partial payments may be withheld from applicable bid items. After the application for payment is reviewed by the Engineer, the Engineer will make a recommendation to the Contracting Agency for payment. When payment approval is required by the governing body, the payment recommendation will be reviewed for approval consideration at the next available regular meeting of the governing body. Payment to the Contractor will be made within 30 calendar days from the Contracting Agency's acceptance date of the properly completed progress estimate, as recommended by the Engineer. If a contract is funded by grant, state, or federal money, the public body shall pay the prime contractor for satisfactory performance within thirty calendar days of the date the public body receives a payment request that complies with the contract or within thirty calendar days of the date the public body actually receives the grant or federal money, whichever is later. Failure to submit an Application for Payment within the required time may delay action by the Contracting Agency and further delay payment to the Contractor.

All payments for lump sum items over $5,000.00 or a single payment for a lump sum contract of any amount will be measured by a schedule of values established as follows:

At the Preconstruction Conference, the contractor shall furnish a breakdown for each lump sum bid item or for the total lump sum contract price showing the amount bid for each principal category of the work, in such detail as requested by the Engineer, to provide a basis for determining progress payments. This breakdown, referred to as the "Schedule of Values," will be approved by the Engineer as described in Section 1-08 Prosecution and Progress before the first payment is made.

1-09.9(1) Retainage
(*****)

Add the following to the fourth paragraph:

6. An affidavit is delivered to the Contracting Agency by the Contractor, stating that all persons performing labor or furnishing materials have been paid.

1-09.9(2) Contracting Agency's Right to Withhold and Disburse Certain Amounts (New Section)
(*****)

The following new section shall be added to the Standard Specifications:

In addition to monies retained pursuant to RCW 60.28 and subject to RCW 39.04.250, RCW 39.12, and RCW 39.76, the Contractor authorizes the Engineer to withhold progress payments due or deduct an amount from any payment or payments due the Contractor which, in the Engineer's opinion, may be necessary to cover the Contracting Agency's costs for or to remedy the following situations:

1. Damage to another contractor when there is evidence thereof and a claim has been filed.

2. Where the Contractor has not paid fees or charges to public authorities or municipalities which the Contractor is obligated to pay.

3. Utilizing material, tested and inspected by the Engineer, for purposes not connected with the work (Section 1-05.6).

4. Landscape damage assessments per Section 1-07.16.

5. For overtime work performed by Contracting Agency personnel or its representative, per Section 1-08.0(3).

6. Anticipated or actual failure of the Contractor to complete the work on time:

    a. Per Section 1-08.9 Liquidated Damages; or

    b. Lack of construction progress based upon the Engineer's review of the Contractor's approved progress schedule which indicates the work will not be completed within the Contract Time. When calculating an anticipated time overrun, the Engineer will make allowances for weather delays, approved unavoidable delays, and suspensions of the work. The amount withheld under this subparagraph will be based upon the liquidated damages amount per day set forth in Contract Documents multiplied by the number of days the Contractor's approved progress schedule, in the opinion of the Engineer, indicates the Contract may exceed the Contract time.

7. Failure of the Contractor to perform any of the Contractor's other obligations under the Contract, including but not limited to:

    a. Failure of the Contractor to provide the Engineer with a field office when required by the Contract Provisions.

    b. Failure of the Contractor to protect survey stakes, markers, etc., or to provide adequate survey work as required by Section 1-05.4.

    c. Failure of the Contractor to correct defective or unauthorized work (Section 1-05.7).

    d. Failure of the Contractor to furnish a Manufacturer's Certificate of Compliance in lieu of material testing and inspection as required by Section 1-06.3.

    e. Failure to submit Intent to Pay Prevailing Wage forms, or correct underpayment to employees of the Contractor or subcontractor of any tier as required by Section 1-07.9.

    f. Failure of the Contractor to pay workers' benefits (Title 50 and Title 51 RCW) as required by Section 1-07.10.

    g. Failure of the Contractor to submit and obtain approval of a progress schedule per Section 1-08.3.

The Contractor authorizes the Engineer to act as agent for the Contractor disbursing such funds as have been withheld pursuant to this section to a party or parties who are entitled to payment. Disbursement of such funds, if the Engineer elects to do so, will be made only after giving the Contractor 15 calendar days prior written notice of the Contracting Agency's intent to do so, and if prior to the expiration of the 15-calendar day period:

1. No legal action has commenced to resolve the validity of the claims, and

2. The Contractor has not protested such disbursement.

A proper accounting of all funds disbursed on behalf of the Contractor in accordance with this section will be made. A payment made pursuant to this section shall be considered as payment made under the terms and conditions of the Contract. The Contracting Agency shall not be liable to the Contractor for such payment made in good faith.

If legal action is instituted to determine the validity of the claims prior to expiration of the 15-day period mentioned above, the Engineer will hold the funds until determination of the action or written settlement agreement of the parties.

When the conditions 1-7 are resolved or the Contractor provides a Surety Bond satisfactory to the Contracting Agency which will protect the Contracting Agency in the amount withheld, payment shall be made for amounts withheld because of them.

1-09.9(3) Final Payment (New Section)
(*****)

The following new section shall be added to the Standard Specifications:

Upon completion of all work under this Contract, the Contractor shall notify the Engineer, in writing, that he has completed his part of the Contract and shall request final payment. Upon receipt of such request, the Engineer will inspect and, if acceptable, submit to the Owner his recommendation as to acceptance of the completed work and as to the final estimate of the amount due the Contractor. Upon approval of this final estimate and upon final acceptance of the work under this Contract, the Owner will notify the Department of Revenue of the completion of said Contract. Provided the Department of Revenue certifies there are no taxes or penalties due and owing from the Contractor, and there are no other known claims or liens against the retained funds, and further provided the terms of Section 1-09.9(1) are in compliance, the Owner will pay to the Contractor the balance of monies due under this Contract in accordance with RCW Title 60.28. In the event unsatisfied claims or liens for taxes, material, labor, and other services are known to exist, an amount will be further withheld from the retainage sufficient to satisfy the settlement of such claims and liens, including attorney's fees incurred, and the remainder will be released from escrow, or released from the retained funds and paid to the Contractor.

On contracts for public works, final payment of the retained percentage will not be made until after the Contractor has filed with the Owner the Affidavit of Wages Paid forms required by RCW 39.12.040 certifying that the Contractor and subcontractors have paid not less than the prevailing rate of wages.

The parties further agree that the Owner may, without liability, withhold final payment to the Contractor until such time as the Contractor has completed all forms required by the Owner.

If a contract is funded by grant, state, or federal money, the public body shall pay the prime contractor for satisfactory performance within thirty calendar days of the date the public body receives a payment request that complies with the contract or within thirty calendar days of the date the public body actually receives the grant or federal money, whichever is later.

1-09.11 Disputes and Claims

1-09.11(3) Time Limitation and Jurisdiction
(December 30, 2022 APWA GSP)

Revise this section to read:

For the convenience of the parties to the Contract it is mutually agreed by the parties that all claims or causes of action which the Contractor has against the Contracting Agency arising from the Contract shall be brought within 180 calendar days from the date of final acceptance (Section 1-05.12) of the Contract by the Contracting Agency; and it is further agreed that any such claims or causes of action shall be brought only in the Superior Court of the county where the Contracting Agency headquarters is located, provided that where an action is asserted against a county, RCW 36.01.050 shall control venue and jurisdiction. The parties understand and agree that the Contractor’s failure to bring suit within the time period provided, shall be a complete bar to all such claims or causes of action. It is further mutually agreed by the parties that when claims or causes of action which the Contractor asserts against the Contracting Agency arising from the Contract are filed with the Contracting Agency or initiated in court, the Contractor shall permit the Contracting Agency to have timely access to all records deemed necessary by the Contracting Agency to assist in evaluating the claims or action.

1-09.13 Claims Resolution

1-09.13(1) Conditions Precedent to Binding Arbitration or Litigation

1-09.13(1)A General
(December 30, 2022 APWA GSP)

Revise this section to read:

Prior to seeking claims resolution through arbitration or litigation, the Contractor shall proceed in accordance with Sections 1-04.5 and 1-09.11. The provisions of Sections 1-04.5 and 1-09.11 must be complied with in full as a condition precedent to the Contractor's right to seek claim resolution through binding arbitration or litigation.

Any claims or causes of action which the Contractor has against the Contracting Agency arising from the Contract shall be resolved, as prescribed herein, through binding arbitration or litigation.

The Contractor and the Contracting Agency mutually agree that those claims or causes of action which total $1,000,000 or less, which are not resolved by mediation, shall be resolved through litigation unless the parties mutually agree in writing to resolve the claim through binding arbitration.

The Contractor and the Contracting Agency mutually agree that those claims or causes of action in excess of $1,000,000, which are not resolved by mediation, shall be resolved through litigation unless the parties mutually agree in writing to resolve the claim through binding arbitration.

1-09.13(3) Arbitration

1-09.13(3)A Arbitration General
(January 19, 2022 APWA GSP)

Revise the third paragraph to read:

The Contracting Agency and the Contractor mutually agree to be bound by the decision of the arbitrator, and judgment upon the award rendered by the arbitrator may be entered in the Superior Court of the county in which the Contracting Agency's headquarters is located, provided that where claims subject to arbitration are asserted against a county, RCW 36.01.050 shall control venue and jurisdiction of the Superior Court. The decision of the arbitrator and the specific basis for the decision shall be in writing. The arbitrator shall use the Contract as a basis for decisions.

1-09.13(4) Venue for Litigation
(December 30, 2022 APWA GSP)

Revise this section to read:

Litigation shall be brought in the Superior Court of the county in which the Contracting Agency's headquarters is located, provided that where claims are asserted against a county, RCW 36.01.050 shall control venue and jurisdiction of the Superior Court. It is mutually agreed by the parties that when litigation occurs, the Contractor shall permit the Contracting Agency to have timely access to all records deemed necessary by the Contracting Agency to assist in evaluating the claims or action.

END OF SECTION 01 11 50

SECTION 01 25 50 – SUBSTITUTION OF MAJOR EQUIPMENT ITEMS AND PRODUCTS

PART 1 – GENERAL

1.01 DESCRIPTION

A. This Section defines the total bid price contract format using "Basis of Bid" major equipment items, materials, and products for preparation of the TOTAL BID PRICE and outlines the procedure for proposal of substitute items by "Alternate" manufacturers.

B. The use of this bidding format is intended to:

1. Provide a common basis for all Bidders on which to base their TOTAL BID PRICE.

2. Protect the Owner and Bidders so that no one Bidder gains an unfair bid price advantage by quoting a lower price for a major equipment item or product which is not "or equal."

3. Assure that the Owner receives full benefit of the savings in cost involved in any substitution of a major equipment item or product.

C. Bidders shall provide all required information as noted in this section.

1.02 BID SCHEDULE FORMAT

A. The Bid Schedule format is based on a total bid price contract using "Basis of Bid" major equipment items and products which have been identified and described in the Contract Documents. Major equipment items and products identified in Column 1 of Table 1 in the Bid Proposal Form are considered "Basis of Bid" items. Contract Document sections defining "Basis of Bid" major equipment items or products include:

Section 43 21 00 – Positive Displacement Rotary Lobe Pumps
Section 46 33 33 – Polymer Blending and Feed Equipment
Section 46 76 28 – Dried Sludge Conveyors
Section 46 76 33 – Centrifuge
Section 46 76 71 – Indirect Biosolids Drying System

B. The TOTAL BID PRICE noted in the Bid Schedule shall include the installed prices of only "Basis of Bid" major equipment items or products. The Bidder shall note the installed price of each "Basis of Bid" major equipment item or product in the space provided in Column 1 of Table 1 in the Bid Schedule. The installed price shall include the labor and material cost, profit and overhead, plus the cost for all necessary appurtenances to provide a complete system.

Failure to furnish the installed price of each "Basis of Bid" item may be cause for rejection of the bid.

C. It is not the intent of the Contract Documents to contain proprietary, exclusionary, or discriminatory requirements other than those based on performance. Manufacturers who believe that their equipment can meet the performance requirements and, with the exception of minor details, the technical requirements of the Contract Documents, are encouraged to submit a quotation to a Bidder for a substitute major equipment item or product. Model number designations for the major equipment items are included for information purposes. Proposed "Basis of Bid" major equipment items and "Alternate" major equipment items will be evaluated on the basis of the requirements contained in the Contract Documents.

D. Bidders desiring to quote a price for a substitute major equipment item or product in lieu of a "Basis of Bid" item may at their option write in the name of one manufacturer to be identified in Column 2 of Table 1 in the Bid Schedule in the space provided. The manufacturer listed by the Bidder in Column 2 shall be considered the proposed "Alternate" major equipment item or product. The Bidder shall note the installed price of each proposed "Alternate" major equipment item or product in Column 2 of Table 1 in the Bid Schedule in the space provided.

   The Bidder shall not use the installed price for any proposed "Alternate" major equipment item or product in preparing the TOTAL BID PRICE.

E. If the Bidder writes in the name of a proposed "Alternate" manufacturer and fails to note the installed price or writes in the installed price and fails to identify the name of the proposed "Alternate" manufacturer, the Bidder shall furnish the "Basis of Bid" item for the installed price noted in Column 1 of Table 1 in the Bid Schedule.

1.03 QUALIFICATION PACKAGE

A. All Bidders shall submit with the Bid Package a "Qualification Package" for each "Alternate" major equipment item or product which the Bidder proposes to furnish in lieu of a "Basis of Bid" major equipment item or product identified in Column 1 of Table 1. A “Qualifications Package” may also be submitted prior to the Bid opening in accordance with paragraph H. below.

B. The Bidder shall submit each "Qualification Package" under separate cover. Each "Qualification Package" shall be bound with protective cover, identify the Specification section number and title, and the product manufacturer's name on a cover sheet. The Bidder shall submit all "Qualification Packages" in a sealed sturdy box or suitable container with the Bid Package attached to or enclosed in the box or container. Each package shall be uniquely identified by the manufacturer, by number and date, with the number and date written on the outside of the package. The Contractor shall write the identification number in the right column of Table 1 for each “Qualifications Package” corresponding to the “Alternate” manufacturer listed in Column 2.

C. The "Qualification Package" for the "Alternate" major equipment items or products the Bidder proposes to furnish shall include, but not be limited to, the information defined in paragraph 1.03.D, and special information as required for submittal in each of the individual specification sections for which alternative equipment consideration is desired.

   FAILURE TO FURNISH THE REQUIRED INFORMATION WITH THE BID PROPOSAL FORM, OR UNDER SEPARATE COVER PRIOR TO BID OPENING, MAY BE CAUSE FOR REJECTION OF A PROPOSED ALTERNATE MAJOR EQUIPMENT ITEM OR PRODUCT FOR USE ON THIS PROJECT

D. The "Qualifications Package" submittal requirements for each equipment section defined in 1.03.C shall be as follows:

   1. A complete set of drawings, specifications, catalog cut-sheets, and detailed descriptive material of proposed major equipment items or products. This information shall identify all technical and performance requirements stipulated on each drawing and in each specification section.

   2. Detailed information shall be submitted for all additional items such as hardware, motors, bearings, reducers, belts, sheaves, motor controllers, and instrumentation (field device, major control panel device, and anticipated control panel layout).

   3. List showing materials of construction of all components, including all buy-out items.

4. Manufacturer's recommended spare parts.

5. Information on equipment field erection requirements including total weight of assembled components and weight of each subassembly.

6. A maintenance schedule showing the required maintenance, frequency of maintenance, lubricants, and other items required at each regular preventive maintenance period.

7. Process equipment electrical requirements and schematic diagrams.

8. Examples of reports and hard copies of CRT displays similar to those required by this project.

9. Detailed written documentation with discussion of all deviations of equipment, including all buy-out items, from the Contract Documents.

E. If the Bidder fails to furnish all of the preceding information which has been deemed necessary by the Engineer to evaluate a proposed "Alternate" major equipment item or product for equivalency with the "Basis of Bid" major equipment item or product, the proposed "Alternate" qualification package will be rejected by the Engineer. If the "Alternate" qualification package is rejected by the Engineer, the Bidder shall furnish the "Basis of Bid" major equipment item or product for the installed price noted in Column 1 of Table 1 in the Bid Proposal Form.

F. No proposed "Alternate" major equipment item or product will be considered unless, in the opinion of the Engineer, it conforms to the Contract Documents in all respects, except for make and manufacturer and minor details.

G. The Engineer shall be the sole authority for determining conformance of a proposed "Alternate" major equipment item or product with the Contract Documents. Under no circumstances will the Engineer be required to prove that an "Alternate" major equipment item or product is not equal to the "Basis of Bid" major equipment item or product.

H. In lieu of submitting the qualifications package with the Bid Package, a qualifications package may also be submitted by the equipment manufacturer directly to the Owner at any time prior to opening of Bids. These pre-submitted qualifications packages will remain unopened until after bids have been opened and shall be submitted to the Owner at the address where Bids are received. Pre-submitted qualifications packages shall be submitted according to the following requirements:

1. The contents of the Qualifications Package shall be identical in all respects to the packages described elsewhere in this section.

2. It shall be the sole responsibility of the Bidder to ensure a Qualifications Package has been submitted by an equipment manufacturer listed as an “Alternate” in Column 2 of Table 1 of the Bid Schedule.

3. Qualifications Packages must be received on or before the time set forth for the receipt of Bids.

4. The Qualifications Package shall be clearly labeled as required for the sealed bids and the words “EQUIPMENT QUALIFICATIONS PACKAGE” shall be clearly written on the outside of the package.

5. Each package shall be uniquely identified by the manufacturer, by number and date, with the number and date written on the outside of the package. The Contractor shall write the identification number in the right margin adjacent to Table 1 for each pre-submitted Qualifications Package.

6. Failure of the manufacturer to pre-submit a Qualifications Package, or failure of the Bidder to provide the identification number on Table 1, may be cause for rejection of a proposed alternate major equipment or product for use on this project.

1.04 CONTRACT AWARD

A. Award of the Contract will be made on the basis of the Bid Schedule from the lowest responsive, responsible, qualified Bidder using the TOTAL BID PRICE.

B. In the event a proposed "Alternate" major equipment item or product is not accepted as "or equal" by the Engineer, the "Basis of Bid" major equipment item or product as specified shall be furnished for the amount noted in Column 1 of Table 1 in the Bid Schedule and without adjustment to the TOTAL BID PRICE.

C. If a proposed "Alternate" qualification package is accepted as "or equal" by the Engineer, the "Alternate" major equipment item or product listed in Column 2 of Table 1 in the Bid Schedule shall be furnished for the amount noted and the CONTRACT PRICE shall be adjusted accordingly, based on the price differences noted in Table 1 between Column 1 and Column 2. The CONTRACT PRICE will be adjusted by subtracting the sum of differences in prices from the subtotal bid price, then adding the applicable sales tax to the adjusted subtotal price in each schedule accepted by the Owner to arrive at the adjusted CONTRACT PRICE.

1.05 SHOP DRAWING SUBMITTALS

A. Acceptance of a proposed "Alternate" major equipment item or product "Qualification Package," or naming of "Basis of Bid" equipment, does not eliminate the need for shop drawing submittals and reviews during construction, nor does it eliminate the requirement that the equipment manufacturer satisfy the requirements of the Contract Documents.

B. Shop drawings shall be furnished in accordance with Section 01 33 00 – Submittals Procedure.

C. Should the Bidder furnish a major equipment item or product requiring changes to the Contract Documents, he shall notify the Engineer in writing of all dimensional, mechanical, electrical, and structural changes and/or requirements for the major equipment item's use in this Project and shall reimburse the Owner for any associated redesign and/or construction drawings. The Bidder shall consider all costs associated in furnishing and installing a major equipment item or product in his installed price proposal. Redesign and contract drawing revisions to accommodate equipment or products will be prepared by the Engineer during the shop drawing review process. Reimbursement shall be based on 2.7 times the Engineer's salary cost plus reimbursable expenses at cost.

END OF SECTION 01 25 50

SECTION 01 33 00 – SUBMITTALS PROCEDURE

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies procedures for Contractor submittals. The Contractor shall submit descriptive information that will enable the City to determine whether the proposed materials, equipment, testing and schedule for fabrication are in general conformance to the design concept and in compliance with the Contract Documents. The information to be submitted shall consist of drawings, specifications, descriptive data, certificates, test procedures, test results and such other information, all as specifically required in the Contract Documents.

1.02 CONTRACTOR RESPONSIBILITIES

A. The Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall ensure that the material, equipment, testing, and schedule for fabrication shall be as described in the submittal. The Contractor shall verify that the material and equipment described in each submittal conforms to the requirements of the Contract Documents. If the information shows deviations from the Contract Documents, the Contractor shall, by statement in writing accompanying the information, identify the deviations and state the reason. The Contractor shall ensure that there is no conflict with other submittals and notify the Engineer in each case where such submittal may affect the work. The Contractor shall ensure coordination of submittals among related crafts.

B. Unless otherwise approved by the Engineer, all submittals shall be submitted only by the Prime Contractor, who shall indicate by a signed stamp, or other means, on the submittal the Prime Contractor has checked the submittal. The Contractor's stamp of approval shall constitute a representation to the Owner and Engineer that the Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, or similar data and assumes full responsibility for doing so, and that he/she has reviewed or coordinated each submittal with the requirements of the Contract Documents.

PART 2 – PRODUCTS

2.01 SCHEDULE OF VALUES

A. The Contractor shall submit a Schedule of Values for the major components of the work. The Schedule of Values shall be submitted within 20 days of Notice to Proceed. The Schedule of Values shall include a breakdown for each lump sum bid item for the total lump sum contract price showing the amount bid for each principal category of the work, in such detail as requested by the Engineer, to provide a basis for determining progress payments. At a minimum, the breakdown shall be according to the following elements:

1. Major construction and/or structure area, or other site features.

2. Pipe systems with each system divided into major components.

3. Major specification divisions (e.g., Division 26, Division 40, etc.).

4. Major pieces of equipment.

5. Electrical shall be broken down first by construction area, then by major pieces of electrical equipment, process power wiring, process control wiring, lighting fixtures, lighting installation and wiring, and receptacle insulation and wiring.

B. The Contractor and Engineer shall meet and jointly review the Schedule of Values within one week following receipt of the submittal by the Engineer, and make any adjustments in value allocations if in the opinion of the Engineer, these are necessary to establish fair and reasonable allocation values for the major work components. Front end loading will not be permitted. The Engineer may require reallocation of major work components from items in the above listing if, in the opinion of the Engineer, such reallocation is necessary. Within one week of the review meeting a final Schedule of Values will be prepared for distribution to the Engineer and Owner.

C. Approved Change Orders reflected in the Schedule shall be incorporated into the Schedule of Values as a single unit identified by the Change Order number.

D. Changes to the Schedule which add activities not included in the original schedule but included in the original work (schedule omissions) shall have values assigned as approved by the Engineer. Other activity values shall be reduced to provide equal value adjustment increases for added activities as approved by the Engineer.

E. In the event that the Contractor and Engineer agree to make adjustments to the original Schedule of Values because of inequities discovered in the original accepted detailed Schedule of Values, increases and equal decreases to values for activities may be made.

2.02 CONSTRUCTION SCHEDULE

A. A Construction Schedule, as required in 1-08.3 of Section 01 11 50 – Special Provisions, shall be submitted. Scheduling of the work under the Contract shall be performed by the Contractor. The development of the Construction Schedule, cost loading of the schedule, monthly payment requisitions and project status requirements of the Contract shall employ a Critical Path Method (CPM) scheduling. (This CPM schedule is encouraged but NOT required to be a computer based system.) A bar chart system delineating the project schedule with development of critical path, approved by the Engineer, will meet the requirements of this section.

B. The Contractor shall submit a project overview bar chart type plan at the preconstruction conference for all work as indicated below to identify the manner in which the Contractor intends to complete all work within the Contract time.

C. The overview bar chart shall indicate the major components of the project work and the sequence relations between major components and subdivisions of major components. The overview bar chart shall indicate the relationships and time frames in which the various components of the work will be made substantially complete and placed into service in order to meet the project milestones as indicated on schedule. Sufficient detail shall be included for the identification of subdivisions of major components into such activities as (1) excavation, (2) foundation subgrade preparation, (3) foundation concrete, (4) completion of all structural concrete, (5) major mechanical work, (6) major electrical work, (7) instrumentation and control work, (8) installation of equipment, (9) startup and testing, and (10) other important work, for each major facility within the overall project scope. Planned durations and start dates shall be indicated for each work item subdivision. Each major component and subdivision component shall be accurately plotted on time scale sheets not to exceed 36 inches by 60 inches in size.

D. The Engineer will review the project overview bar chart. The Engineer’s review and comment on the schedules shall be limited to contract conformance. The Contractor shall make corrections to the schedule necessary to comply with the contract requirements and shall adjust the schedule to incorporate any missing information requested by the Engineer.

E. By way of the Contractor assigning activity durations and proposing the sequence of the work, the Contractor agrees to utilize sufficient and necessary management and other resources to perform the work in accordance with the schedule. Total schedule float identified belongs to the project and shall not be for the exclusive benefit of any party. Upon submittal of a schedule update, the updated schedule shall be considered the "current" project schedule.

F. Submission of the Contractor's progress schedule to the Owner or Engineer shall not relieve the Contractor of total responsibility for scheduling, sequencing, and pursuing the work to comply with the requirements of the Contract Documents, including adverse effects such as delays resulting from ill-timed work.

G. The Contractor shall monitor the progress of the work and adjust the schedule each month to reflect actual progress and any changes in planned future activities, as a minimum for the following calendar month. Each schedule update submitted must be complete including all information requested. Each update shall continue to show all work activities including those already completed. These completed activities shall accurately reflect the "as built" information by indicating when the work was actually started and completed.

H. Neither the submission nor the updating of the Contractor's original schedule submittal nor the submission, updating, change or revision of any other report, curve, schedule or narrative submitted to the Engineer by the Contractor under this Contract, nor the Engineer's review or acceptance of any such report, curve, schedule or narrative shall have the effect of amending or modifying, in any way, the Contract completion date or milestone dates or of modifying or limiting, in any way, the Contractor's obligations under this Contract. Only a signed, fully executed Change Order can modify these contractual obligations.

I. Upon approval of a Change Order, or upon receipt by the Contractor of authorization to proceed with additional work, the change shall be reflected in the next submittal of the schedule by the Contractor. The Contractor shall utilize a sub-network in the schedule depicting the changed work and its effect on other activities. This sub-network shall be tied to the main network with the appropriate logic so that a true analysis of the Critical Path can be made.

2.03 SHOP DRAWINGS

A. Prior to fabrication or release for manufacturing of all components of the project, the manufacturer shall submit shop drawings to the Engineer for review.

B. Drawings: Unless otherwise specifically directed by the Engineer, the manufacturer shall identify each copy of the shop drawings with the drawing number in the lower right hand corner, shall make all shop drawings accurately to a scale sufficiently large enough to show all pertinent features of the item and its method of connection to the work, and shall make all shop drawing prints in blue or black line on white background. Shop drawings shall be submitted in accordance with paragraphs 3.01 and 3.02 A. Each item listed in Paragraph C below shall be included and be appropriately identified.

C. Manufacturer shall submit the following minimum information with their shop drawings for each model or type of unit supplied by the manufacturer.

1. Manufacturer's catalog information, physical and operation description, and specifications.

2. Drawings showing the general dimensions of the equipment and confirming the size of the unit. If applicable, drawings shall include size and location of required piping connections, structural supports, construction details, list of input/output signals for manufacturer provided control panel, wiring diagrams, weights of major components, and utility connection requirements.

3. List of all design modifications to accommodate the equipment proposed.

4. Information and location of nearest parts, service crews, and repair facilities to the project location.

5. Installation list for installations in the U.S. with location, contact names, and phone numbers.

6. List of all variances from the Technical Specifications. Failure to specifically list and fully explain all variances will be cause for rejection of the submittal.

7. Any other information required to clearly and readily demonstrate compliance with all parts of the Technical Specifications.

8. Installation instructions.

9. Design calculations.

10. Manufacturer’s certification of factory applied coating system and coating system technical data sheets.

11. Manufacturer’s guarantee, as specified.

12. Any additional information listed elsewhere in the Technical Specifications and required to be submitted with the shop drawings.

D. When revised for resubmission, manufacturer shall clearly identify changes made since previous submission.

E. Work performed before acceptance of shop drawings shall be at the Contractor's own risk. In the event of termination for convenience, the City will not be responsible for any materials ordered prior to return of acceptable shop drawings marked “NO EXCEPTIONS TAKEN” or “MAKE CORRECTIONS NOTED” as described below.

F. Substitutions: Any substitutions proposed by the manufacturer shall require submittals to fully enable the Engineer to evaluate the proposed substitution. All submittals shall clearly note and explicitly describe all details of any substitutions or deviations from the Contract Documents. The Engineer's acceptance of any shop drawings shall not release the manufacturer from responsibility for deviations from the Contract Documents.

G. The practice of submitting incomplete or unchecked shop drawings for the Engineer to correct or finish will not be acceptable, and shop drawings which, in the opinion of the Engineer, clearly indicate they have not been checked by the manufacturer will be considered as not complying with the intent of Contract Documents and will be returned to the manufacturer for resubmission in proper form.

2.04 SAMPLES

A. Samples, as required in the Technical Specifications, or requested by the Engineer, shall be submitted for review with the shop drawings, or subsequently as soon as possible (Engineer may request Samples for substitute equipment or materials in order to fully assess acceptability), unless otherwise specifically directed by the Engineer.

B. All samples shall be individually and indelibly labeled or tagged, indicating the WASTEWATER TREATMENT PLANT IMPROVEMENTS - PHASE 1, Manufacturer's name, equipment name, equipment specification number, contract number, and all specified physical characteristics.

C. Unless otherwise specified, all colors and textures of specified items will be selected by the Engineer from the Manufacturer's standard colors and standard product lines.

2.05 TEST REPORTS

A. Test reports shall be furnished to the Engineer as specified in the Technical Specifications. Test reports required prior to shop drawing approval shall be submitted with the shop drawings. Test reports required for factory testing shall be submitted and accepted prior to shipment of the equipment to the construction site and shall be submitted with the Operation and Maintenance information unless directed otherwise by the Engineer. Test reports required after installation shall be submitted within 30 days after the final test date.

B. Test reports shall be clearly identified with the equipment title, specification number(s), and manufacturer name printed on the front of the report.

C. If test results are required to be witnessed by an independent testing laboratory, the Test report shall be certified by that laboratory.

D. Unless specified otherwise, factory tests shall be non-witnessed tests. Test reports shall be certified by the manufacturer.

2.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and Maintenance Manuals shall be submitted in conformance with this section, except as modified in Section 01 78 00 – Operation and Maintenance Manuals.

2.07 MANUFACTURERS GUARANTEE

A. The Manufacturer's Guarantee shall be submitted to the Engineer with the Operation and Maintenance Manuals and shall be in conformance with this section.

2.08 CERTIFICATE OF INSTALLATION AND MANUFACTURER’S CERTIFICATE

A. After equipment installation and on-site performance testing has been completed, the Contractor shall submit a Certificate of Installation and a separate manufacturer’s Certificate of Installation and Startup According to the Specifications and Manufacturer’s Requirements, in accordance with this section and the manufacturer’s standard warranty conditions.

PART 3 – EXECUTION

3.01 TRANSMITTAL PROCEDURE

A. Submittals shall be accompanied by transmittal form/letter. A sample transmittal form/letter is included at the end of this section. Equipment or identification numbers shall be listed on the form for items being submitted. Submittals for various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole.

B. A unique number, sequentially assigned, shall be noted on the transmittal form accompanying each item submitted. Original submittal numbers shall have the following format: “XX”; where “XX” is the sequential number assigned by the manufacturer. Resubmittals shall have the following format: “XX-Y”; where “XX” is the originally assigned submittal number and “Y” is a sequential letter assigned for resubmittals, i.e., A, B, or C being the 1st, 2nd, and 3rd resubmittals, respectively. Submittal 02-B, for example, is the second resubmittal of submittal number 2.

C. Submittal Completeness: Submittals which do not have all the information required to be submitted are not acceptable and will be returned without review.

D. Submittal Priority: Manufacturer shall indicate priority for receipt of reviewed submittals when multiple submittals have been sent to the Engineer for review. Engineer will attempt to review and reply to the highest priority submittals in the timeliest manner when manufacturer indicates that there is a priority; otherwise submittals will be reviewed in the order received, in accordance with the time indicated in paragraph 3.02.

E. See 1.02 B for additional Contractor requirements.

F. Electronic review stamps may be used by the Contractor and shall be applied in accordance with paragraph 3.01 E. Electronically applied stamps shall contain the Contractor's original wet ink signature. High resolution scanned PDF documents, in accordance with paragraph 3.02 A., containing the Contractor's review stamp and signature will be acceptable.

3.02 REVIEW PROCEDURE

A. For each required submittal, the manufacturer shall submit the specified information as follows:

1. For standard 8-1/2 x 11 inch, 8-1/2 x 14 inch, and 11 x 17-inch size sheets, provide one electronic copy of each page, including the transmittal form, in PDF format and meeting the following requirements:

a. Original or scanned PDF files shall have a minimum resolution of 600 dpi, irrespective of document size. Scanned or resized PDF files that do match the original document size, or do not properly fill a standard page size, will not be accepted.

b. PDF files containing multiple submittal items shall be "bookmarked" to match the submittal table of contents, as specified in paragraph 3.01 A., for easy reference and viewing.

2. For all other size sheets, provide one (1) reproducible high-resolution print and one (1) additional print of each page, until approval is obtained.

B. Unless otherwise specified, within ten (10) working days after receipt of the submittal, the Engineer will review the submittal and return the marked-up reproducible original noted in paragraph 1 above. The returned submittal will indicate one (1) of the following actions:

1. If the review indicates that the material, equipment, test or work method is in general conformance with the design concept and complies with the Contract Documents, submittal copies will be marked "NO EXCEPTIONS TAKEN." In this event the manufacturer may begin fabrication of materials and equipment.

2. If the review indicates that the submittal is insufficient or that limited corrections are required, copies will be marked "MAKE CORRECTIONS NOTED." The manufacturer may begin fabrication of materials and equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in Operation and Maintenance data, a corrected copy shall be provided; otherwise no further action is required.

3. If the review reveals that the submittal is insufficient or contains incorrect data, copies will be marked “MAKE CORRECTIONS NOTED” or “REVISE AND RESUBMIT.” If the comments are of a nature that can be confirmed without a resubmittal, copies will be marked “MAKE CORRECTIONS NOTED” with “CONFIRM” or “VERIFY” written where appropriate on the submittal. If the comments require a revision and resubmittal, copies will be marked “REVISE AND RESUBMIT.” Except at its own risk, the manufacturer shall not undertake work covered by this submittal until the attached comments have been either confirmed by a separate written communication or the submittal has been revised, resubmitted and returned to the manufacturer marked either “NO EXCEPTIONS TAKEN” or “MAKE CORRECTIONS NOTED.”

4. If the review indicates that the material, equipment, test, or work method is not in general conformance with the design concept or in compliance with the Contract Documents, copies of the submittal will be marked “REJECTED” and “REVISE AND RESUBMIT,” or “REJECTED” and “SUBMIT SPECIFIED ITEM.” Submittals with deviations that have not been identified clearly may be rejected. Except at its own risk, the manufacturer shall not undertake work covered by such submittals until a new submittal is made and returned marked either “NO EXCEPTIONS TAKEN” or “MAKE CORRECTIONS NOTED.”

3.02 EFFECT OF REVIEW OF MANUFACTURER'S SUBMITTALS

A. Review of drawings, tests, methods of work, or information regarding materials or equipment the manufacturer proposes to provide, shall not relieve the manufacturer of its responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the Owner or by any officer or employee of the Owner, and the manufacturer shall have no claim under the Contract on account of the failure, or partial failure, of the method of work and test, material, or equipment so reviewed. A mark of “NO EXCEPTIONS TAKEN” or “MAKE CORRECTIONS NOTED” shall mean that the Owner has no objection to the manufacturer, upon the manufacturer's own responsibility, providing the materials or equipment proposed.

B. The Engineer's review shall be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The review shall not extend to the means, methods, sequences, techniques, or procedures of construction, or to safety precautions or programs incidental thereto. The review by the Engineer of a separate item as such will not indicate review of the assembly in which the item functions.

END OF SECTION 01 33 00

SUBMITTAL TRANSMITTAL

HLA Project No. 23166

Project Name: Phase 2 – Wastewater Treatment Plant Improvements

Contracting Agency: City of Selah

Prime Contractor: _____

Submittal No.: _____

Submitted by: _____

Each copy of the submittal shall be collated and assembled by the Prime Contractor with the Submittal Transmittal as the cover. Each catalog cut shall be marked with the Bid Item that the Submittal is intended for in the upper right-hand corner and the specific item intended for use shall be highlighted. In the table below, the Prime Contractor shall complete the Bid Item number associated with the Submittal, Product Description (including Supplier, Manufacturer, Model #, Dimensions), as applicable, the page number of the overall submittal, and the spec reference.

Item	Bid Item	Product Description *(Supplier, Manufacturer, Model, Dimensions)*	Pg.	Spec.	Engineer Use Only	
					Engineer Comments	Response
1						
2						
3						
4						
5						
6						
7						
8						

The individual named below, as an authorized representative of the Prime Contractor, acknowledges the following:

1. We have determined and verified all quantities, dimensions, field construction criteria, material catalog numbers and similar data, and/or assume full responsibility for doing so.
2. We have reviewed and coordinated each submittal with the requirements of the Contract Documents.
3. This submittal does not conflict with other submittals or the Contract Documents.
4. The submittals have been coordinated.

Authorized Representative Name and Title: _____ **Date:** _____

Response Key	
NET	No Exceptions Taken
MCN	Make Corrections Noted
REJ	Rejected
R&R	Revise and Resubmit
SSI	Submit Specified Item

Corrections or comments made on the shop drawings during this review do not relieve Contractor from compliance with requirements of the Drawings and Specifications. This review is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction, coordinating his work with that of all other trades, and performing his work in a safe and satisfactory manner.

Engineer or Delegee Signature: _____ **Date:** _____ **Copy to:** _____

SECTION 01 45 11 – TESTING, INSPECTIONS, SUPERVISION

PART 1 – GENERAL

1.01 GENERAL DESCRIPTION

A. The work of this section applies to the Plans, Specifications, and Special Provisions of the Contract. The Contractor shall employ the services of an independent, certified testing firm and/or laboratory to complete on-site inspection, sampling and testing for the following:

1. Earthwork and trenching;

2. Subgrade;

3. Crushed surfacing and granular backfill;

4. Asphalt paving;

5. Concrete strength and reinforcement;

6. Structural steel welds and/or bolting;

B. The Contractor shall be responsible for scheduling all material testing required by these Contract Documents.

C. The Contractor shall coordinate, be responsible for, and pay for the following testing and inspections:

1. Electrical and control system testing and inspections.

2. All required gradation, fertility analysis and other required testing of imported aggregate and soil materials.

3. Factory testing of materials and equipment as required.

4. All required material, equipment, and system testing required for startup and operation of facilities and equipment.

5. Other testing and inspections as specified to be furnished by the Contractor in this section and/or elsewhere in the Contract Documents.

D. Additional requirements for testing may be described in various sections of these Specifications.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with testing company personnel, provide access to work.

B. Furnish usual labor and facilities:

1. To provide access to work to be tested.

2. To obtain and handle samples at the site.

3. To facilitate inspections and tests.

4. For testing company's exclusive use for storage and curing of test samples.

C. Notify testing company and Engineer sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests.

1.03 QUALITY ASSURANCE

A. Testing, when required, will be in accordance with all pertinent Codes and Regulations and with selected standards of the American Society for Testing and Materials.

1.04 DOCUMENTATION AND DISTRIBUTION

A. Testing company will promptly process and distribute required copies of test reports and related instructions. Contractor shall allow time for necessary retesting and replacement of materials with the least possible delay in progress of the work.

B. When a product is tested for conformance with criteria or standard specifically noted in Specifications, testing report will specifically state conformance or non-conformance with that specific standard.

C. Testing company will distribute copies of the testing reports, with copies sent to the Contractor and the Engineer.

PART 2 – PRODUCTS

2.01 PAYMENT FOR TESTING

A. The Contractor will pay for all sampling and testing costs, except as otherwise noted. The costs for additional sampling and testing, due to failed tests shall be the responsibility of the Contractor.

2.02 CODE COMPLIANCE TESTING AND INSPECTIONS

A. Inspections and tests required by Codes or Ordinances or by a plan review approval authority, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

B. Portions of the work are subject to inspection by the building official, and all construction shall remain accessible and exposed for inspection purposes until approved by the building official.

2.03 CONTRACTOR'S CONVENIENCE TESTING

A. Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

PART 3 – EXECUTION

3.01 COOPERATION WITH TESTING COMPANY AND ENGINEER'S ON-SITE REPRESENTATIVE

A. Representatives of the testing company and the Engineer shall have access to the Work at all times and at all locations where the work is in progress. Contractor shall provide facilities for such access to enable the Engineer and the testing company to perform its functions properly.

3.02 TAKING SPECIMENS

A. All specimens and samples for testing, unless otherwise provided in the Contract Documents and/or approved in writing by the Engineer prior to the respective phase of work, shall be taken by testing company personnel.

3.03 SCHEDULES FOR TESTING

A. By advance discussion with the testing company, determine the time required for the company to perform its tests and to issue each of its findings.

B. Coordinate the testing schedule of materials with the construction schedule.

C. Revising schedule: When changes of the construction schedule are necessary during construction, coordinate all such changes with the testing company as required.

D. Adherence to schedule: When the testing company is ready to test according to the established schedule, but is prevented from testing or taking specimens due to incompleteness of the work, any delay charges for testing attributable to the delay shall be the responsibility of the Contractor.

E. Testing frequencies specified herein may be modified to assure compliance with the Specifications.

3.04 INSPECTING AND TESTING OF SOILS, GRANULAR BASES, AND PAVEMENT

A. See structural plans for special inspection and testing requirements. Contractor shall coordinate test durations with these special inspections and testing requirements.

B. Inspections and tests include, but are not necessarily limited to:

1. Visually inspect on-site and imported fill and backfill, making such tests as are necessary to determine compliance with the Contract requirements.

2. Field density tests on samples from in-place material as required for compaction compliance.

3. As pertinent, inspect and test the scarifying and recompacting of cleaned subgrade; inspect the progress of excavating, filling, and grading; make density tests at fills and backfills; and verify compliance with provisions of the Contract Documents and governmental agencies having jurisdiction.

C. Trench Backfill

1. Copies of moisture-density curves for each type of material encountered and copies of all test results shall be provided to the Engineer as construction progresses.

2. Compaction tests shall be taken at a frequency and at depths sufficient to document that the required density has been achieved. At a minimum, one (1) compaction test shall be taken for each 100 linear feet of pipeline trench and one (1) test for each lateral trench shorter than 100 feet. At alternating 100-foot locations along the main trench line, tests shall be taken at 1-foot, 2-foot, and 3-foot depths below finish grade.

3. The Engineer may request additional tests be performed at the Contractor's expense, if test results do not meet the required trench backfill densities.

4. All trenches shall be backfilled and compacted to at least 95 percent of maximum density as determined by ASTM D 1557 (Modified Proctor).

D. Earth Embankments

1. Copies of the moisture density curves for each type of material encountered and copies of all test results shall be provided to the Engineer as construction progresses.

2. Compaction tests shall be taken at a frequency sufficient to document that the required density has been achieved. At a minimum, one (1) compaction test shall be taken for every 2,500 square feet of surface area for each lift of embankment, or one (1) compaction test for each lift in areas smaller than 2,500 square feet.

3. The Engineer may request additional tests be performed at the Contractor's expense, if test results do not meet the required subgrade densities.

E. Subgrade

1. Copies of the moisture density curves for each type of material encountered and copies of all test results shall be provided to the Engineer as construction progresses.

2. Compaction tests shall be taken at a frequency sufficient to document that the required density has been achieved. At a minimum, one (1) compaction test shall be taken for every 2,500 square feet of subgrade, or one (1) compaction test in each area smaller than 2,500 square feet.

3. The Engineer may request additional tests be performed at the Contractor's expense, if test results do not meet the required subgrade densities.

4. Subgrade compaction shall be as specified for in Section 31 23 11 – Excavation, Backfill and Compaction for Structures.

F. Aggregate Materials and Crushed Surfacing

1. Copies of the moisture density curves for each type of material incorporated into the project and copies of all test results shall be provided to the Engineer as construction progresses.

2. Compaction tests shall be taken at a frequency sufficient to document that the required density has been achieved. At a minimum, one (1) compaction test shall be taken for every 2,500 square feet of surface area for each lift of ballast or crushed surfacing, or one (1) compaction test in each area smaller than 2,500 square feet.

3. The Engineer may request additional tests be performed at the Contractor's expense, if test results do not meet the required subgrade densities.

4. Compaction of aggregate materials and crushed surfacing shall be as specified in Section 32 11 11 – Aggregate Materials.

G. Asphalt Paving

1. Copies of Maximum Rice Density test for each class of asphalt pavement and copies of all test results shall be provided to the Engineer as construction progresses.

2. Density tests shall be taken at a frequency sufficient to document that the required density has been achieved. At a minimum, one (1) compaction test shall be taken for every 2,500 square feet of surface area for each lift of asphalt pavement, or one (1) compaction test in each area smaller than 2,500 square feet.

3. The Engineer may request additional test be performed at the Contractor’s expense, if test results do not meet the required densities.

4. Each course of asphalt pavement shall be compacted to a minimum of 91 percent of theoretical Maximum Rice Density, in accordance with ASTM D2041.

3.05 CONCRETE INSPECTING AND TESTING

A. Contractor certification of Portland Cement

1. Contractor shall secure from the cement manufacturer Certificates of Compliance delivered directly to the concrete producer for further delivery directly to the testing laboratory.

B. Molded concrete cylinders by testing company:

1. Three test cylinders will be for each 100 cubic yards, or fraction thereof, of each class of concrete of each day's placement.

2. One cylinder will be tested at seven days, one at 28 days, and one when so directed.

3. A report of the mix, slump, gage, location of concrete in the structure, and test results will be written.

4. Specimens and tests will be done in accordance with the applicable ASTM standard specifications.

C. Core tests:

1. Core test may be done when specifically requested by the Engineer because of non-complying cylinder test results.

2. Cut from locations indicated by the Engineer, securing in accordance with ASTM C 42, and prepare and test in accordance with ASTM C 39. Concrete not in compliance will be removed and replaced at Contractor's expense.

D. Supervision Required by Contractor:

1. On concrete specified to be 2,000 psi or greater, provide continuous supervision or as required by governmental agencies having jurisdiction.

2. Throughout progress of concrete placement, perform slump tests to confirm specified slump.

3. Throughout progress of concrete placement, verify that finished concrete surfaces will have the level or slope required by the Contract Documents by using the proper and necessary personnel and equipment.

E. Refer to Section 03 30 00 – Cast-In-Place Concrete for additional requirements.

3.06 CONCRETE REINFORCEMENT INSPECTING AND SUPERVISION

A. Contractor shall verify that all reinforcement steel bars are in compliance with the specified standards prior to their use in the work.

1. Material identified by mill test reports and certified by the testing company does not require additional testing. Require the supplier to furnish mill test reports to the testing company for certification.

2. If material is not so identified, provide proper tests to the Engineer's satisfaction that the furnished materials meet the Specifications.

3.07 STRUCTURAL STEEL INSPECTING AND SUPERVISION

A. Contractor shall verify all structural steel for compliance with the specified standards prior to their use in the work.

1. Material identified by mill test reports and certified by the testing company does not require additional testing. Require the supplier to furnish mill test reports to the laboratory for certification.

2. If material is not so identified, Contractor shall provide proper tests to the Engineer's satisfaction that the furnished materials meet the Specifications.

B. Field Welding: Contractor shall provide continuous supervision by qualified personnel. Testing company employed by Owner shall inspect welds. Suspect welds will be tested and those not in compliance will be repaired at Contractor's expense.

C. Special Inspection: Testing agency employed by Owner shall provide special inspection as per IBC and as required in the Contract Drawings.

3.08 ROOFING AND WATERPROOFING INSPECTING AND SUPERVISION

A. Contractor shall provide the following inspection and supervision:

1. Prior to start of roofing installation, Contractor shall conduct a job site meeting attended by representatives of the installing subcontractors, the Contractor's field superintendent, and the Engineer, to review procedures to be followed. Verify that the procedures and specifications are approved by the manufacturer for the specific application.

2. Prior to start of installation, verify that materials at the job site comply with the specified standards, that the subcontractor is qualified, and that the installing personnel are fully informed as to procedures to be followed.

3. During installation, verify that materials are installed in strict accordance with the manufacturers' procedures and specifications.

4. When requested by the Engineer, make test cuts to verify conformance with the specified requirements. Costs of cutting, patching, and repair shall be borne by the Contractor. No more than one test cut will be made if the initial test cut shows compliance with the Specification.

3.09 WAIVER OF INSPECTION AND/OR TESTS

A. Specified inspections and/or tests may be waived only in writing by the Engineer.

END OF SECTION 01 45 11

SECTION 01 57 13 – TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work included in this section consists of all work necessary to prevent erosion due to construction activities, prevent sedimentation of waterways and open drainage way due to construction activities, and restore areas eroded due to insufficient preventative measures or construction activities.

B. This section includes installation of temporary and permanent erosion and sedimentation control systems.

C. Dust control shall be provided for the full duration of the project. The Contractor shall be responsible for obtaining and paying for any required permits from the local clean air agency.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 31 10 00 – Site Clearing

C. Section 31 22 13 – Rough Grading

D. Section 31 23 11 – Excavation, Backfill and Compaction for Structures

E. Section 31 23 15 – Trench Excavation and Backfill

F. Section 31 23 19 – Dewatering

1.03 REGULATORY REQUIREMENTS

A. Comply with all requirements of Washington State Department of Ecology for erosion and sedimentation control including but not limited to the 2017 Construction Stormwater General Permit.

B. Conform to clean air regulations of the Washington Department of Ecology. A copy of the regulations is available at the Central Regional Office of the Washington Department of Ecology located in Yakima, Washington.

C. Comply with the State of Washington regulation regarding disposal of waste material as outlined in WAC 173-304, Subchapter 461.

D. Protect adjacent properties and receiving water resources from erosion and sediment damage until final stabilization is achieved. All stormwater controls and systems must be installed and functioning as designed and free of accumulated sediment and debris before final project approval.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

1.05 QUALITY ASSURANCE

A. Best Management Practices Standard: Stormwater Management Manual for Eastern Washington 2004.

B. Timing: Put preventive measures in place as soon as possible before disturbance of surface cover and before precipitation occurs.

C. Stormwater Runoff: Control increased stormwater runoff due to disturbance of surface cover due to construction activities for this project.

1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.

D. Erosion on Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.

1. Control movement of sediment and soil from temporary stockpiles of soil.

2. Prevent development of ruts due to equipment and vehicular traffic.

3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to owner.

E. Erosion off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.

1. Prevent windblown soil and soil laden water from leaving the project site.

2. Prevent tracking of mud onto public roads outside site.

3. Prevent mud and sediment from flowing onto sidewalks and pavements.

4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to owner.

F. Open Water: Prevent standing water that could become stagnant.

G. Maintenance: Maintain temporary preventive measures.

PART 2 – PRODUCTS

2.01 MATERIALS

A. High Visibility Fencing

1. UV stabilized, orange, high-density polyethylene or polypropylene mesh, and shall be at least 4 feet in height.

2. Support posts shall be wood or steel and have sufficient strength and durability to support the fence through the life of the project.

B. Perforated Drain Pipe

1. Corrugated Polyethylene (PE) Underdrain Pipe shall be used.

2. Perforated pipes do not require a watertight joint.

3. Pipe shall be jointed with snap-on, screw-on, bell and spigot, or wraparound coupling bands, as recommended by the manufacturer of the pipe.

4. AASHTO Class II perforations shall be used uniformly spaced along the length and circumference of the pipe.

C. Silt Fence

1. Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:

   a. Average Opening Size: 30 U.S. Std. Sieve, max, when tested in accordance with ASTM D 4751.

   b. Permittivity: 0.02 sec-1, minimum, when tested in accordance with ASTM D 4491.

   c. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D 4355 after a 500-hour exposure.

   d. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 180 lb-f, minimum, in machine direction; when tested in accordance with ASTM D 4632.

   e. Elongation: 15 to 30 percent, when tested in accordance with ASTM D 4632.

   f. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D 4533.

   g. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

2. Posts: One of the following, minimum 5 feet long:

   a. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.

   b. Wood, 2 by 2 inches in cross section.

D. Gravel

1. Gravel used for filtration or protection of a temporary erosion and sediment control systems shall conform to WSDOT Standard Specifications, Section 9-03.12(4) “Gravel Backfill for Drains.”

E. Quarry Spalls

1. Material shall meet WSDOT Standard Specifications, Section 9-13.6 “Quarry Spalls”.

F. Geotextile Fabric for Soil Stabilization

1. Material shall meet WSDOT Standard Specifications, Section 9-33 “Geotextile for Soil Stabilization”.

G. Catch Basin Insert

1. “Dandy Sock” by Mirafi or equivalent. Insert shall be designed for stormwater to pass through the fabric; filtering sediment before entering the downstream conveyance.

2. The insert shall have overflow holes to pass large stormwater runoff events that exceed filtration capacity.

H. Temporary and Permanent Seeding

1. Refer to Section 8-01 of the WSDOT Standard Specifications for temporary seeding requirements, if used.

2.02 SOURCE QUALITY CONTROL

A. For each type of materials provided to the project, use the same source throughout the work.

PART 3 – EXECUTION

3.01 PREPARATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

B. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

C. In all cases, if permanent erosion resistant measures have been installed (i.e. pavement, gravel surfacing, vegetation, etc.) temporary preventive measures are not required.

3.02 EROSION AND SEDIMENTATION CONTROL IMPLEMENTATION

A. Place erosion and sediment control systems in accordance with the Plans and SWPPP or as may be dictated by site conditions in order to maintain the intent of the specifications and permits.

B. Owner has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations and to direct Contractor to provide immediate permanent or temporary pollution control measures.

C. Maintain erosion and sedimentation control systems as dictated by site conditions, indicated in the construction documents, or as directed by governing authorities or Owner to control sediment until final stabilization. Contractor shall respond to maintenance or additional work ordered by Owner or governing authorities immediately, but in no case, within not more than 48 hours at no additional cost to the Owner.

D. Contractor shall incorporate permanent erosion control features, paving, permanent slope stabilization, and vegetation into project at earliest practical time to minimize need for temporary controls.

E. Permanently seed and mulch cut and fill slopes as construction proceeds to extent considered desirable and practical.

3.03 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences (when applicable):

1. Promptly replace fabric that deteriorates unless need for fence has passed.

2. Remove silt deposits that exceed one-third of the height of the fence.

3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Clean out temporary sediment control structures weekly and relocate soil on site.

E. Place sediment in appropriate locations on site and stabilize to prevent erosion.

3.04 CLEANUP

A. Remove temporary measures after permanent measures have been installed.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade, finish to match adjacent ground surfaces, and stabilize with permanent cover (i.e. seeding, sod, or gravel surfacing).

END OF SECTION 01 57 13

SECTION 01 78 00 – OPERATION AND MAINTENANCE MANUALS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The work included in this section consists of preparing, assembling, and submitting operation and maintenance manuals for all equipment supplied under this Contract, including the following:

1. Building operating systems and equipment.

2. Care, preservation, and maintenance of architectural products and finishes.

3. Mechanical (i.e., pumps, valves, HVAC systems, etc.) equipment.

4. Electrical and control equipment and components.

B. Additional requirements for operation and maintenance manuals may be described in other sections of these Specifications.

PART 2 – PRODUCTS

2.01 OPERATION AND MAINTENANCE MANUALS

A. Provide operations and maintenance manual. The following information shall be included in the manual:

1. Catalog information.

2. Maintenance instructions for all components of the installation, including installation instructions, start-up instructions, and specific instructions for maintenance procedures necessary to sustain and extend the service life of the installed equipment.

3. List of recommended spare parts and materials needed to maintain the equipment.

4. Manufacturer's specifications.

5. Electrical requirements and schematic diagrams.

6. List showing materials of construction of all components.

7. Information and location of parts, service crews, and repair facilities nearest to the City of Selah.

8. When required, manufacturer's certification of compliance with the specifications.

9. Manufacturer's guarantee.

10. Safety precautions, warnings, and procedures.

B. All operation and maintenance information shall be comprehensive and detailed, and shall contain information adequately covering all normal operation and maintenance procedures, as well as emergency operation and maintenance procedures.

C. Submit one (1) electronic bookmarked PDF file of each O&M manual in accordance with Section 01 33 00 – Submittals Procedure, and two (2) hard copies bound in three-ring, hard-covered binders with insert pockets on the front and spine with project-specific title sheets inserted. Payment will not be made until all manuals are received and approved by the Engineer.

D. Separate O&M manual binders are not required for each piece of equipment. Information may be combined into single, larger O&M manual binders, grouped based on separate pieces of equipment. Binders shall be neatly organized and each binder shall be provided with project-specific cover sheets and a table of contents to easily locate necessary information. The number of binders, division of materials, and size of binders may need to be adjusted based on the volume of material.

E. The electronic O&M manuals shall be organized to match the format and layout of the hard-copy manual binders. A single PDF file shall be created for each binder provided. PDF files shall be “bookmarked” to match to table of contents, as specified in paragraph 3.02 A. of Section 01 33 00 – Submittals Procedure. Manufacturer’s original PDF documents may be combined with type written scanned documents to create a single PDF file. Scanned documents shall meet the requirements of paragraph 3.02 A. of Section 01 33 00 – Submittals Procedure and all text shall be converted so that the final O&M manual file is searchable.

F. One (1) electronic copy and one (1) hard copy of the initial O&M manual submittal may be provided to the Engineer for review and approval prior to preparing final hard copies of the O&M manuals. The initial O&M manuals will be returned to the manufacturer with the Engineer’s comments for preparation of the final documents.

G. Operation and maintenance and/or special warranty information is required for the following specification sections:

1. Section 07 41 11 – Metal Roof and Wall Panels

2. Section 08 71 00 – Door Hardware

3. Division 09 – Finishes

4. Division 22 – Plumbing

5. Division 23 – Heating, Ventilating, and Air Conditioning (HVAC)

6. Division 26 – Electrical

7. Division 40 – Process Interconnections

8. Division 43 – Process Gas and Liquid Handling Equipment

9. Division 46 – Water and Wastewater Equipment

Additional operation and maintenance information shall be provided by the Contractor if required by the Engineer.

2.02 MAINTENANCE SUMMARY

A. In addition to the above items, the manuals shall include a "maintenance summary." The "maintenance summary" shall be bound into the manual and shall contain the following information compiled by the manufacturer or the manufacturer's representative:

1. Description or name of equipment;

2. Manufacturer;

3. Name, address, telephone number, and FAX number of manufacturer's local representative;

4. Equipment serial number, where applicable;

5. Equipment nameplate data;

6. Recommended maintenance procedures:

   a. Name of part to be maintained and description of procedure;

   b. Frequency of maintenance;

   c. Lubricant(s) or other materials required, where applicable, including type of lubricant, lubricant manufacturer, and specific compound;

   d. Additional information as may be required for proper maintenance;

7. Recommended spare parts.

B. A sample "maintenance summary" form is bound herein for reference.

PART 3 – EXECUTION

3.01 GENERAL

A. It shall be the responsibility of the Contractor to ensure all operation and maintenance materials are obtained. Material submitted must meet the approval of the Engineer prior to project acceptance.

B. The above described operations and maintenance information shall be submitted in addition to shop drawings.

C. Payment for furnishing operation and maintenance materials as specified herein shall be included in the bid item for O&M Manuals, as described in Section 1-09.3(1) of the Special Provisions. A minimum bid amount has been entered in the Bid Proposal for this item. The Contractor must bid at least that amount. Payment equal to 100% of the lump sum bid for this item will be paid upon Engineer approval of complete O&M manuals. No partial payment will be made for preliminary or incomplete O&M manual submittals.

MAINTENANCE SUMMARY
FOR
EACH PIECE OF EQUIPMENT

1. EQUIPMENT ITEM:_____

2. MANUFACTURER:_____

3. SERIAL NO. (if applicable):_____

4. NAMEPLATE DATA (horsepower, voltage, speed, etc.):_____

5. MANUFACTURER'S LOCAL REPRESENTATIVE:

   NAME:_____

   ADDRESS:_____

   TELEPHONE NO.:_____

6. MAINTENANCE REQUIREMENTS:

Maintenance operation	Frequency	Lubricant (if applicable)	Comments
List briefly each maintenance operation required and refer to specific information in Manufacturer's standard maintenance manual, if applicable.	List required frequency of each maintenance operation	Refer by symbol to lubricant list as required.	

7. LUBRICANT LIST:

Reference Symbol	Standard Oil of California	Union	Texaco	Shell
List symbols used in Item 6 above	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.			

8. SPARE PARTS: Include your recommendations regarding what spare parts, if any, should be kept on the job.

END OF SECTION 01 78 00

DIVISION 02 – EXISTING CONDITIONS

SECTION 02 41 00 – DEMOLITION

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work included in this section consists of all work, tools and equipment necessary to remove and dispose of existing buildings, structures and appurtenances, or portions of existing buildings, structures and appurtenances, as shown on the plans.

B. This section also includes the removal, storage and/or protection of existing materials and equipment that are scheduled to remain, or to be reinstalled in existing and/or new locations.

C. Demolition work will be carried out in a manner as to not jeopardize the integrity of adjacent or connected structures, which are to remain.

D. Repair of the existing concrete structures and/or structure modifications (if needed), following demolition, will be included in this section.

E. Dust control shall be provided for the full duration of the project.

1.02 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete

B. Division 26 – Electrical

C. Section 31 10 00 – Site Clearing

D. Section 31 14 11 – Soil Materials

E. Section 32 11 11 – Aggregate Materials

1.03 REGULATORY REQUIREMENTS

A. Conform to applicable Local, State, and Federal codes for environmental requirements, disposal of debris and removal and disposal of hazardous materials. The Contractor shall be responsible for the appropriate disposal of all debris. No on-site burning will be permitted and no debris, including concrete and asphalt, may be placed in fill areas.

B. The use of explosives for demolition will not be permitted.

C. Coordinate demolition work with all utility companies. The contractor is responsible for obtaining and complying with all requirements of the respective utility companies. The contractor shall protect all existing utilities which are to remain in service.

D. Conform to clean air regulations of the Washington Department of Ecology. A copy of the regulations is available at the Central Regional Office of the Washington Department of Ecology located in Yakima, Washington.

E. Comply with the State of Washington regulation regarding disposal of waste material as outlined in WAC 173-304, Subchapter 461.

1.04 SUBMITTALS

A. No submittals required for this section.

1.05 QUALITY ASSURANCE

A. Work shall be performed in accordance with the requirements of Section 2-01, Clearing, Grubbing, and Roadside Cleanup, and Section 2-02, Removal of Structures and Obstructions, of the WSDOT Standard Specifications, 2025 Edition.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Refer to Section 31 14 11 – Soil Materials and Section 32 11 11 – Aggregate Materials for materials required to fill remaining voids from structure demolition.

B. Refer to Section 03 30 00 – Cast-In-Place Concrete for concrete patching materials, if required

PART 3 – EXECUTION

3.01 PREPARATION

A. The Contractor shall verify that all existing utilities have been disconnected prior to beginning demolition. Coordinate disconnecting the existing power service with the utility company.

B. The Contractor shall be responsible for securing a location to store salvaged materials and equipment during demolition and construction. The storage location shall keep all equipment and materials free from dust, dirt, rain, moisture, or any other environment that will affect the condition of the salvaged material.

C. A waste site has not been provided by the Contracting Agency for disposal of demolition materials. All materials shall be disposed of off-site by the Contractor.

3.02 PROTECTION

A. Locate, identify, and protect from damage any utilities which remain.

B. The Contractor shall provide any shoring or bracing necessary to prevent movement, settlement, or collapse of adjacent structures that are planned to remain.

3.03 DEMOLITION

A. Remove all materials and equipment which are shown on the Plans to be salvaged and store materials in a secured location prior to beginning demolition of existing buildings and/or structures.

B. Perform demolition work in a systematic manner, from a higher to lower level, using required methods to complete all demolition work indicated on the Plans and specified herein. All demolition work shall be done in accordance with governing regulations.

C. Demolish concrete and masonry materials in small sections. Cut and carefully remove concrete and masonry near existing structures to remain using a masonry saw or hand tools. Do not use power impact tools to remove material around portions of existing structures scheduled to remain.

D. Sawcut to remove concrete walls and walkways where called out on the Plans. Other low-impact methods of removal may only be used with approval of the Engineer. Patch concrete with grout as specified in Section 03 30 00 – Cast-In-Place Concrete.

E. Remove and dispose of all exposed fasteners and anchor bolts remaining in existing structure walls and floors after removal of existing equipment and materials, unless otherwise noted on the plans. Patch any holes remaining in existing structures with grout and/or sealant as specified in Section 03 30 00 – Cast-In-Place Concrete.

3.04 DUST CONTROL

A. The Contractor shall be solely responsible for dust control on this project and shall protect motoring public, adjacent homes, and vegetation from damage due to dust, by whatever means necessary. The Contractor shall be responsible for any claims for damages and shall protect the Contracting Agency, Yakima County, and the Consultant from any and all such claims.

B. When directed by the Engineer, the Contractor shall provide water for dust control within two hours of such order and have equipment and manpower available at all times including weekends and holidays to respond to order for dust control measures.

3.05 SALVAGED MATERIAL

A. See the Plans and related sections these specifications for installation of salvaged equipment. The Contractor shall be responsible for salvaging all parts of the equipment necessary for a complete installation in new and/or existing buildings. No additional payment will be made for replacement of materials planned to be reused that are needed for installation of the salvaged equipment.

3.06 CLEANUP AND REPAIR

A. Upon completion of the demolition work all tools, equipment and demolished materials shall be removed from the site.

B. Repair any portion the existing concrete structures which were damaged during demolition, or as directed by the Engineer. See Section 03 30 00 – Cast-In-Place Concrete for specified cementitious repair materials.

END OF SECTION 02 41 00

DIVISION 03 – CONCRETE

SECTION 03 10 00 – CONCRETE FORMING AND ACCESSORIES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work covered by this section consists of furnishing and installing all formwork, embedded items and form ties for cast-in-place concrete to produce the finished concrete elements as shown on the Plans.

B. All formwork and methods of construction shall conform to the requirements of the Department of Labor and Industry of the State of Washington and OSHA Standards.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 03 20 00 – Concrete Reinforcing

C. Section 03 30 00 – Cast-In-Place Concrete

D. Section 05 50 11 – Miscellaneous Metals

1.03 REFERENCE STANDARDS

A. American Concrete Institute (ACI)

1. ACI 301 – Specifications for Structural Concrete for Buildings.

2. ACI 318 – Building Code Requirements for Structural Concrete.

B. American Society for Testing and Materials (ASTM)

1. A 153 – Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. When requested by the Engineer for the purposes of explaining detail or structural integrity, the Contractor shall submit formwork shop drawings. Complete descriptive literature shall be submitted for items proposed as alternatives to products specified.

PART 2 – PRODUCTS

2.01 GENERAL

A. The Contractor shall provide all formwork and those materials required to develop the strength and finishes required of the finished concrete.

1. Except where noted herein, the formwork system used is the Contractor's choice, provided it performs in the manner specified.

2. Form materials: Contractor may use any forming materials and methods which will achieve the finish qualities specified in Section 03 30 00 – Cast-In-Place Concrete, subject to the following limitations.

a. 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 requiring bond or adhesion or impeded wetting of surfaces to be cured with water or curing compound. Do not use form-coating compounds that will cause concrete staining when water comes in contact with the coating after forms are removed.

b. Form ties: Form ties shall be bolts or rods designed so that no metal shall be within the required thickness of reinforcement cover of the finished concrete surface, and to provide a void which shall be grouted to seal the opening. The detail used shall be watertight for all exterior concrete and concrete in contact with earth or water.

2.02 EMBEDDED ITEMS

A. Section 05 50 11 – Miscellaneous Metals for anchor bolts.

B. Inserts shall be as required by other trades or as shown on the Plans. Attach securely to forms. Inserts within reinforcement cover thickness shall be hot dip galvanized, nonferrous or other approved non-rusting material.

C. Waterstops: See Section 03 30 00 – Cast-In-Place Concrete, paragraphs 2.10 and 3.04. Splice to maintain continuity at corners and intersections

D. Embedded conduit: Rigid embedded conduit shall be of hot-dip galvanized steel or plastic specified elsewhere. Conduit shall be approved and listed by Underwriters Laboratories, Inc. and bear the UL label.

E. Miscellaneous embedded items: All exposed items permanently embedded in concrete within the required concrete reinforcement cover thickness shall be hot dip galvanized, nonferrous or plastic as approved, to eliminate the possibility of stained or rusty spots.

PART 3 – EXECUTION

3.01 FORM DESIGN

A. Forms shall be designed on the basis of deflection to maintain true lines within the allowable variations shown in 3.02 A. 1. below. Slab, beam and girder forms shall be cambered for dead load. Forms shall be braced and supported as required.

3.02 FINISH CONCRETE TOLERANCES

A. Every reasonable effort shall be made to maintain plumbness, and alignment as shown on the Plans.

1. Allowable variations – maximum

a. Tops of walls, parapets and curbs exposed to visual alignment + 1/8 inch in 10 feet.

b. Cross-section thicknesses of walls, columns and beams + 1/8 inch.

c. Flat surfaces of walls, slabs and tank sides, + 1/8 inch in 10 feet.

d. Linear alignment of structure lines, tank sides, and column lines as follows:

10-foot length – 1/8 inch
20-foot length – 3/8 inch
40-foot length – 1/2 inch
Over 40 feet – 3/4 inch

e. Footings:

Alignment: + 2 inches
Thickness: Plus-as required. Minus-none.

3.03 CONSTRUCTION DETAILS

A. Exposed edges of concrete on the outside of structures and all those in the inside of structures shall be chamfered or beveled at an angle of 45 degrees, such bevel being 3/4 inch on a side, except where rounded corners are shown on the Plans. If so directed by the Engineer, however, the Contractor shall provide square edges for any portion of the work.

B. Form tie holes: Form tie holes shall be pointed-up fully with mortar as specified in Section 03 30 00 – Cast-In-Place Concrete, paragraph 2.08.

C. Embedded items:

1. Position in forms in location shown. Do not place concrete before receiving approval of placing plan.

2. Provide adequate support to prevent displacement during concreting.

3. Allow other trades ample time and facilities for placing and installing embedded items.

4. Conduits must have same cover as required for reinforcing. Do not embed conduits larger than 1-inch nominal size unless specifically called out on the Plans or written approval of Engineer is obtained. Conduits shall be placed inside the reinforcing.

5. No insert shall be permitted with less cover than the reinforcement unless approval of Engineer is obtained.

3.04 FORM CLEANING

A. All dirt, chips, sawdust, and other foreign matter shall be removed from within the forms before any concrete is deposited therein. Forms previously used shall be thoroughly cleaned of all dirt, mortar and foreign matter before being used.

B. Temporary openings shall be provided at the base of column and wall forms and at other points where necessary to facilitate cleaning and inspection immediately before depositing concrete.

3.05 FORM REMOVAL

A. Form bracing and shores shall be kept in place until concrete has reached adequate strength to properly support itself. In no case shall removal commence earlier than the following schedule unless approved by the Engineer.

Sides of footings	24 hours

Walls and columns not yet supporting load	48 hours
Vertical sides of beams, girders and similar members	48 hours
Slabs, beams and girders	10 days
Shoring for slabs, beams and girders	21 days

Forms shall not be stripped from concrete which has been placed at a temperature under 50 degrees F without first determining if the concrete has properly set, without regard to the time element. If, in the opinion of the Engineer, stripping of forms on the basis of above schedule would result in damage to the concrete, the schedule shall be modified to prevent such an occurrence.

END OF SECTION 03 10 00

SECTION 03 20 00 – CONCRETE REINFORCING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work covered by this section consists of furnishing and installing all reinforcing steel, wire reinforcement, and accessories required for all cast-in-place concrete.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 03 10 00 – Concrete Forming and Accessories

C. Section 03 30 00 – Cast-In-Place Concrete

D. Section 05 50 11 – Miscellaneous Metals

1.03 REFERENCE STANDARDS

A. American Concrete Institute (ACI)

1. ACI 301 – Specification for Structural Concrete for Buildings.

2. ACI 315 – Manual of Standard Practice for Detailing Reinforced Concrete Structures.

3. ACI 318 – Building Code Requirements for Reinforced Concrete.

4. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures and Commentary. (Applies to all structures designed to contain water/wastewater or any structure with internal hydrostatic pressure.)

5. ACI 350.1 Tightness Testing of Environmental Engineering Concrete Structures. (Applies to all structures designed to contain water/wastewater or any structure with internal hydrostatic pressure.)

B. American Society for Testing and Materials (ASTM)

1. A 185 – Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement.

2. A 615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

3. A 706 – Standard Specification for Weldable Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

C. American Welding Society (AWS)

1. AWS D1.4 – “Structural Welding Code-Reinforcing Steel”.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Shop Drawings: Prepare complete shop drawings showing bending and placing diagrams in accordance with ACI 315. Shop drawings are to show plan views of all slabs, and elevation views of all walls. Shop drawings are to show all openings and penetrations, and include proper trim steel as shown on the Plans.

C. Shop drawings herein are to be coordinated with shop drawings required under Section 03 30 00 – Cast-In-Place Concrete 1.04. The shop drawings herein are to be submitted after the Section 03 30 00 – Cast-In-Place Concrete 1.04 shop drawings are approved.

D. Shop drawings are to be presented in a format that can be printed on 11-inch x17-inch paper with a text font that is readable at that scale.

1.05 QUALITY ASSURANCE

A. Mill tests: If requested by the Engineer, furnish certified copies of mill test reports showing compliance with structural Plans and Specifications.

PART 2 – PRODUCTS

2.01 STEEL AND WIRE REINFORCEMENT

A. Reinforcing steel shall consist of deformed bars of the sizes called for on the Plans. Steel shall conform to the requirements of ASTM A 615, Grade 60.

B. Wire reinforcement: Welded wire fabric shall conform to ASTM A 185. Mill tests: If requested by the Engineer, furnish certified copies of mill test reports showing compliance with structural Plans and Specifications.

C. Reinforcement to be welded is to conform to the requirements of ASTM A 706.

2.02 TIE WIRE

A. Use No. 16 double annealed iron wire.

2.03 ACCESSORIES

A. Bar supports to be detailed and placed according to minimum standards of Chapter 7, ACI 315. Include all devices necessary for the proper placing spacing, supporting and fastening of steel reinforcement in place. Where bottom surface of concrete is concealed, use standard steel chair and bolsters. Where exposed, use plastic-protected chairs conforming to CRSI Manual of Standard Practice, Chapter 3 (V), "Class 1 - Plastic Protected Bar Supports."

In footings and slabs, well-cured concrete blocks may be used in lieu of above.

B. Dowel bar replacement systems. Richmond Screw Anchor Company Dowel-In, and Dowel-DB-SAE Dowel Bar Splicer System; Dayton Superior MRC-150 system are pre-approved for use. Other systems must be approved by the Engineer prior to use.

PART 3 – EXECUTION

3.01 FABRICATION

A. Clean, bend and splice reinforcement in accordance with International Building Code and ACI 315. Hooks shall conform to Table 2-1 of ACI 315. Do not straighten or rebend Grade 60 reinforcement. All bars shall be bent cold. No welding of reinforcement is permitted unless prior approval is obtained from the Engineer. If approved, welding shall be performed by welders certified by the American Welding Society and in accordance with AWS D1.4.

B. Bars are to be shop-bent unless specifically approved to be field bent by the Engineer. Bars approved to be field bent shall be bent to a standard bend radius in accordance with ACI 317, Chapter 7.

C. Hoop bars for curved structures shall be shop-bent to the proper radius to fit into the structure. No field bending of straight bars to the radius required for curved structures will be permitted.

3.02 BENDING SCHEDULES

A. Placement drawings and bending schedules shall be submitted to the Engineer for review. Reinforcement shall be carefully formed as indicated on the drawings and according to industry practices. Bend for all bars shall be in accordance with the requirements of ACI 318, Section 7.1.

3.03 PLACING REINFORCING STEEL

Cover is defined as the distance between the face of the concrete and the nearest part of any reinforcing steel. Where reinforcing steel is called out as being on the “face”, that means that the reinforcing steel is to be placed such that its nearest part is just entirely within the cover requirement as shown below. See also paragraph 3.05, Tolerances.

A. Reinforcing steel, before being positioned, shall be cleaned thoroughly of mill scale, dirt, or other coatings that will destroy or reduce the bond. Reinforcement appreciably reduced in section by rust shall be rejected. Prior to placing concrete, the reinforcement shall be re-inspected by the Engineer and, when necessary, cleaned to the satisfaction of the Engineer.

B. Reinforcing steel shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the Plans shall not be used. Heating or welding of bars will not be permitted unless the entire operation is acceptable to the Engineer.

C. Reinforcing steel shall be positioned accurately and secured against displacement by using annealed iron wire or suitable clips at intersections and shall be supported by concrete or metal chairs or spacers, or metal hangers. Reinforcing in slabs on grade will be positioned using chairs or bolsters such as concrete blocks. Reinforcing shall be wired or otherwise secured to bolsters so that the bars do not fall off the supports during concrete placement.

D. Reinforcing steel called out as being on the “face” shall be positioned at the minimum cover distance from the face of the concrete.

E. In slabs, beams, girders and walls subject to lateral pressure, splices of reinforcement shall not be made at points of maximum stress without the express acceptance of the Engineer. Splices, where permitted, shall provide sufficient lap to transfer the stress between bars by bond and shear. Adjacent bars shall not be spliced at the same point. In walls, horizontal bars at a cold joint shall be extended in pairs of three, with splices staggered a distance equal to the lap required for the bars in question. Where not otherwise shown, reinforcement shall be in accordance with the requirements of ACI 350.

F. The clear distance between parallel bars shall not be less than the diameter of the bars and, unless specifically authorized, shall not be less than 1 inch nor less than one and one-third times the maximum size of coarse aggregate specified.

G. Double bars at the top and sides of walls are to be placed in each face, not tied together on each side of the vertical bars.

H. Horizontal bars at the bottom of walls shall be placed not less than 2 inches from the bottom of the wall, nor more than 4 inches from the bottom.

I. Spacings shown as on-center (o.c.) spacings on the Plans shall be the maximum allowed spacing. Where an integral number of bars cannot be placed within the maximum spacing, and the requirements of this section, an additional bar must be provided, which will reduce the spacing below the maximum.

J. Cover: Concrete protection for reinforcement, unless stated otherwise on the Plans, shall have cover as follows:

1. Cast against and permanently exposed to earth: 3 inches

2. All other Concrete: 2 inches

3.04 CUTTING REINFORCEMENT AT EMBEDDED ITEMS

A. Cut no reinforcement which has been placed unless it is absolutely necessary. Reinforcement which must be cut shall be replaced by a like amount of reinforcement, including both size of bars and spacing. Replacement reinforcement shall be spliced into the continuing reinforcement with splice lengths as shown on the Plans.

B. Cutting bars for the placement of embedded items. Reinforcement that must be cut to allow placement of embedded items, such as wall spools, is to be cut only once. The ends of the cut bar that are in the way of the item to be embedded shall be bent to the side to allow the placement of the embedded item. Following placement of the embedded item, the bars are to be bent back to a position near the embedded item.

3.05 TOLERANCES

A. Fabricating and placing tolerances shall be in accordance with ACI 301.

B. Tolerance on concrete cover is ± 1/4-inch.

3.06 WELDING

A. Reinforcement is not to be welded unless specifically shown on the Plans or approved in writing by the Engineer.

B. Where approved as in A., reinforcement to be used is to conform to ASTM A 706 and be welded in accordance with AWS D1.4.

END OF SECTION 03 20 00

SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work consists of furnishing all labor, material and equipment required to construct all walls, footings, slabs, beams, columns and all other items classified as cast-in-place concrete, as shown on the Plans and as specified herein.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 45 11 – Testing, Inspections, Supervision

C. Section 03 10 00 – Concrete Forming and Accessories

D. Section 03 20 00 – Concrete Reinforcing

E. Section 03 35 11 – Concrete Hardener

1.03 REFERENCE STANDARDS

A. Except where noted otherwise, all concrete and concreting procedures shall conform to applicable sections of ACI 301. Contractor shall have at least one copy of the current edition of this standard available at the site at all times. Contractor is to have at least one copy of the current edition of ACI 305, and ACI 306 available at the site at all times.

B. American Concrete Institute (ACI)

1. ACI 211.1 – Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete.

2. ACI 301 – Specifications for Structural Concrete for Buildings.

3. ACI 304.2 – Placing Concrete by Pumping Methods.

4. ACI 305 – Hot Weather Concreting.

5. ACI 306 – Cold Weather Concreting.

6. ACI 318 – Building Code Requirements for Structural Concrete.

7. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures and Commentary. (Applies to all structures designed to contain water/wastewater or any structure with internal hydrostatic pressure.)

8. ACI 350.1 Tightness Testing of Environmental Engineering Concrete Structures. (Applies to all structures designed to contain water/wastewater or any structure with internal hydrostatic pressure.)

C. American Society for Testing and Materials (ASTM)

1. C 31 – Standard Method of Making and Curing Concrete Test Specimens in the Field.

2. C 33 – Standard Specification for Concrete Aggregate.

3. C 42 – Standard Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

4. C 94 – Standard Specification for Ready-Mixed Concrete.

5. C 109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50-mm Cube Specimens).

6. C 138 – Standard Test Method for Unit Weight, Yield, and Air Content (gravimetric) of Concrete.

7. C 143 – Standard Test Method for Slump of Portland Cement Concrete.

8. C 150 – Standard Specification for Portland Cement.

9. C 156 – Standard Test Method for Water Retention by Concrete Curing Materials.

10. C 168 – Definition of Terms Relating to Thermal Insulating Materials.

11. C 172 – Fresh Concrete Sampling.

12. C 231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

13. C 260 – Standard for Air-Entraining Admixtures for Concrete.

14. C 309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

15. C 412 – Standard Specification for Concrete Drain Tile.

16. C 494 – Standard Specification for Chemical Admixtures for Concrete.

17. C 618 – Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement.

18. D 1751 – Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonrecurring and Resilient Bituminous Types).

19. E 154 – Standard Method of Testing for Use as Vapor Barriers Under Concrete Slabs and as Ground Cover in Crawl Spaces.

D. U.S. Army Corps of Engineers (USACE) Handbook for Concrete and Cement

1. CRD – C588 – Expansion Grouts.

E. Federal Specifications (FS)

1. FS-TT-S-00227E – Interim Federal Specification for Sealing Compound: Elastomeric Type, Multi-Component (For Caulking, Sealing, and Glazing in Buildings and Other Structures).

F. Washington State Department of Transportation (WSDOT)

1. Standard Specifications for Road, Bridge, and Municipal Construction.

a. Section 6-02 Concrete Structures.

b. Section 9-01 Portland Cement.

c. Section 9-03 Aggregates.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Mix Designs: Submit mix designs and supporting data in accordance with paragraph 2.12 B.1. for each concrete mix used on the project.

C. Admixture certificates: Contractor shall submit copies of tests showing conformance with requirements specified herein.

D. Epoxy grout and adhesives: Submit manufacturer's data on any epoxy grout or adhesives prior to use.

1.05 QUALITY ASSURANCE

A. Control of materials: All materials indicated to be tested in this section shall be tested by a certified agency and approved for use by Engineer. Tests shall be performed in accordance with International Building Code Section 1905.

1.06 TESTING AGENCY

A. Testing and inspection as described herein shall be performed by a firm in accordance with Section 01 45 11 – Testing, Inspections, Supervision.

PART 2 – PRODUCTS

2.01 CEMENT

A. Cement, except as otherwise specified, shall conform to ASTM C 150 and shall be Type II for all concrete in hydraulic or below grade structures and Type I or II for other cast-in-place concrete. Type I-II cement may be used for all structures.

Cement shall at all times be suitably stored and protected from exposure to the atmosphere. In the event the cement shows signs of deterioration, it shall not be used unless additional tests show that it conforms to the requirements stated above.

2.02 POZZOLAN

A. Fly ash shall conform to ASTM C 618 Class F. Maximum loss on ignition to be 1 percent.

2.03 AGGREGATES

A. Fine and coarse aggregate for concrete shall conform to ASTM C 33.

2.04 WATER

A. Water shall be any potable water, clean and free from injurious amounts of oil, acid, alkali, and organic materials. Water shall meet the requirements set for the in ASTM C 94, Section 4.1.3 "Water".

2.05 ADMIXTURES

A. Water reducing agent: Water reducing admixtures shall comply with ASTM C 494, Types A or F. Admixture shall be free of added calcium chloride. In addition to ASTM requirements, use shall be in strict accordance with the manufacturer's recommendations. Contractor shall use the type best suited for job conditions on the approval of Engineer. Water reducing agent shall be Master Builders “Polyheed N”, “Polyheed 997” low, to mid-range (Type A), or “Glenium 3000 NS” high range (Type F) water reducers, or approved equal.

B. Air entraining agent: Materials proposed for use as air entraining admixture shall conform to ASTM C 260. Air entraining agent added shall result in an entrained air content of 4 percent ± 1 percent unless otherwise noted or specified herein. The air content in the concrete shall be determined by pressure method (ASTM C 231). Master Builders “MB AE 90” or approved equal.

C. Fly ash may be used in concrete mixes. Maximum fly ash content is 150 pounds per cubic yard. Fly ash may replace part of cement content of concrete mix provided that the minimum cement required herein is maintained.

D. A shrinkage-reducing admixture (SRA) may be used to reduce drying shrinkage. Minimum amount of a shrinkage-reducing admixture shall be 1.0 fluid gallon per cubic yard of concrete.

Products:
Masterlife SRA 035 by Master Builders or approved equal.
Masterlife CRA 007 by Master Builders or approved equal.
Eucon SRA-XT by Euclid Chemicals or approved equal.

E. Other admixtures shall not be used unless approved by Engineer prior to use.

2.06 EPOXY BONDING COMPOUNDS

A. Epoxy resin bonding compound shall be "Concresive LPL" as manufactured by DeGussa, “Sikadur" as manufactured by Sika Chemical, or equal. Application of all epoxy bonding compounds shall be in accordance with manufacturer's specifications or instructions.

2.07 GROUT

A. Grout shall be either the non-shrink type, or standard concrete grout class 4000G as specified below.

B. Non-shrink grout shall be a cement-type grout meeting the requirements of ASTM C-1107. Non-shrink grout shall be used where called for on the Plans, and where grout will be placed with a thickness less than 2 inches. Non-shrink grout shall be mixed in proportions to be “flowable”, but not “pourable”. Specimens molded, cured and tested in accordance with ASTM C 109 shall have a minimum compressive strength of 6,200 psi. Grout shall not exhibit visible bleeding.

2.08 MORTAR AND DRYPACK

A. Mortar (drypack) for repair and where called out on the Plans for grouting, shall be composed of non-shrink grout, as above.

2.09 CURING COMPOUND

A. Concrete curing compound shall be of a nature and composition not deleterious to concrete and shall be of a standard and uniform quality ready for use as shipped by the manufacturer. Curing compound shall be of the membrane-forming type. The formulation shall be such that concrete surfaces on which it is applied can be sacked or coated with finish materials such as paints. At time of use, the curing compound shall be in a thoroughly stirred condition. Curing compounds shall not be diluted by addition of solvent or thinners, or be altered in any manner without specific approval of, and in a manner prescribed by, the manufacturer. Curing compound shall be Master Builders or approved equal.

B. Curing compound shall, when tested in accordance with ASTM C 156, be effective in limiting water loss in the concrete test specimens to 3½ percent when applied at the coverage rate recommended by manufacturer.

C. Curing compound shall conform to ASTM C 309 and shall be clear and not discolored. Curing compound and coatings where used, shall be verified by Contractor to be compatible prior to application.

D. Monomolecular film shall be used when conditions are such that surface evaporation is likely. This film shall be applied in accordance with manufacturer's instructions. Master Builders Confilm, or Engineer approved equal.

2.10 VAPOR BARRIER

A. Plastic Vapor Barrier: ASTM E 1745, Class A, with actual tested perm rating of less than 0.100, tensile strength not less than 45 lbf/in, puncture resistance 2200 grams. Include manufacturer's recommended adhesive or pressure-sensitive tape and pipe boots. Subject to compliance with requirements, provide one of the products:

1. Fortifber Corporation, Moistop Ultra 15
2. Insulation Solutions, Inc, Vipor Vaporcheck II 15-mil
3. Raven Industries, Vaporblock 15
4. Stego Industries, LLC, Stego Wrap 15

2.11 WATERSTOPS

A. Waterstops embedded in concrete shall be polyvinyl chloride (PVC) plastic meeting the following minimum requirements:

Tensile Strength	1,800 psi
Elongation	300%
Shore A Durometer	50

B. Test for materials shall be in accordance with ASTM D 412. No reclaimed PVC will be allowed.

C. Waterstop shall be 6 inches wide, 3/8-inch thick heavy-duty type, unless indicated otherwise on the Plans or Specifications. Installation and splicing shall be as recommended by manufacturer. Waterstops shall be Greenstreak #732, Horn Durajoint Type 9, or equal. Split-flange waterstops may not be used unless approved in advance by the Engineer.

2.12 JOINT SEALANT

A. Use joint sealant appropriate for use with concrete, and one which is compatible with any finishes which are to be applied as specified elsewhere. Use polyethylene rope backing where necessary in larger width cracks.

2.13 MIX DESIGN AND CONTROL

A. Concrete

1. Quality: Concrete shall be designated by class with a minimum required 28-day strength. Water/cement ratio shall be varied as specified below. Calculations of water/cement ratios shall include all cementitious materials, including fly ash, in the denominator. The proportions of materials shall be such as to produce a workable, dense, impermeable concrete of the strength required.

    a. Class 5000LS (low shrinkage) concrete shall have a minimum 28-day strength of 5,000 psi. Class 5000LS concrete shall have a maximum water/cement ratio of 0.40, a minimum water/cement ratio of 0.35, contain a minimum of 588 pounds of cement per cubic yard. Class 5000LS used for slabs and interior tank walls shall contain 1 percent to 3 percent entrained air with no air entraining admixture. Class 5000LS used for exterior walls shall contain 5 percent entrained through the use of an air entraining admixture. Type F fly ash may be used in 5000LS concrete to a maximum of 20 percent by weight, of the total cementitious materials. Water-reducing admixtures shall be used as required in Class 5000LS concrete to maintain workability. Class 5000LS concrete shall be used for water-retaining structures and as specified below in the Concrete Schedule.

    b. Class 4000 concrete shall have a minimum 28-day strength of 4,000 psi. Maximum water/cement ratio shall be 0.45. Class 4000 concrete that is not exposed to the elements need not have air entrainment.

    c. Class 4000A concrete shall have a minimum 28-day strength of 4,000 psi, a maximum water/cement ratio of 0.42, air entrainment of 4 percent to 6 percent. Class 4000A concrete shall be used for sidewalks and exterior concrete stairs.

    d. Class 4000G concrete shall have a minimum 28-day strength of 4,000 psi, a maximum water/cement ratio of 0.38, and a maximum aggregate size of 3/8 inch. Class 4000G concrete shall be used for grout, where the thickness of the grout is greater than 2 inches. This does not include grout for clarifiers. 4000G concrete that is used at the bottom of water-retaining structures need not be air entrained. 4000G concrete that will be exposed to the elements shall have air entrainment of 4 percent to 6 percent.

    e. Class 3000 concrete shall have a minimum 28-day strength of 3,000 psi, a maximum water/cement ratio of 0.55, air entrainment is not required for Class 3000 concrete. Class 3000 concrete shall be used for encasement of pipes under structures, and for encasement of electrical duct banks.

2. Consistency: Adequate water shall be used to produce the necessary workability for placement. However, the slump determined in accordance with ASTM C 143 shall not exceed the following values unless water-reducing admixtures or other means are used to obtain larger slumps while maintaining water-cement ratios as specified herein:

Vertical wall sections, columns, beams	4 inches
Footings, slabs	3 inches
Plain unreinforced concrete	4 inches

Class 5000LS concrete used for water-retaining structures and as specified below in the Concrete Schedule, shall have a maximum slump of 8 inches when used in walls, and 6 inches when used for slabs. In addition, Class 5000LS concrete shall have a minimum slump of 4 inches when used for walls. Class 4000G concrete shall have a slump of 2 inches to allow it to be placed as shown on the Plans.

3. Aggregate: Aggregates shall meet the requirements of ASTM C33. In the mix design submittal, identify the borrow source of the aggregate to be used in the concrete for this project. Provide State Department of Transportation pit numbers if available. Alkali-reactive aggregates shall be mitigated by such measures as the addition of Type F fly ash. Coarse aggregate having a maximum particle size of 1-1/2 inches (1-1/2-inch minus) may be used in structures where the concrete cover is specified as 2 inches or greater and reinforcing bar spacing's are greater than 2 inches. Other coarse aggregates shall have a maximum particle size of 3/4-inch (3/4-inch minus).

B. Control tests – Characteristics of the concrete shall be controlled as follows:

1. Mix design: Before beginning concrete work, Contractor shall determine proper proportions of materials for each strength and type of concrete. Mix shall consist of the exact proportions of cementitious material, aggregates, water, and admixtures proposed for the particular concrete mix. Admixtures shall be proportions recommended by the manufacturer to achieve results herein noted. Mix design shall be prepared at the Contractor's expense and shall show the expected strength, corresponding slump, air content, and all ingredient weights, and other physical properties necessary to check each design mix. Where more than one grading of coarse aggregate will be used, tests shall be made for the finest gradation to be used. Mix designs and supporting data shall be submitted in accordance with Section 01 33 00 – Submittals Procedure.

2. Shrinkage Testing: Concrete supplier shall perform drying shrinkage tests for the 5000LS trial batches. Fabricate, cure, dry, and measure specimens in accordance with ASTM C175. The maximum concrete shrinkage for specimens cast in the laboratory shall be 0.025 percent. Test specimens with different amounts of a shrinkage reducing admixture (SRA). If trial batch specimens do not meet the shrinkage requirements, adjust the mix design and retest. Use a mix design for construction that has met the trial batch shrinkage requirements.

3. Slump tests: All slump testing is to be done after any water which is going to be added, has been added at the job site. Following addition of any water, slumps exceeding permitted slumps will be cause for rejection of the load.

PART 3 – EXECUTION

3.01 BATCHING AND MIXING

A. Batching: Concrete shall not be batched on the job unless prior approval is obtained from the Engineer.

B. Transit mixed concrete: Ready-mixed concrete shall be used. Transit mixed concrete shall comply with applicable portions of this specification and ASTM C 94. Batch tickets shall be provided with each truckload of concrete in accordance with ASTM C 94 including type and amount of cementitious material, type and amount of admixtures, total water content by producer, and weights of fine and coarse aggregate. Batch ticket shall also state the maximum amount of water that may be added at the job site without violating the maximum allowable water/cement ratio as specified above for each class of concrete. Water may be added at the job site up to the maximum allowed for the water/cement ratio of the class of concrete being delivered, provided the concrete does not exceed the permitted slump. No water may be added at the job site without authorization from the Engineer. In no case shall water be added without adequate means for measuring and recording the amount added. If water is added, the Engineer may require test cylinders to be taken on the load of concrete to which water was added. These test cylinders are in addition to the test cylinders taken under normal conditions.

3.02 CONCRETE FOR PUMPING

A. Special requirements apply when concrete is to be placed by pumping.

1. Standards – The following standards shall govern:

a. ACI 211.1

b. ACI 304.2R

2. Pumping: Type of pump to be used shall be approved by the Engineer.

3. Mix design shall be in accordance with above standards. An average loss of slump of 1/2 to 3/4 inch per 100 feet of pipeline shall be accommodated in the mix design and batching processes.

4. Aggregates: In concrete that is to be pumped, all aggregate shall fall in the middle of ASTM C 33 gradation limits.

5. Admixtures: Any admixtures used to improve pumpability shall strictly follow Paragraph 2.05 Admixtures, and Paragraph 2.15 Mix Design and Control.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. In general, conform to ACI 304, Guide for Measuring, Mixing, Transporting, and Placing Concrete. Conform to the temperature limitations in “Concrete Temperature” in ACI 301, Section 4, “Concrete Mixtures,” and the International Building Code.

B. Particular care shall be taken with concrete mixes with water/cement ratios less than 0.50 to avoid surface drying. In low humidity, or windy conditions, monomolecular film or fogging shall be used to prevent surface drying and consequent cracking.

C. Cold weather concreting shall be in accordance with ACI 306 R, except as modified herein.

1. Cold weather is defined as a period when for more than 3 days the mean daily temperature drops below 40 degrees F. When temperatures above 50 degrees F occur during more than half of any 24-hour period, the concrete should no longer be regarded as cold weather concrete. Low humidity and windy conditions in the winter require evaporation retarders as noted below under Hot Weather Concreting.

2. Concrete temperatures as mixed and as placed shall be maintained within the recommended temperature ranges for the indicated period.

3. When heating of concrete materials is required, apparatus used shall heat the mass uniformly and not create overheated areas or hot spots. Direct heating devices will not be allowed. Any added moisture shall be taken into account in the mix design.

4. No frozen materials or materials containing ice shall be used. Surfaces with which the concrete is to come in contact shall be free of snow, ice, and frost and have a temperature above freezing.

5. Plans for protecting fresh concrete shall be made well in advance of expected freezing temperatures. All necessary materials and equipment shall be on-site before the first frosts are likely to occur.

6. Protective coverings shall quickly follow the concrete placing. If it is necessary to expose the concrete, only small areas shall be exposed at a time and then only for short periods.

7. Choice of curing method shall consider and be compatible with the cold weather protection method. If heaters are used, they shall be vented to the outside. Water curing during cold weather as defined in this section shall not be permitted.

8. All concrete placed in cold weather shall be protected from freezing for a minimum of 7 days following placement.

D. Hot weather concreting shall be in accordance with ACI 305 R, except as modified herein.

1. Hot weather is defined as any combination of high air temperature, low relative humidity, and wind velocity tending to impair the quality of fresh or hardened concrete or otherwise resulting in abnormal properties.

2. Contractor shall schedule delivery of concrete so it can be placed promptly upon arrival. Formwork shall be ready to receive concrete. Construction joints shall be properly placed and prepared. Concrete shall not be placed faster than it can be properly consolidated and finished by the personnel and equipment at hand.

3. Flatwork shall be protected from excessive drying during finishing operations, by such means as use of a monomolecular film after placing but before finishing, or fogging upwind of the concrete operation. Each finishing operation shall be performed without delay as soon as the concrete is ready for it. Curing shall be applied promptly and continued without interruption.

4. If ice is used in the mixing water, mixing shall continue until ice is thoroughly melted, but not longer than specified elsewhere in this section.

5. No water shall be added to the mix at site except that water may be added sufficient to adjust to within 1 inch below the specified maximum slump, provided such an addition does not exceed the specified maximum water-cement ratio. Any later addition of water must be approved by Engineer.

E. Protection of concrete construction: All surfaces shall be protected against injury. During the first 72 hours after placing concrete, any wheeling, working or walking on concrete shall not be permitted. All slabs subject to wear shall be covered with a layer of sand or other suitable material as soon as concrete has set. Sisal paper or other similarly tough, waterproof paper may also be used, provided all joints between adjacent strips of paper are carefully sealed. This does not alter requirements for proper curing as specified in Paragraph 3.09, Curing Concrete.

1. No concrete slabs or top surfaces of walls shall be placed during rain unless acceptable protective shelter is provided; and during such weather, all concrete placed within the preceding 12 hours shall be protected with waterproof canvas or other suitable coverings. These shall be provided and kept ready at hand.

2. All concrete construction shall be protected from excessive loading. Installation of mechanical and electrical equipment shall be accomplished by employing shores, bearing plates, frames, cranes and temporary beams.

3.04 VAPOR BARRIER

A. Plastic Vapor Barrier: Place underslab vapor barrier directly over subbase when subbase moisture test results taken prior to slab pour don't exceed the requirements of the manufacture. Install, protect and repair vapor barrier according to the manufacturer's written instructions. Comply with ASTM E1643, "Standard Practice for Selection, Design Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs".

1. Lap joints 6 inches and seal with manufacturers recommended tape and seal all penetrations in accordance with manufacturer's written instructions.

3.05 CONSTRUCTION JOINTS

A. General: Concrete in each unit of construction shall be placed continuously. Contractor shall not begin work on any part unless his/her facilities and forces are sufficient to complete the unit without interruption. Before new concrete is deposited on or against concrete which has set, the forms shall be re-tightened and the surface of the set concrete shall be thoroughly cleaned of foreign matter. Concrete surfaces on which concrete is to be deposited shall be wetted, then all free moisture shall be removed. No cold joints are allowed in watertight construction unless a waterstop is used at the joint.

B. Construction: All construction joints shall be formed as described on the Plans. All construction joints in basements and water-retaining structures shall be made watertight.

C. Locations: Construction joint locations shall be shown on shop drawings as required above, and shall be as approved by the Engineer. Construction joints shall be kept to a minimum consistent with sound construction practices.

D. Water-tightness: PVC waterstops shall be provided in construction joints where watertight construction is required. Waterstops shall be held firmly in proper position during concreting operation. Watertight construction will be required as follows:

1. Joints in all parts of structures exposed to ground or water on one side with areas to be occupied by non-submerged equipment or personnel on the other.

2. All joints of tanks and channel walls that are or may be subjected to water pressure.

E. If joint is not watertight after construction, the Engineer may require any of the following:

1. Grouting of the joint by drilling grout holes to the center of the structural unit and forcing epoxy grout into the joint under pressure.

2. Cutting of a bevel groove on the water side of the joint. The groove shall be 1/2 to 3/4 inch in width and depth and shall be filled per manufacturer's instructions with cementitious waterproofing as directed by the Engineer.

3.06 CRACK CONTROL JOINTS

A. Crack control joints shall be formed as described in the Plans by saw-cutting or as otherwise described in the Plans. All saw cutting shall be done within 24hours of the pour.

B. Sidewalks. Sidewalks shall have tooled crack control joints at a spacing equal to the sidewalk width, with a maximum spacing between tooled joints of 10 feet.

3.07 INSERTS AND EMBEDMENTS

A. Inserts: Where pipes, castings, or conduits are to pass through walls, Contractor shall place such pipes or castings in the forms before pouring concrete.

Additional reinforcement shall be provided around such openings as shown on the Plans or directed by Engineer. Pipes, castings, or conduits as specified shall be grouted in place by pouring in grout under a head of at least 4 inches. Grout shall be poured or rammed into place to fill completely the space between pipes, castings, or conduits, and sides of the opening so as to obtain the same water tightness as required for the wall itself.

B. Embedment: Contractor shall set accurately and hold in exact position in the forms all embedded items until concrete is poured and set. Contractor shall furnish and set accurately all inserts and anchor bolts necessary for attaching piping, valves, and equipment.

3.08 PLACING CONCRETE

A. Concrete shall not be placed until forms and reinforcement have been accepted by Engineer. Concrete shall be conveyed from mixer to place of final deposit as rapidly as possible by methods which will prevent separation or loss of ingredients. It shall be deposited in the form as nearly as practicable in its final position so as to maintain a plastic surface approximately horizontal. Concrete shall not be dropped more than 4 feet unless a suitable chute or tube is used. Forms for walls or other sections of considerable height shall be provided with openings, or other devices which will permit the concrete to be placed in a manner which will avoid accumulations of hardened concrete on forms or metal reinforcement. Under no circumstances shall concrete that has partially hardened be deposited in the work. Temporary joints shall not remain exposed for more than 45 minutes before adjacent concrete is placed.

B. Immediately after depositing, concrete shall be thoroughly compacted by means of high-frequency mechanical internal vibrators which shall oscillate at 7,000 cycles per minute minimum.

3.09 PLACING GROUT

A. The substrate on which the grout is to be placed shall be bush hammered to provide a roughened surface. All loose material shall be removed, and the substrate shall be clean. The substrate is to be thoroughly wetted to prevent wicking out of moisture from the grout. If the grout does not contain an adhesive admixture, one shall be applied prior to placing the grout.

B. Grout at the bottom of water-retaining structures is to be finished with Finish FF as specified herein.

C. Grout used for walking surfaces shall be finished with Finish LB, and shall have hardener applied to the surface.

D. Grout is to be cured as required below.

3.10 CURING CONCRETE

A. Immediately following placement, concrete shall be protected from premature drying, hot and cold temperatures, rain, flowing water and mechanical injury. Materials and methods of curing shall be approved by Engineer. Wet curing shall continue for not less than 7 days.

1. Approved methods include ponding or continuous fog spray, and liquid membrane-forming compounds as described below, except as specified elsewhere in this section. Intermittent wetting of concrete is not permitted. Where wet cure is used, it shall be continuous, and shall prevent the surface from ever drying out for the duration of the 7-day cure period.

   Application of liquid membrane-forming compound shall conform to ASTM C 309. Material shall restrict the loss of water to not more than 0.55 kg/square meter or surface in 72 hours when used at a coverage of 400 square feet per gallon and tested in accordance with ASTM C 156. The curing compound shall be used at a minimum rate of one gallon per 400 square feet.

2. Formed surfaces shall be kept moist prior to stripping forms. Immediately following stripping of forms, concrete shall be cured by the curing compound method.

3. Slabs shall be kept wet for 24 hours. Then cured by the curing compound method, or by wet methods as above. If the temperature drops below freezing, protect the slab as required to prevent freezing for 7 days.

4. Curing compounds shall not be used on surfaces to receive waterproofing membranes.

3.11 REPAIR OF CONCRETE CONSTRUCTION

A. Immediately after removal of forms, all concrete shall be inspected and all porous concrete, rough sections or rock pockets containing loose materials shall be repaired by cutting back to solid concrete and making an opening of such size and shape as will form a 1-inch key for a cement mortar fill. Before the mortar is applied, the surface of the existing concrete shall be coated with an epoxy bonding compound. All form tie holes and imperfections greater than one-fourth cubic inch shall be filled. Fill for small imperfections and form ties shall bond thoroughly to concrete and be of an equivalent quality as the surrounding concrete. Fill shall form a dense plug impervious to water. Where the area or volume of defective concrete is large, it may be repaired by reforming the surface and filling the opening with concrete. For such repairs, the concrete surface shall be coated with an epoxy bonding compound. The exposed surface shall be neatly finished to match the surface and texture of adjacent concrete. All patches shall be cured as approved by Engineer.

3.12 FINISH OF FORMED SURFACES

A. Finishes for surfaces of individual structures and portions of structures is to be as detailed in the Concrete Schedule herein. Any concrete not specifically called out in the Concrete Schedule shall receive Finish B, unless otherwise agreed to by the Engineer.

B. Formed surfaces

1. Finish A: Finish A shall be a Grout-cleaned finish in accordance with ACI 301.

   All fins, ridges and other projecting irregularities shall be ground smooth. All concrete to receive Finish A shall be sandblasted to provide a rough surface for the adherence of the grout, and to remove curing compounds. The surface shall be thoroughly wetted and a bonding agent applied to promote adherence of the slurry mixture to the hardened concrete. All surface imperfections shall be covered with the slurry mixture, leaving a blemish-free finish. The sack-rubbed finish shall be cured by continuous wetting, or by use of curing compound if the curing compound does not cause any blotching or unevenness in the finish.

   Where Finish A is called for, it shall extend to 2 feet below the water surface, or 1 foot below the ground surface, as applicable.

2. Finish B: Hardened concrete shall be blasted with high-pressure (3000 psi or greater) water stream to remove any loose concrete. Surface imperfections greater than 1/4-inch dimension including form tie holes shall be pointed up with cement type grout, flush with the concrete surface.

3. Finish C: Surfaces imperfections greater than 1/2-inch dimension and form tie holes shall be pointed up with cement type grout flush with the concrete surface. Finish C surfaces on buildings and structures with habitable spaces below grade that are to be backfilled are to be coated with asphalt emulsion below finished grade.

4. Top of walls

   a. Strike concrete smooth. Round corners with steel radius tool of 1/2-inch radius or provide chamfer as specified herein.

   b. Float to texture comparable to formed surfaces.

   c. Provide rubbed finish per Finish A wherever adjacent formed surface is scheduled to receive Finish A.

3.13 SLAB FINISHES

A. Slab finishes shall be in accordance with ACI 301, Paragraph 11.7, Finishes. See concrete schedule for types of finish required for each structure.

1. Finish LB. Light broom finish.

2. Finish MB. Medium broom finish. This finish is used for sidewalks and stair landings outdoors.

3. Finish FF. Float finish. Concrete is bull floated, machine floated, and then hand troweled to a smooth finish with a long-handled steel trowel.

4. Finish ST. Burnished steel trowel. Following floating, concrete is troweled in several passes until a ringing sound is heard.

5. Finish RF. Rake Finish. Slabs to receive grout toppings are to be raked to a rough finish with a rake, or rolled with an expanded metal roller that leaves a rough finish on the concrete. Prior to applying the grout topping, surface is to be high-pressure washed as in Finish B, above.

3.14 SURFACE TOLERANCES

A. Finished concrete surfaces shall be true planes within 1/8 inch in 10 feet as determined by a 10-foot straightedge placed anywhere on the slab in any direction. Wall tops shall be level, with a maximum deviation from the elevation shown on the Plans of 1/4-inch.

B. Slopes to drains shall be true to line. All slopes to drains are to have an even slope from the high point to the inlet to the drain, with no changes in slope, such that “birdbaths” do not form. Slope all exterior and interior work including stair landing and individual treads. Stair landings and treads to be sloped 1/8 inch per foot. Minimum slope to drains where not otherwise specified on the Plans is 3/16 inch per foot.

3.15 FIELD TESTING

A. Concrete will be sampled and tested in accordance with ACI 301 and supplements during the progress of concrete work. Slump and air content tests shall accompany all test cylinders for strength. Engineer shall be notified 48 hours ahead of all scheduled pours. Contractor shall notify Engineer 24 hours in advance of any cancellation of pours.

1. When there is a question as to quality of the structure because of cylinder strength test failures, strength tests will be made on specimens taken from the structure, and testing in accordance with ASTM C 42 will be required.

2. Samples of concrete will be obtained in accordance with ASTM C 172 and will be transported to a place on the site where air and slump tests can be made and cylinders stored without being disturbed for the first 24 hours. Cylinders for strength tests will be made in accordance with ASTM C 31 and ASTM C 94.

3. Concrete failing to meet the requirements of these specifications shall be deemed unacceptable and shall be removed from the structure if so required by the Engineer.

B. Cylinders will be made as required by ACI 301, and supplements for strength tests following applicable ASTM standards. Cylinders shall be cured in the laboratory. If a specimen shows evidence of improper sampling, molding or testing, it will be discarded.

C. Slump and air tests shall be made following the procedure in ASTM C 143. Slump tests shall be made for concrete from any batch from which strength tests are made.

1. If the measured slump falls outside limits specified, a check test will be made immediately on another portion of the same sample. In the event of a second failure, concrete will be considered to have failed to meet requirements of the specifications and shall be unacceptable.

D. Air content tests shall be made in accordance with ASTM C 231.

1. If the measured air content falls outside limits specified, a check test will be made immediately on another portion of the same batch. In the event of a second failure, concrete will be considered to have failed to meet requirements of the specifications and shall be unacceptable.

3.16 CONCRETE CLASS AND FINISH SCHEDULE

CONCRETE SCHEDULE				
Structure	**Concrete Class**	**Finish**	**Hardener**	**Comments**
Sidewalks, Outdoor Landings, and Equipment Pads	4000A	MB	Y	
Buildings				
Slab	5000	ST	Y	See Structural Plans for information regarding air entrainment.
Walls	4000A			
both sides, below grade		C	N	
both sides, above grade (exposed)		A	N	
Grout	4000G	ST	N	

END OF SECTION 03 30 00

SECTION 03 35 11 – CONCRETE HARDENER

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work covered by this section includes all labor, materials, and equipment required for surface preparation and application of concrete hardener as indicated on the Plans and as specified herein.

B. Concrete hardener is to be applied to all concrete floors inside buildings, and as shown on the Concrete Schedule in Section 03 30 00 – Cast-In-Place Concrete. Hardener is not required inside water-retaining structures.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 03 30 00 – Cast-In-Place Concrete

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):

1. D3278 – Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus.

2. D2369 – Standard Test Method for Volatile Content of Coatings.

3. D4060 – Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.

4. D1475 – Standard Test Method for Density of Liquid Coatings, Inks and Related Products.

5. D1545 – Standard Test Method for Viscosity of Transparent Liquids by Bubble Time Method.

6. D3960 – Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit the following in accordance with Section 01 33 00 – Submittals Procedure:

1. Technical Data Sheets: For concrete hardener system, Contractor shall submit a technical data sheet from the manufacturer. The technical data sheet shall at minimum provide the material name, manufacturer name, product name and number, material specification, recommended coverage and thickness.

2. Material Safety Data Sheets (MSDS).

3. Copy of warranty to be issued.

PART 2 – PRODUCTS

2.01 CONCRETE HARDENER SUPPLIER

A. This section is based on Eco-Hard-N-Seal™ concrete hardener by Tennant Company, P.O. Box 1452, Minneapolis, MN 55440, (800) 228-4943. Equivalent products are acceptable with Engineer's approval. Also approved for use is Dayton Superior Day-Chem Sure Hard (J-17).

B. The concrete hardeners specified herein may be used as the curing compound on new concrete specified elsewhere in these specifications.

2.02 DELIVERY, STORAGE AND HANDLING

A. Store materials in dry, enclosed area with adequate protection from moisture. Keep temperature of storage area between 65°F (18°C) and 90°F (32°C).

B. Deliver all materials to the job site in original, new, and unopened packages and containers bearing manufacturer's name and label.

1. Provide labels on each container with the following information:

a. Name or title of material.

b. Federal Specification number, if applicable.

c. Manufacturer's stock number.

d. Manufacturer's name.

e. Contents by volume.

f. Thinning instructions, if any.

g. Application instructions.

C. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application in a clean condition, free of foreign materials and residue.

2.03 JOB CONDITIONS

A. Do not apply when conditions are such that dust, dirt, or other deleterious substances which may impair the quality of coats or the finish are present or will be present before the coating is fully cured.

B. Comply with manufacturer's recommended limitations for ambient and surface temperature and humidity. No painting is to be done when the relative humidity exceeds 85 percent.

C. Comply with manufacturer's recommendations for minimum and maximum times between applications.

PART 3 – EXECUTION

3.01 PREPARATION

A. Application can begin after the final concrete trowelling or anytime thereafter.

B. No preparation process is required for newly placed concrete.

C. Remove coating or membranes from existing concrete with one of the following methods:

1. Mechanical – Sand floors.

2. Chemical – Scrub thoroughly with TENNANT 654. Remove curing membranes with TENNANT 530/531/528. Remove paint and coatings with TENNANT 510.

3.02 APPLICATION

A. Apply in accordance with Manufacturer's written specification.

1. Assemble equipment.

2. Mix Eco-Hard-N-Seal™ before using. For new concrete: Spray on the surface with a low-pressure sprayer immediately following the finishing operation. Apply Eco-Hard-N-Seal™ at an average coverage rate of 200 square feet per gallon to the entire surface as soon as the surface is firm enough to walk on and before hairline and temperature cracking begins. Keep the entire surface wet with Eco-Hard-N-Seal™ for 30 minutes by brooming excess material onto the dry spots or by respraying them immediately. After 30 minutes, squeegee or broom all puddled excess of Eco-Hard-N-Seal™ so that any remaining material penetrates into the surface. For old concrete: (Average or Broom Trowelled Concrete) Saturate the surface with Eco-Hard-N-Seal™ at an average coverage rate of 200 square feet per gallon. If dry spots appear, broom all puddled or excess Eco-Hard-N-Seal™ on to them or respray them immediately so that the entire surface is wet for 30 minutes. After approximately 30 minutes, the floor will become slippery. Add more water to the solution, and work it in using a disc machine or automatic scrubber.

3. Scrub and rinse 2-4 hours after application to ensure removal of all residue. White residue upon drying indicates inadequate rinse. Repeat rinse step if necessary. Floor may be open to traffic after it has dried. Apply a second application using the same procedure as before, if there is very little residue remaining after the first application. Check Floor: Texture of floor should feel smooth and appear somewhat glossy. WAIT: Allow to dry 12 hours before trafficking.

4. CAUTION: TENNANT coatings provide a smooth, non-porous surface. Immediately clean liquid spillage or soilage on coated surfaces to avoid a slippery condition. Use TENNANT grit in slip-hazard areas.

3.03 PROTECTION

A. Close job site to traffic for a period of 12 hours after sealing application.

END OF SECTION 03 35 11

DIVISION 05 – METALS

SECTION 05 50 11 – MISCELLANEOUS METALS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work consists of furnishing all labor, materials and equipment for the fabrication and erection of all metal fabrications shown on the drawings and as specified including metal work associated with electrical and instrumentation installations.

B. Work includes, but is not limited to, embedded and non-embedded metal work including structural steel and aluminum shapes, clip angles, sheet steel, rungs, tubing, rods, guides, inserts, brackets, anchor bolts, bracing and supports, hangers, stair treads, fixed ladders, access doors, and metal workbenches for all related sections.

C. Work of this section also includes supply and installation of fabricated aluminum ladders and appurtenances, as specified and shown on the Plans.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 45 11 – Testing, Inspections, Supervision

C. Section 03 10 00 – Concrete Forming and Accessories

D. Section 03 20 00 – Concrete Reinforcing

E. Section 03 30 00 – Cast-In-Place Concrete

F. Section 05 52 11 – Aluminum Railings

G. Section 05 53 11 – Aluminum Gratings

H. Section 07 41 11 – Metal Roof and Wall Panels

I. Section 07 62 00 – Sheet Metal Flashing and Trim

J. Section 07 92 00 – Joint Sealants

K. Section 08 11 13 – Hollow Metal Doors and Frame

L. Section 09 90 00 – Painting and Coating

M. Division 23 – Heating, Ventilating, and Air Conditioning (HVAC)

N. Division 26 – Electrical

O. Division 33 - Utilities

P. Division 40 - Process Interconnections

Q. Division 46 – Water and Wastewater Equipment

1.03 REFERENCE STANDARDS

A. American Iron and Steel Institute (AISI)

B. American Society for Testing and Materials (ASTM)

1. A 36 – Structural Steel.

2. A 53 – Pipe, steel, black and hot-dip, zinc-coated, welded and seamless.

3. A 123 – Standard Specification for Zinc (Hot Dip Galvanized) coatings on Iron and Steel Products.

4. A 153 – Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.

5. A 167 – Stainless and heat-resisting chromium-nickel steel plate, sheet and strip.

6. A 386 – Zinc coating (hot dip) on assembled steel products.

7. A 307 – Carbon steel externally threaded standard fasteners.

8. A 366 – Steel, carbon, cold-rolled sheet commercial quality.

9. A 500 – Hot formed welded and seamless carbon steel structural tubing.

10. A 526 – Steel sheet, zinc-coated (galvanized) by the hot-dip process, commercial quality.

11. A 780 – Standard Practice for Repair of Damaged Hot Dip Galvanized Coatings.

12. B 308 – Aluminum alloy standard structural shapes, rolled or extruded.

13. F 468 – Nonferrous bolts, hex cap screws, and studs for general use.

14. Additional ASTM Standards as called for in the Contract Drawings.

C. American Welding Society (AWS)

D. National Association of Architectural Metal Manufacturers (NAAMM).

E. The Society for Protective Coatings (SSPC):

1. SSPC-Guide 14 – Guide for the Repair of Imperfections in Galvanized or Inorganic Zinc Coated Steel Using Organic Zinc Rich Coating.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Product data: Submit manufacturer's descriptive literature and installation instructions for the following:

1. Fasteners;

2. Grouts;

3. Galvanizing repair paint;

4. Ladder Rungs

5. Stair Treads

6. Access Doors

C. Shop drawings: Submit shop drawings of metal fabrications in accordance with Section 01 33 00 – Submittals Procedure.

1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners and accessories.

2. Include erection drawings, elevations and details where applicable.

3. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths. Include data for welding materials and methods to be used.

1.06 DELIVERY, STORAGE AND HANDLING

A. Do not deliver any steel items, other than those to be encased in concrete, which have not received either a galvanized, painted or anodized surface treatment, or are constructed of stainless steel.

B. Store job site metals on blocks above snow, mud, and soil. After erection, remove any weld spatter, oil and grease. Cover items with cover that allows air movement but keeps out moisture.

PART 2 – PRODUCTS

2.01 FABRICATION, GENERAL

A. Verify dimensions on site prior to shop fabrication.

B. Fabricate items with joints neatly fitted and properly secured.

C. Fit and shop assemble in largest practical sections, for delivery to site.

D. Exposed mechanical fastenings shall be flush countersunk screws or bolts, unobtrusively located consistent with design of structure, except where specifically noted otherwise.

E. Make exposed joints flush butt type hair line joints where mechanically fastened.

F. Supply components required for proper anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, unless otherwise specified or scheduled herein.

G. Thoroughly clean surfaces of rust, scale, grease and foreign matter prior to prime painting, galvanizing, anodizing or buffing.

H. Do not shop prime surfaces to be embedded in concrete. Primer is part of paint system specified in. Galvanized surfaces to be painted may be shop primed at Contractor's option.

2.02 CORROSION PROTECTION

A. All ferrous metals except stainless steel that are not entirely embedded in concrete shall be hot-dip galvanized after fabrication. All other structural steel and miscellaneous steel items not specifically described elsewhere shall be hot-dip galvanized.

2.03 MATERIALS, GENERAL

A. Steel and Iron

1. Carbon steel shapes ASTM A36. Plates and bars: ASTM A36. Wide flange shapes: ASTM A992, Grade 50.

2. Steel pipe and tubing:

a. Pipe: ASTM A53, Grade B, Type E or S, Schedule 40 unless indicated otherwise.

b. Square or rectangular: ASTM A500, Grade C, welded and seamless.

3. Steel sheet: ASTM A366 if not galvanized, ASTM A526 if galvanized.

4. Finish: All ferrous material not encased in concrete shall be hot-dip galvanized or stainless steel.

B. Aluminum

1. Aluminum: ASTM B308, Type 6061 T6 unless a different type is called for in an individual part of this specification.

2. Finish: AA-C22-A41, Class I unless indicated otherwise.

C. Stainless steel: ASTM A 167 Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

1. Bolts: ASTM F593-95 Alloy AISI Type 316.

2. Nuts: ASTM F594-91 Alloy AISI Type 316.

2.04 FASTENERS

A. General:

1. Wet exposure. All the following are considered a wet exposure and shall be stainless steel:

a. All fasteners which are in contact with water or sewage.

b. Above open channels or tanks containing water or sewage.

c. Attached to a tank containing water or sewage.

2. Unless otherwise specified on the drawings, expansion bolts or drilled-in adhesive anchors may be substituted for cast-in anchor bolts in concrete or masonry base materials.

3. Drilled-in adhesive anchors are to use parallel tubes of resin and hardener, dispensed through a mixing tube which ensures proper mixing and eliminates any possibility of measuring errors. The mixed adhesive is to be injected directly into the hole drilled in the base material. Drill sizes and techniques are to be per manufacturer’s recommendations. No polyester or vinyl ester-based resins are to be used. Drilled holes are to be cleaned out prior to placing the adhesive.

4. An appropriate anti-seize compound, as recommended by the fastener manufacturer, shall be used on all stainless-steel threaded bolt connections to prevent galling during installation.

B. Metal to metal:

1. Steel to steel: Except wet exposure as noted above, use ASTM A325, Grade A, hex head, hot-dip galvanized. All bolts 3/8-inch diameter or larger are to be either hot-dip galvanized or stainless steel. Bolts smaller than 3/8-inch diameter may be zinc plated bolts.

2. Aluminum to aluminum: ASTM F468.

C. Metal to concrete:

1. Anchor bolts: ASTM A307, Grade A, hex head, hot-dip galvanized. All embedded anchor bolts are to be standard bolts with hex head. Do not use “J” bolts.

2. Anchor bolts, for submerged or intermittently submerged applications: Stainless steel; ANSI B 1.1 threads.

3. Expansion bolts: Meet Federal Specification FS FF-S-325, Group II, Type 4, Class 1. Material is to be stainless steel as noted under “General”, above. Manufacturer: Hilti, Kwik Bolt TZ, or equal. Equality to be determined based on allowable loads in the ICBO or ICC report for the proposed substitute.

D. Metal to wood:

1. Bolts: ASTM A307, Grade A, hex head, hot-dip galvanized, except stainless steel where noted on drawings.

2. Lag screws: FS FF-B-561, hot-dip galvanized coated for steel, stainless steel for all other.

E. Metal to hollow construction: Toggle bolts, FS FF-B-588, (hot-dip galvanized).

F. Powder-actuated fasteners: To be used where called for on the drawings. Galvanized for steel; stainless steel for all other.

G. Washers: Provide washers of the same material and finish as the bolt or lag bolt in the following locations:

1. Under all nuts.

2. Under bolt heads except in steel-to-steel connections.

H. Lock washers: Provide spring steel helical lock washers, of the same finish as the bolt, under nuts and bolt heads of connections subject to vibration.

2.05 WELDING

A. Perform welding in accordance with pertinent recommendations of the American Welding Society. Use electrodes and methods recommended by manufacturer of material being welded, or as shown on the drawings. Type, size and spacing of welds in accordance with reviewed shop drawings.

1. Welding shall be done by operators who have been qualified by tests as prescribed in the AWS in “Standard Qualification Procedure” to perform the type of work required. The quality of welding shall conform to AWS “Code for Arc Welding in Building Construction,” Section 4 Workmanship.

B. Welds behind finished surfaces: Use methods to minimize distortion and discoloration of finished surface.

C. Remove flux and slag from both sides of welds.

D. Grind accessible welds smooth.

E. Buff or polish welded surfaces which will be exposed to view in the finished work to match and blend with adjacent parent material.

F. Complete welding before galvanizing, anodizing or painting.

2.06 GALVANIZING REPAIR PAINT

A. High zinc dust content paint, meeting the requirements of SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

B. Surface Treatment – Shop Applied

1. Galvanized surfaces: Galvanize steel surfaces in accordance with ASTM A123, A386 and A526.

2. Steel Surfaces

a. Paint in accordance with paint system in Section 09 90 00 – Painting and Coating.

b. If fabricator uses different primer, it must be compatible with finish coating specified in Section 09 90 00 – Painting and Coating.

C. Surface Treatment – Field Applied

1. Cutting or drilling in the field will not be allowed unless it has been approved by the Engineer.

2. Galvanized surfaces: Items that must be drilled or cut in the field shall be coated with galvanizing repair paint before installation. Field welded items shall be hot-stick galvanized after welding.

3. Painted surfaces: Damaged shop primed surfaces and all field priming and finish painting shall be done as specified in Section 09 90 00 – Painting and Coating.

2.07 HANGER SYSTEMS

A. All hanger systems on this project are to be as manufactured by Unistrut Corporation standard shapes and accessories or approved equal. All such shapes and accessories must conform to the same ASTM specifications as the standard Unistrut items. See drawings for particular configurations and sizes.

B. It is the responsibility of the particular trade using this system as support to determine the appropriate units and attachments and accessories required for the proper completion of their work. Attachment to the building structure, however, shall be limited to that shown on the drawings. Additional ceiling penetrations or other attachment must have prior approval of the Engineer. See Division 07 – Thermal and Moisture Protection for sealant around ceiling penetrations.

C. All channel shapes shall be hot-dipped galvanized in accordance with ASTM A-123 or A-153. All parts, screws and nuts shall be hot dip galvanized or stainless steel.

D. Refer to Division 40 – Process Interconnections and the Plans for pipe support requirements and specifications.

2.08 ALUMINUM LADDERS

A. All ladders shall conform to IBC and OSHA/WISHA standards. See Plans for standard details, types and locations.

B. Submit shop drawings and product data on all ladders prior to fabrication.

C. Manufacturers: UPNOVR Inc./ACL Industries, Model U-505, Aluminum Ship's Ladder Folding Type with rail extension for mezzanine access, or Engineer approved equal.

D. Materials: Folding type aluminum ship's ladder for hatch and mezzanine access shall have the following design features and material properties:

1. Operation: Folding ladder to store against wall with stringers in vertical position. Top of ladder to pivot with sliding hinge assembly with pin to move ladder to inclined position.

2. Stringers (Siderails): Aluminum channel 3-inch X 1-inch, with non-skid rubber feet at bottom of stringers.

3. Treads: Aluminum 1-1/4-inch square tubing double rung with corrugated surfaces, 2-foot-0-inch wide.

4. Top Mounting Bracket: Fabricated from 3-inch x 1/4-inch aluminum plate.

5. Handrail: 1-1/4-inch aluminum pipe.

6. Height: Reference Plans.

7. Angle of Inclination: 75 degrees.

8. Finish: Mill finish aluminum.

E. Fabrication: Ladders shall be completely fabricated ready for installation before shipment to the site. Handrail components are completely fabricated ready for field assembly to the ladder before shipment to the site.

2.09 METAL STAIR TREADS

A. Bar grating stair treads are to be manufactured by McNichols Company, Model GW with Type B checker plate nosing. Equivalent products are acceptable with Engineer's approval.

B. Stair treads are to be pre-manufactured treads designed to support a 300-pound concentrated load or 100 psf.

C. Tread Size:

1. Height: 2 inches.

2. Depth: Nominal 12 inches.

3. Width: See stair details on Plans.

D. Construction:

1. Bearing Bar Thickness: 3/16 inch.

2. Bearing Bar Spacing: 1 3/16 inch.

3. Cross Bar Spacing: 4 inches.

4. Surface Texture: Smooth.

5. Nosing: Checkered.

6. Finish: Mill finish aluminum.

E. Fasten stair treads to carriages with bolts or welds as recommended by the manufacturer to support the loads listed above.

F. All stair treads for the project are to be the same style, and be from the same manufacturer.

PART 3 – EXECUTION

3.01 INSPECTION

A. Installer must examine the areas and conditions under which miscellaneous metal items are to be installed and notify the Contractor in writing of conditions detrimental to the timely and proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner satisfactory to the installer.

3.02 PREPARATION

A. Furnish setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors which are to be embedded in concrete or masonry. Coordinate delivery of such items to project site.

3.03 ERECTION

A. Obtain Engineer's written permission prior to on-site cutting, welding, or making other adjustments which are not part of scheduled work.

B. Install items square and level, accurately fitted and free from distortion or defects.

C. Make provision for erection stresses by temporary bracing. Keep work in alignment.

D. Replace items damaged in course of installation.

E. Grouting (see Section 03 30 00 – Cast-In-Place Concrete).

F. After installation, touch up scratched and damaged prime painted and galvanized surfaces.

1. Use same primer as used for shop priming of painted surfaces.

2. Use galvanizing repair paint for galvanized surfaces. Use hot-stick galvanizing for field-welded areas, and for damaged areas that are classified as a “wet use” above at Section 2.04 A. 1.

3.04 LADDER INSTALLATION

A. Install ladders in accordance with the manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive accessory units, roof insulation, roofing and flashing, as required, to ensure that each element of the Work performs properly.

B. Clean exposed metal surfaces according to Manufacturer's instructions. Touch up damaged metal coatings.

END OF SECTION 05 50 11

SECTION 05 52 11 – ALUMINUM RAILINGS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work consists of furnishing all labor, materials, and equipment for the installation of non-welded aluminum guardrails and handrails.

B. Railings as used in this section shall include handrails at stairways, and guardrails as required by the International Building Code and Washington Industrial Safety and Health Act (WISHA) regulations. All guardrails and handrails shall meet the requirements of the International Building Code (IBC), Section 509, and OSHA. Guardrails and handrails as required by IBC and WISHA shall be furnished and installed at no additional cost whether or not they are explicitly shown on the Plans.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 03 30 00 – Cast-In-Place Concrete

C. Section 05 50 11 – Miscellaneous Metals

1.03 REFERENCE STANDARDS

A. International Building Code, 2021 Edition.

B. Washington Industrial Safety and Health Act (WISHA).

C. American National Standards Institute (ANSI).

1. A21.1 Safety Requirements for Floor and Wall Openings, Railings and Toe Boards.

D. American Society for Testing and Materials (ASTM).

1. B 221 Specifications for Aluminum-Alloy Bars, Rods, Wires, Shapes and Tubes.

2. B 429 Specifications for Aluminum-Alloy Extruded Structural Pipe and Tube.

E. Aluminum Association (AA).

1. SAA-46 Standards for Anodized Architectural Aluminum.

F. National Association of Architectural Metal Manufacturers (NAAMM).

1. Pipe Railing Manual - ANSI/NAAMM AMP 521-95.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Product data:

1. Submit manufacturer's technical product data, installation instructions. Include highlighted data substantiating that materials comply with requirements.

C. Shop Drawings: Submit drawings for fabrication and installation of aluminum railing system.

1. Indicate component details, materials, finishes, connection and joining methods, and the relationship to adjoining work.

D. Furnish (1) sample of the following:

1. Extruded aluminum pipe.

2. Extruded aluminum toe board.

E. Test Reports: Specifying that all products comply with performance requirements specified within this section.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Components and installation are to be in compliance with state and local code authorities.

2. Components and installation are to follow current ADA and ANSI guidelines.

B. Single Source: All components and fittings are to be furnished by the same manufacturer or approved by the primary component manufacturer.

1.06 DELIVERY, HANDLING AND STORAGE

A. Deliver materials to the job site in good condition and properly protected against damage to finished surfaces.

B. Store material in a location and in a manner to avoid damage. Stacking shall be done in a way that will prevent bending.

C. Store material in a clean, dry location away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.

D. Keep handling on-site to a minimum. Exercise particular care to avoid damage to finishes of material.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with the requirements of these specifications, products by one of the following manufacturers is acceptable:

1. Golden Railings, Inc., 720 Corporate Circle Suite J, Golden, CO 80401-5626; Phone: (303) 279-5807: Fax: (303) 279-6214: www.goldrail.com.

2. AlumaGuard Corporation, 2250 S Lipan St., Denver, CO 80223; Phone: (303) 935-7245: Fax: (303) 937-0823: www.alumaguard.com.

3. Superior Aluminum Products, Inc., 555 E. Main St., Russia, OH, 45363; Phone: (800) 548-8656; Fax: (937) 526-3904: www.superioraluminum.com.

4. Thompson Fabricating, LLC, 1411 Commerce Place, Tarrant, AL 35217, Phone: (800) 824-6182: Fax: (205) 841-0822: www.tfco.com.

2.02 STRUCTURAL REQUIREMENTS

A. Design handrails and guardrails to withstand a 200-pound concentrated load applied horizontally or vertically at any point along the rail. This concentrated load is to be applied non-concurrently with any other load. Design guardrails to withstand a 20 pound/foot uniformly distributed load applied horizontally at the top rail. Design intermediate rails to withstand a load of 20 pounds per linear foot applied horizontally along the rail and a 50-pound concentrated load applied horizontally at any location along the rail. This concentrated load need not be combined with any other load. Design for the above loads or for the loads specified in the International Building Code, whichever is greater.

2.03 DIMENSIONAL REQUIREMENTS

A. Guardrails shall be 42 inches high, and Handrails shall be 34 inches high as measured from the front top of the stair tread. Guardrails shall have a maximum post spacing of 5 feet; and handrails 5 feet.

B. Each guardrail is to be constructed with intermediate railings such that a 12-inch sphere cannot pass through any opening in the rail assembly, including the opening between the bottom rail and the solid surface to which the rail is attached. This requirement shall also apply to handrails where the height difference between the walking surface of the stair and surfaces below to which a person could fall exceeds 30 inches.

C. A toe board shall be attached continuously to the bottom of the guardrail assembly where shown on the Plans or required by OSHA regulations. The spacing between the toe board and the solid surface beneath shall be 1/4-inch or the minimum required by OSHA regulations, whichever is less.

D. Railings shall be smooth and free from defects or variations in finish which would cause scrapes or injury to persons brushing or sliding along the railing surface.

E. Changes in direction shall be done with a radius corner, not a mitered corner. Radius corners shall fall between a 4-inch minimum and 8-inch maximum, measured from the centerline of the pipe.

F. In long linear runs of railings, an expansion joint shall be provided at least every 50 feet of run to prevent buckling of railings.

G. Adjust railing prior to anchoring to ensure matching alignment at butting joints. All bolts fastening guardrails are to be straight and be placed so that they are perpendicular to the substrate surface.

H. Vertical opening (gaps) between walls, other rails and equipment shall be 1-1/2 inches minimum and 3 inches maximum.

2.04 MATERIALS AND FINISH

A. Aluminum:

1. Extruded Pipe: Alloy 6063-T6 or 6105-T5 meeting with ASTM B 221 or ASTM B 429.

2. Solid Reinforcing Bars: Alloy 6061-T6 meeting ASTM B 221.

3. Extruded Bars and Shapes: Alloy 6063-T6 meeting ASTM B 221.

4. Castings: Almag 35 meeting ASTM B 26.

5. Extruded Toe Board: Alloy 6063-T6 meeting ASTM B 221.

6. Finish: Class I (0.7 mil. minimum), clear anodized (refer to NAAMM Metal Finishes Manual).

2.05 RAILING SYSTEM

A. Material shall conform to 2.02 A, and be finished in accordance with 2.04 A. 6.

B. Railing system shall be permanently anchored except where shown as removable on the Plans.

C. Rails and Posts:

1. Rails: Fabricate from anodized aluminum, 6063-T6 pipe with nominal size of 1-1/2 inches (1.900 inches outside diameter), Schedule 40 (0.145-inch wall, minimum).

2. Posts: Fabricate from anodized aluminum, 6063-T6 or 6105-T5 pipe with nominal size of 1-1/2 inches (1.90 inches outside diameter, 1.50 inside diameter), Schedule 40 (0.145-inch wall, minimum) or 80 (0.20 inch wall, minimum).

a. Provide post reinforcement consisting of solid aluminum reinforcing bar if required to meet structural requirements specified above.

D. Fittings:

1. Fittings shall be of wrought material of aluminum. Tee-fittings and elbows, which are fabricated from more than one piece, shall be of welded construction with no weld marks visible when the fitting is installed.

E. Connector Sleeves:

1. Internal connector sleeves shall be of extruded aluminum.

F. Mounting Flanges:

1. Floor Flanges:

a. One piece cast aluminum.

b. Two (2) 3/8-inch diameter stainless steel set screws.

c. Two (2) minimum holes for attachment.

2. Heavy Duty Floor Flange:

a. One (1) piece cast aluminum with a solid aluminum-reinforcing bar.

b. Two (2) 3/8-inch diameter stainless steel set screws.

c. Four (4) holes for attachment.

3. Side Mount Flanges:

a. Aluminum with a solid aluminum-reinforcing bar.

b. One piece.

c. Two (2) 3/8-inch diameter stainless steel set screws.

d. Four (4) holes for attachment.

4. Wall Flange:

a. One (1) piece cast aluminum.

b. One (1) 3/8-inch diameter stainless steel set screw.

G. Toe Board:

1. Toe Board shall be of extruded aluminum; equal to BLUM No. 6446. Toe boards shall have at least one continuous horizontal stiffening web. Flat bar toe boards will not be accepted.

2.06 FASTENERS

A. Mechanical fasteners are to be provided as required by the manufacturer. All fasteners shall be either aluminum or stainless steel.

1. Machine screws used to mount flanges to stair stringers shall be of stainless steel, 3/8-inch diameter.

B. Adhesive: Scotch-Weld epoxy adhesive, Catalog No 3M EC-2216 B/A Clear Amber, or approved equal.

C. Cement Hydraulic, ASTM C 595, factory prepared with accelerator.

2.07 HANDRAIL BRACKETS

A. Aluminum extruded.

2.08 FABRICATION

A. Form rail-to-end post connections and all changes in rail direction by radius elbows, not a mitered corner. Radius corners shall fall between a 4-inch minimum and an 8-inch maximum, measured from the centerline of the pipe.

B. Cut material square and remove burrs from all exposed edges, with no chamfer.

C. Make exposed joints butt tight and flush.

D. Close exposed ends of pipe by use of appropriate end cap.

E. Locate intermediate rails as shown on the Plans.

F. Verify dimensions on-site prior to shop fabrication.

G. All edges, imperfections and fasteners such as rivets shall be completely flush with tubing surface in order to avoid any edges that could inflict injury on an operator or catch an article of clothing. Any raised portions of fasteners shall be entirely removed and reinstalled properly and edges properly connected.

PART 3 – EXECUTION

3.01 DISSIMILAR METALS

A. When aluminum components come into contact with dissimilar metals, surfaces shall be kept from direct contact by painting the dissimilar metal with a heavy coat of a proper primer.

B. When aluminum components come into contact with cement or lime mortar, exposed aluminum surfaces shall be painted with heavy bodied bituminous paint.

3.02 INSTALLATION

A. Install in accordance with shop drawings and manufacturer's instructions.

B. Erect work square and level, horizontal or parallel to rake of steps or ramp, and free from distortion or defects detrimental to appearance or performance.

C. Expansion joints shall be provided as specified herein to allow for thermal expansion or contraction.

3.03 CLEANING

A. As installation is completed, wash thoroughly using clean water and soap; rinse with clean water.

B. Do not use acid solution, steel wool or other harsh abrasives.

C. If stain remains after washing, remove finish and restore in accordance with NAAMM Metal Finishes Manual. Finish must be removed from anodized aluminum. Re-anodizing can only be done by removing railing and returning it to the anodizer.

3.04 REPAIR OF DEFECTIVE WORK

A. Remove stained or otherwise defective work and replace with material that meets specification requirements.

END OF SECTION 05 52 11

SECTION 05 53 11 – ALUMINUM GRATINGS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work consists of furnishing all labor, materials and equipment for the fabrication and installation of all aluminum gratings, including banding, hold-down clips, shown on the Plans, and specified herein.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 03 30 00 – Cast-In-Place Concrete

C. Section 05 50 11 – Miscellaneous Metals

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. B 221 Specifications for Aluminum-Alloy Bars, Rods, Wires, Shapes and Tubes.

2. B 429 Specifications for Aluminum-Alloy Extruded Structural Pipe and Tube.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Product data:

1. Gratings: Submit materials, sizes, and banding techniques.

2. Hold-down devices. Submit type of hold-down device to be used, and the means of fastening the hold-down devices to the underlying structure.

C. Shop Drawings:

1. Submit shop drawings showing layouts of gratings, provisions for removable gratings where called for in the Plans and as specified herein. Show details of how hold-down devices are to be attached to the gratings and the underlying structure.

D. Informational Data:

1. Design Data: Submit certification that the gratings meet the design requirements shown on the Plans and specified herein.

2. Manufacturer's instructions. Submit copies of manufacturer’s instructions for installation of gratings.

1.05 QUALITY ASSURANCE

A. Single-Source: All aluminum gratings are to be obtained from one manufacturer, and shall be of a single style.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with the requirements of these specifications, products by one of the following manufacturers is acceptable:

1. McNichols Co., P.O. Box 30300, Tampa, FL 33630; Toll Free: (800) 237-3820; www.mcnichols.com.

2. Ohio Gratings, Inc., 5299 Southway SW, Canton, OH 44706; Toll Free: (800) 321-9800; Phone: (330) 477-6707; Fax: (330) 477-7872; www.ohiogratings.com.

3. Alabama Metal Industries Corporation, 3245 Fayette Avenue, Birmingham, AL 35208; Toll Free: (800) 366-2642; Fax: (205) 780-7838; www.amico-grating.com.

2.02 PRODUCT REQUIREMENTS

A. All aluminum gratings are to be swaged rectangular bearing bar gratings or “I” shaped section gratings with cross bars.

B. Bearing bars: Bearing bar spacing shall 1-3/16 inches on center, with a minimum bar thickness of 3/16 inches. See schedule on the Plans for the size to use for a specific grating span. Bearing bars are to bear a minimum of 1 inch on supporting structure.

C. Cross bars: Cross bar spacing shall be 4 inches on center, with a minimum bar thickness of 3/16 inches. Cross bars may be square, round, or rectangular. Cross bar connection to bearing bars may be pressure fit, swaged, or welded, or other means provided the bars are permanently attached and do not loosen with time.

D. All gratings shall be designed to support a minimum uniformly distributed load of 100 psf, or a concentrated load at any point of 300 pounds distributed over 12 inches square. Live load deflection shall be limited to 1/180th of the span when subjected to the concentrated load of 300 pounds placed at mid span.

E. Gratings shall be manufactured to lie flat, forming a continuous flat surface with the surrounding walking surface. Gratings shall not protrude above the surrounding walking surface. Gratings having more than a 1/4-inch warp in 6 feet will be considered unacceptable. Gratings which rock when walked on are unacceptable.

F. Openings to be grated shall be field measured prior to making shop drawings and fabricating gratings.

G. Cut-outs shall be end banded. Bearing bars shall be continuously banded at ends.

H. Banding over support shall be welded to bearing bars with full height 1/8-inch fillet to edge bearing bars. Banding at cut-outs shall be welded with full height 1/8-inch fillet to all bearing bars. All cross bars shall be tack welded to the bearing bars at the edge of each grating panel and to the bearing bars at the edge of cut-outs.

I. All gratings shall be fastened to supporting surfaces with hold-down devices such as saddle clips, or Z clips. All grating hold-down devices are to be Type 316 stainless steel, and be approved by the Engineer.

J. Gratings over operable gates and weirs shall be fabricated in sections small enough to be easily handled by one person (40 pounds or less per section).

K. Long runs of gratings shall be fabricated in sections of a size such that the greatest dimension is 12 feet, 0 inches or less.

L. Gratings shall be provided with corrugated angle nosing at edge facing upcoming stair assemblies.

2.03 MATERIALS

A. Gratings to be fabricated from aluminum bars or aluminum extrusions. Aluminum for bearing bars shall be Alloy 6061 T6, and for cross bars Alloy 6063 T6.

B. Hold-down devices to be 316 stainless steel. Fasteners for hold-down devices to be 316 stainless steel.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances and method of attachment with other work. All work is to be laid out using field determined dimensions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and as specified herein.

3.03 ADJUSTING, CLEANING AND PROTECTION

A. Remove construction debris from project site and legally dispose of debris.

B. Gratings shall be left in a clean, non-stained condition at the end of the project.

END OF SECTION 05 53 11

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

SECTION 06 10 00 – ROUGH CARPENTRY

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered by this section consists of furnishing and installing rough carpentry as shown on the Plans and as specified herein.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 05 50 11 – Miscellaneous Metals

C. Section 07 21 00 – Thermal Insulation

D. Section 07 41 11 – Metal Roof and Wall Panels

E. Section 07 62 00 – Sheet Metal Flashing and Trim

F. Section 13 34 19 – Pre-Engineered Metal Building System

1.03 REFERENCE STANDARDS

A. Rough carpentry shall conform to International Building Code (IBC), latest edition, and other referenced codes and standards of governing authorities. In case of conflict between any codes and standards and this section, the more stringent shall govern.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Manufacturers' catalog cuts showing rough hardware conforming to or equivalent to hardware shown shall be submitted to the Engineer for review.

C. Shop Drawings and Certificates of Compliance shall be submitted wherever specifically called for herein.

D. Wood Treatment data from chemical treatment Manufacturer. Include chemical treatment Manufacturer’s instructions for handling, storing, installing, and finishing treated material.

1. Fire-Retardant Treatment: Include certification by treating plant that treated wood complies with specified requirements.

2. Warranty: Include warranty of chemical treatment Manufacturer for each type of treatment.

PART 2 – PRODUCTS

2.01 LUMBER

A. All lumber, unless otherwise noted, shall be legibly trade- and grade-marked, kiln-dried S4S, Douglas Fir/Larch conforming to the Western Wood Products Association grading rules. Moisture content of lumber shall be 16 percent or less at time of installation.

2.02 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.

2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

4. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841. For enclosed roof framing, framing in attic spaces, and where high temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.

a. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

b. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

5. Application: Treat all rough carpentry, including the following:

a. Concealed blocking.
b. Roof construction.
c. Plywood backing panels.

2.03 PLYWOOD

A. All plywood, unless otherwise noted, shall be identified with grade marks of the American Plywood Association (APA) and shall meet the requirements of the U.S. Product Standard PS-183 for softwood plywood. All plywood shall be constructed with exterior glues.

B. Plywood for roof sheathing shall be Exposure 1, CDX.

C. Plywood for interior walls exposed to view shall be APA rated AC. Screws shall be hot-dip galvanized.

D. All other plywood not exposed to view may be oriented strand particle board of the same thickness and structural rating as the plywood called out on the Plans.

2.04 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, AC, Exposure 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.05 ROUGH HARDWARE

A. The term "rough hardware" includes bolts, nails, lag screws, washers, plates, and similar items employed in erection and construction of rough work. Bolt anchorages embedded in concrete shall be provided as shown and required to complete work, including installation of such items furnished under other sections of these Specifications. Standard product rough hardware shall be of standard manufacture approved by a recognized agency for loads as shown. Hardware shall be steel of thickness shown. Rough hardware shall be hot-dip galvanized after fabrication.

2.06 FASTENERS

A. Nails called out on the Plans are to be common wire nails unless otherwise specified or shown. Nails shall be galvanized or stainless steel as appropriate where exposed to weather. Nails used for exterior plywood (exposed to view) shall be stainless steel.

B. Screws shall conform to UBC Standard 23-17 and shall be galvanized where exposed to weather.

C. Bolts and nuts shall conform to ASTM A307, sizes as indicated on the Plans, galvanized where exposed to weather.

D. Plyclips shall be extruded 6063-T6 aluminum alloy.

2.07 TREATED LUMBER

A. Kiln Drying: Kiln-dry lumber shall be treated with water-borne preservative and have a maximum moisture content of 15 percent after treatment.

B. Pressure Treated Lumber: All wooden nailing blocks, sills, and plates resting on or embedded in concrete or masonry within 18 inches of grade shall be pressure-treated in accordance with American Wood Preservers' Association Manual of Recommended Practice. Preservatives shall conform to those specified in the standard. Each piece of treated lumber shall have approval mark of approved testing agency. Creosote shall not be used.

C. Cuts: Wherever necessary to cut, notch, dap drill, or frame treated lumber, newly cut or bored surfaces shall be treated with two heavy coats of the same preservative used in original treatment, minimum ¼ inch depth of penetration.

2.08 MISCELLANEOUS MATERIALS

A. Sill Sealer Gaskets: See Section 07 21 00 – Thermal Insulation for material specifications.

PART 3 – EXECUTION

3.01 CARPENTRY

A. Framing: Framing members and assemblies shall be set accurately to required lines and level, and to arrangements shown. Framing shall be accurately and neatly cut and strongly nailed, spiked, or otherwise secured in place in a workmanlike manner. Use joist hangers or framing clips at all joist or rafter connections to other framing members. Structural wood framing members shall not be spliced between bearing points or supports. Approval shall be secured from the Engineer before cutting of any wood members that may weaken structure. All blocking and backing in walls and ceilings shall be 2 x material with depth as needed and shall be accurately located around light fixtures, ceiling registers, grilles, and other required mechanical and electrical items. Backing shall be accurately located and installed for all building specialties and finish hardware items as required. Due care shall be exercised in placing framing so that structural and other important members do not require cutting for openings, pipes, vents, conduits, or ducts. Bearing surfaces on which wood structural member are to rest shall be finished to give full, true, and even support. Wedges or shims shall not be used to correct faulty work. Wood members which have been split or otherwise damaged to such an extent as to materially impair their strength shall be removed and replaced at no additional cost to the Owner.

B. Nailing: Nails shall not be driven closer together than 1/2 their length unless driven in drilled holes, nor closer to edge of member than 1/4 its length. Holes drilled slightly smaller than nail diameters shall be used when necessary to prevent splitting. The nails shall penetrate second or farther member not less than 1/2 of the length of nail. Common nails shall be used unless otherwise specified or shown. Staples may be used to fasten plywood to framing provided Contractor has previously provided the Engineer with product data showing that the stapling proposed will be structurally equivalent to the nailing called for.

C. Bolts and Nuts: Malleable or cut steel washers shall be provided under heads and nuts except where bearing on steel plates or other steel attachments, or where flat-head countersunk bolts are shown. Members shall be clamped together and bore holes shall be the same diameter as bolts, true to line. Bolts shall be driven in place and nuts drawn up tightly. Bolts shall be drawn tight again immediately prior to enclosing with finish or, if left exposed, upon completion of other work. Holes at anchor bolts embedded in concrete may be 1/8-inch larger than bolt diameter.

D. Screws: Lag and wood screws shall be screwed (not driven) into pre-drilled pilot holes. Pilot holes shall be bored first of the same diameter and depth as shank, then continued to depth equal to length of screw with diameter equal to base of the thread. Screws shall penetrate a distance equal to at least seven times the diameter of the screw shank into far members. Washers shall be installed under each lag screw head bearing on wood.

E. Plywood Sheathing: Plywood sheathing shall be installed with face grain across supports, end joints over joists and staggered, and blocking, if shown, shall be provided at unsupported edges. Arrange panels to avoid widths less than 2 feet 0 inches.

F. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

END OF SECTION 06 10 00

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 07 21 00 – THERMAL INSULATION

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish all labor, materials, and equipment for the installation of insulation at building structure exterior walls, ceiling, and foundation walls.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 03 30 00 – Cast-In-Place Concrete

C. Section 13 34 19 – Pre-Engineered Metal Building System

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. C272 – Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions.

2. C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

3. C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

4. C991 – Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings.

5. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

6. D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

7. D4397 – Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.

8. E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

9. E 96 - Standard Test Method for Water Vapor Transmission of Materials in Sheet Form (Procedure A).

B. Federal Specifications (FS)

1. HH-I-521F Insulation Blankets, Thermal (mineral fiber, for ambient temperatures).

C. National Fire Protection Association (NFPA)

1. NFPA 701 – Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. Underwriters Laboratories (UL)

1. UH 723 – Test for Surface Burning Characteristics of Building Materials

E. Washington State Energy Code (WESC), 2021

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Product Data: Provide manufacturer's technical product data for each of the products specified and/or used on the project including, but not necessarily limited to:

1. Roof installation instructions.
2. Wall installation instructions.
3. Product data sheet.
4. Design considerations guide.

C. Provide shop drawings that indicate the following:

1. Liner fabric layout.
2. Insulation layout and cut list.
3. Customer and project information.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Companies shall be familiar with the installation practices associated with banded liner systems.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Furnish material in manufacturer's packaging, complete with installation instructions.

B. Store products indoors or in dry a dry, covered location. Do not open products until ready to use. Protect products from potential construction site damage. Use care when opening products as pallets may shift during shipment.

C. Banding has sharp edges. Wear cut-proof gloves when handling. Wear safety glasses when unpacking materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with specified requirements, provide insulation provided by one of the following, or approved equal:

Silvercote, LLC
Therm-All, Inc.

2.02 INSULATING MATERIAL

A. Dual Layer Unfaced Mineral Fiber Blanket/Batt Insulation – Pre-Engineered Metal Building:

1. Dual layer blanket insulation shall be used to insulate the pre-engineered metal building, installed between the outside building wall sheeting and the support members (purlins and girts). The nominal size of the innermost layer shall be equal to the height of associated purlins or girts. Length and width shall be suitable for installation in pre-engineered metal buildings per insulation manufacturer's installation instructions.

2. Thermal and acoustical insulation produced by combining glass fibers with thermosetting resins to comply with ASTM C991 for Type I (blankets without membrane facing).

3. Combustion Characteristics: Passes ASTM E136 test.

4. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively. Tested in accordance with NFPA 255, UL 723, and/or ASTM E84.

5. Insulation is to have an integral vapor barrier built-in or Contractor is to provide a separate, continuous vapor barrier of at least 6 mil thickness at all insulated spaces. See part 2.02 VAPOR BARRIERS for further detail.

6. Thermal resistance: Thermal resistance requirements shall comply with the Washington State Energy Code for Commercial Buildings (2021 or latest edition) thermal envelope requirements. Minimum requirements for metal buildings with slab-on-grade floors are as follows unless otherwise shown on the Plans:

   a. Roofs: R-25 + R-22 liner system, plus a R-3.5 thermal block at Purlins and/or a maximum U-factor of 0.031.

   b. Walls: R-25 cavity + R-10 faced perforated overlay continuous insulation and/or a maximum U-factor of 0.050.

   c. Floors: R-10.

B. Sill Seal Gasket

1. Shall be FoamSealR manufactured by Owens Corning or approved equal.

2. Thickness: 1/4-inch.

3. Width: To suit sill member site(s) indicated.

2.03 VAPOR BARRIERS

A. Polyethylene Vapor Barrier (fabric liner facing) complies with the following

1. ASTM C1136 Type III through VI, minimum 6 mils thick.

2. Perm Rating: Maximum of 0.033 perm when tested in accordance with ASTM E96.

3. Surface Burning Characteristics: Flame Spread Index of 0 and Smoke Developed Index less that 50 when tested in accordance with ASTM E84.

B. Vapor Barrier Adhesive: Application temperature of 0 to 110 degrees F.

C. Double-Sided Vapor Barrier Tape: Pressure-sensitive tape of type recommended by vapor barrier manufacturer for sealing joints and penetrations in vapor barrier.

D. Patch Tape: one-sided adhesive tape, width of three (3) inches. Installation temperature of 0 to 110 degrees F.

E. Metal Banding: Coated steel, width of one (1) inch. Structural steel Grade 50 per ASTM C635, exposed color to match vapor barrier.

2.04 AUXILIARY INSULATING MATERIALS

A. Thermal Spacer Blocks: Extruded or Expanded polystyrene. Width of 3 inches, and thickness of 1/2 inch to 1 inch, with a minimum R value to comply with WSEC.

B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrate indicated without damaging insulation and substrate.

C. Insulation Fasteners: As required for each application and as recommended by manufacturer for each specific installation.

D. Joint Tape: Closed cell vinyl foam tape for wall applications. Thickness 1/8 to 3/8 inch, and width of 3 inches.

E. Insulation Hangers: Insul-hold insulation hangers or approved equal.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with installer present, for compliance with requirements of section in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Do not install system outside of the temperature, humidity, ventilation, and environmental limits recommended by the manufacturer. Products should be kept covered and dry at temperatures less than 100 degrees Fahrenheit (F) prior to installation. Do not proceed with installation until unsatisfactory conditions are corrected or improved.

3.02 PREPARATION

A. Clean substrate of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

B. Clean dirt from vapor barrier fabric using a soft cloth with soap and water or non-abrasive household cleaner. Solvent-based cleaners and abrasive pads shall be avoided.

3.03 GENERAL INSTALLATION

A. Install in accordance with manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelope entire area to be installed. Cut and fit tightly around obstruction and fill voids with insulation. Remove projections that interfere with placement.

D. Apply each required layer of insulation to produce thickness indicated.

3.04 INSTALLATION OF PERIMETER/FOUNDATION AND UNDER-SLAB INSULATION

A. On vertical surfaces, set units in adhesive applied according to manufacturer’s written instructions. Use adhesive recommended by insulation manufacturer.

B. Protect top surface of horizontal insulation from damage during concrete work.

3.05 INSTALLATION BLANKET INSULATION

A. Unfaced Thermal and Acoustical Wall Batts: Install by friction-fit method except as otherwise required for support of units. Cut, cope and shape units as required at obstructions to provide most effective wall insulation envelope reasonably achievable.

B. Install all metal building walls to form full closure with roof insulation or roof deck. Place insulation into concealed corners and similar areas while areas are still accessible, whether or not such placement requires special sequencing of work.

C. At roof spaces: Install blanket insulation by placing blankets within cavities parallel to purlins, and perpendicular over the framing members. Butt insulation tightly to adjacent blankets at sides and ends. Consult insulation manufacturer’s installation instructions.

1. Thermal Spacer Blocks: to comply with WSEC for Commercial Buildings, include a thermal spacer block of R-value = 3.5. Install per building manufacturer’s recommendations.

D. At walls: Install blanket insulation by friction-fit method between framing cavities and screwing continuous insulation blankets into framing. Butt insulation tightly to adjacent blankets at sides and ends. Consult insulation manufacturer’s installation instructions.

E. Install insulation in full thickness of purlin or girt space with minimum R-value as shown on the Plans or specified herein.

F. Vapor barrier is to be installed on the warm side of the space insulated

1. Extend insulation in thickness indicated to envelop entire area to be insulated. Remove projections that interfere with placement

3.06 INSTALLATION OF VAPOR RETARDERS

A. General: Extend vapor retarder to extremities of areas to be protected for vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping not less than 2 wall studs. Fasten vapor retarders to framing at top, end and bottom edges, at perimeter of wall openings and at lap joints. Space fasteners 16 inches o.c.

C. Seal overlapping joints in vapor retarders with adhesive or vapor-retarder tape according to vapor retarder manufacturer's instructions. Seal butt joints and fastener penetrations with vapor-retarder tape. Locate all joints over framing members or other solid substrate.

D. Firmly attach vapor retarders to substrate with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.

E. Seal joints caused by pipes, conduits, electrical boxes and similar items penetrating vapor retarders with vapor-retarder tape or another layer of vapor retarder.

F. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

3.07 PROTECTION

A. General: Protect installed insulation and vapor retarders from damage due to harmful weather exposure, physical abuse and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 41 11 – METAL ROOF AND WALL PANELS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work includes, but is not necessarily limited to, furnishing all labor, materials and equipment for the installation of manufactured metal roof, and wall panels as shown on the Plans.

B. Provide and install pre-formed pre-finished steel roof and wall panels as a part of pre-engineered metal building.

C. This section shall be used as a reference section to ensure minimum standards for materials specified in Section 13 34 19 - Pre-Engineered Metal Building System, and shall not be bid as a separate contract. All roof and wall panels for pre-engineered metal buildings specified in Section 13 34 19 - Pre-Engineered Metal Building System, are to comply with this specification.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 78 00 – Operation and Maintenance Manuals

C. Section 07 62 00 – Sheet Metal Flashing and Trim

D. Section 13 34 19 – Pre-Engineered Metal Building System

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

2. A792 – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

3. A924 – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

4. D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

5. D522 – Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.

6. D968 – Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.

7. D2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.

8. D2247 – Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.

9. D4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

10. D4587 – Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Product Data: Submit manufacturer's technical product data, installation instructions and recommendations for each type of roofing and siding requirements. Include highlighted data substantiating that materials comply with requirements.

C. Shop Drawings: Submit complete shop drawings detailing roof and wall panel layouts, trim installation, and panel attachments. Shop drawings shall also include details of all perimeter and joint flashings that comply with the manufacturer's standard recommendations. Describe all proposed details that deviate from what is shown on the plans. Include details to allow for expansion and contraction.

D. Samples:

1. Prior to ordering products, submit manufacturer's standard color samples for Engineer's selection.

2. Prior to starting work, submit the following:

a. Roof and Wall Panels: (2) 12-inch-long panel samples showing shape and the representative color as approved by the Engineer.

E. Informational Data:

1. Test Reports: Specifying that all products comply with performance requirements specified within this section,

2. Certifications specified in the following Quality Assurance article.

3. Qualification Data: Manufacturer's, engineer's and installer's qualification data.

4. Manufacturer's instructions.

F. Submit the following closeout data in accordance with Section 01 78 00 – Operation and Maintenance Manuals:

1. Maintenance Data.

2. Warranty: Submit specified warranties.

1.05 QUALITY ASSURANCE

A. Single-Source: Obtain roof and wall panels from one manufacturer.

B. Installers Qualifications: Installer shall be experienced to perform work and is acceptable to panel manufacturer.

C. Manufacturer Qualifications:

1. Manufacturer shall have a minimum of ten 10 years' experience supplying metal roof and wall panels to the region where the work is to be done.

2. Capable of providing field service representation during construction, approving acceptable installer and approving application methods.

D. Regulatory Agency Requirements: Comply with UBC and local Building Code requirements if more than those specified.

1.06 PERFORMANCE REQUIREMENTS

A. Materials: All panels shall be formed from steel conforming to ASTM A653 or ASTM A792, with minimum yield strength of 40,000 psi. Panels shall have a 24-gage minimum thickness.

B. Protective Coatings: All panel coating thickness shall conform to ASTM A653, G90 (Galvanized) or ASTM A792, AZ50 (Zincalume).

C. Finish:

1. Primer Coat Material: All panels are to have a factory-applied baked-on corrosion-resistant primer, minimum primer coat dry film thickness: 0.2 mils.

2. Finish Coat Material: All panels are to have a factory-applied baked-on paint system on both sides using polyvinylidene fluoride (PVF2), such as "Kynar 500" or equal, meeting the following requirements.

a. Weathering: No checking, blistering or adhesion loss when tested for 5000 hours in accordance with ASTM D4587.

b. Chalking: Will not chalk greater than #8 rating when tested for 2000 hours in accordance with ASTM D4214.

c. Fading: Color changed will not exceed 5 NBS units when tested for 5000 hours in accordance with ASTM D2244.

d. Humidity: Shall be less than 5 percent of #8 blister when tested for 5000 hours in 100 percent humidity at 100 degrees F in accordance with ASTM D2247.

e. Flexibility: No rupture of coating when subjected to a 180-degree bend around a 1/8-inch mandrel in accordance with ASTM D522.

f. Formability: When subjected to a 180-degree bend over 1/8-inch diameter mandrel in accordance with ASTM D522, exterior coating shall be flexible to the point of metal rupture without separation of coating from substrate.

g. Abrasion Resistance: Coating system shall withstand a minimum of 65 liters of falling sand before appearance of base metal per ASTM D968.

1.07 DELIVERY, STORAGE AND HANDLING

A. Protect against damage and discoloration.

B. Handle panels with non-marring slings.

C. Do not bend panels.

D. Protest panels against standing water and condensation between adjacent surfaces.

E. If panels become wet, immediately separate sheets, wipe dry and allow to air dry.

F. Remove and strippable film prior to installation and do not allow to remain on panels in extreme cold, heat or in direct sunlight.

1.08 PROJECT CONDITIONS

A. Examine the conditions and substrate in which metal roof and wall panels are to be installed. Substrate shall be installed level, flat and true to avoid panel stresses.

B. Field measurements shall be taken prior to fabrication of panels.

C. Proceed with panel installation only after satisfactory conditions are met.

1.09 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Manufacturer's Product Warranty: Submit a written warranty, for Owner’s acceptance, executed by the manufacturer agreeing to cover failure of the factory-applied exterior finish on metal roof and wall panels within the warranty period

1. Warranty Period: Twenty-five (25) years from Date of Substantial Completion.

C. Manufacturer's Weathertightness Warranty: Submit a written warranty, for Owner’s acceptance, executed by the manufacturer agreeing to cover against leaks in standing seam roof panels, arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions

1. Warranty Period: Twenty years (20) from Date of Substantial Completion.

D. Contractors Warranty: Warrant panels, flashing, sealant, fasteners, and accessories against defective materials and/or workmanship, to remain watertight and weatherproof with normal usage for two (2) years following project substantial completion date, and to repair or replace without additional cost to the owner, any leaks, and resulting damage to other materials and building contents as may occur.

PART 2 – PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Roof and wall panels products specified within this section are by:

1. Nucor Buildings Group

B. Subject to compliance with requirements, equivalent products by the following manufacturers are acceptable:

1. AEP Span

2. Metal Sales Manufacturing Corporation

3. Metal Building Components, Inc. (MBCI)

4. Taylor Metal Products.

5. Approved equal.

2.02 MATERIALS

A. Roof Panels:

1. Nucor Loc Seam Standing Seam, as manufactured by Nucor Buildings Group or approved equal.

a. Profile: 16-inch wide panel, with subtle striations, 1-3/4” high ribs.

b. 24-gauge minimum thickness.

c. Color: As selected by Engineer from manufacturer's standard colors.

B. Wall Panels:

1. Nucor A-Panel, as manufactured by Nucor Buildings Group or approved equal.

a. Profile: 36-inch wide panel, with subtle striations, 1-3/4” high ribs.

b. 24-gauge minimum thickness.

c. Color: As selected by Engineer from manufacturer's standard colors.

2.03 UNDERLAYMENT MATERIALS

A. Self-adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970.

2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D1970.

2.04 ACCESSORIES

A. General: Except as indicated as work of another specification section, provide components required for a complete roof and wall panel system, including, but is not necessarily limited to, fascias, ridge closures and vents, clips, seam covers, flashing, sealants, gaskets, fillers, closure strips and similar items. Match materials and finishes of panels.

B. Roof Panels:

1. Panel Penetration Flashing: Recommended by panel manufacturer.

a. Color: Match panel color.

2. Flashings: Match panel finishes and material. Do not use lead or copper.

3. Fasteners: Per manufacturer recommendations.

a. Conceal whenever possible. If exposed, use same color of parts as they attach. Include sealing washers.

b. Fasteners shall be coated to provide protection against corrosion.

4. Clips: One-piece fixed to accommodate thermal movement.

5. Closure strips: Closed-cell, self-extinguishing, expanded cellular rubber or cross-linked polyethylene foam flexible closure strips. Premolded to match configuration of roof panels. Provide closure strips where indicated or necessary to ensure weathertight construction.

6. Bituminous Coating: Cold-applied asphalt mastic, SSPC paint 12, compounded for 15 mil dry film thickness per coat.

C. Wall Panels:

1. Panel Penetration Flashing: Recommended by panel manufacturer.

a. Color: Match panel color.

2. Flashings: Match panel finishes and material. Do not use lead or copper.

3. Fasteners: Per manufacturer recommendations.

a. Conceal whenever possible. If exposed, use same color of parts as they attach. Include sealing washers.

b. Fasteners shall be coated to provide protection against corrosion.

4. Clips: One-piece fixed to accommodate thermal movement.

5. Closure strips: Closed-cell, self-extinguishing, expanded cellular rubber or cross-linked polyethylene foam flexible closure strips. Premolded to match configuration of wall panels. Provide closure strips where indicated or necessary to ensure weathertight construction.

6. Bituminous Coating: Cold-applied asphalt mastic, SSPC paint 12, compounded for 15 mil dry film thickness per coat.

D. Joint Sealant: Refer to Section 07 92 00, and reference contact drawings.

2.05 FABRICATION

A. Roof and Wall, Panels:

1. Unless otherwise shown on drawings or specified herein, fabricate panels in continuous one-piece lengths and fabricate flashings and accessories in longest practical lengths.

2. Panels shall be factory formed. Field formed panels are not acceptable.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine conditions and proceed with work.

B. Verify dimensions, tolerances and method of attachment with other work.

C. Verify that installation may be made in accordance with approved shop drawings and manufacturer's instructions. If field measurements differ from contract Plans or shop drawings notify Engineer prior to fabrication.

D. Prior to starting work, notify general contractor about defects requiring correction.

E. Do not start work until conditions are satisfactory.

3.02 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

B. Apply over the entire roof surface.

3.03 METAL PANEL INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Apply bituminous coating or other permanent separation materials on panel surfaces where panels would otherwise be in contact with substrate materials that are non-compatible or could result in electrolytic corrosion or deterioration of either material or finishes. Coat back of metal roof and wall panels with bituminous coating where it will contact wood, ferrous metal or cementitious construction.

C. Roof and Wall Panels:

1. Follow roof panel manufacturer's instructions in conjunction with approved shop drawings.

2. Install panel seams vertically.

3. Lap panels away from prevailing wind directions.

4. Overlap roof panels at least 6 inches.

5. Secure panels without warp or deflection.

6. Maximum Alignment Variation: 1/4 inch in 40 feet.

7. Flashing: Refer to Section 07 62 00 – SHEET METAL FLASHING AND TRIM.

8. Cutting and Fitting:

a. Neat, square and true. Torch cutting is prohibited where cut is exposed to final view.

b. Openings 6 inches and larger in any direction shall be shop fabricated and reinforced to maintain original load capacity.

c. Openings less than 6 inches in largest dimension can be made by trade requiring opening.

d. Where necessary to saw cut panels, debur and treat with galvanic paint.

3.04 PREPARATION

A. Clean and dry surfaces prior to applying sealants.

3.05 ADJUSTING, CLEANING AND PROTECTION

A. Panels or flashings that have severe paint and/or substrate damage shall be replaced as directed by the Engineer or Owner’s representative. Do not use touch-up paint on damaged surfaces.

B. At completion of each day's work and at work completion, sweep panels, flashings and gutters clean. Do not allow fasteners, cuttings, fillings or scraps to accumulate. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 07 41 11

SECTION 07 62 00 – SHEET METAL FLASHING AND TRIM

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This Section includes the following categories:

1. Metal flashing.

2. Exposed trim.

3. Exposed fascia.

4. Drain gutter assemblies.

5. Miscellaneous metal fabrication.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 78 00 – Operation and Maintenance Manuals

C. Section 07 92 00 – Joint Sealants

D. Section 13 34 19 – Pre-Engineered Metal Building System

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

2. A792 – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

3. A924 – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

4. D4586 – Standard Specification for Asphalt Roof Cement, Asbestos-Free.

5. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.

C. Samples of sheet metal flashing, trim and accessory items, in the specified finish.

1. Two (2) 8-inch square samples of specified sheet materials to be exposed as finished surfaces.

D. Informational Data: Submit manufacturer's and installer’s qualification data.

E. Submit the following closeout data in accordance with Section 01 78 00 – Operation and Maintenance Manuals:

1. Maintenance Data

2. Warranty: Submit specified warranty.

1.05 QUALITY ASSURANCE

A. Single-Source: Obtain sheet metal from one manufacturer.

B. Installers Qualifications: Engage an experienced installer who has completed sheet metal flashing and trim work similar in material, design and extent to that indicated for this Project and with a record of successful in-service performance.

1.06 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposed to weather without failing.

1.07 DELIVERY, STORAGE AND HANDLING

A. Protect against damage and discoloration.

1.08 PROJECT CONDITIONS

A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance, durability of work and protection of materials and finishes.

1.09 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. The contractor shall furnish, at no additional cost to the Owner, a guarantee of the watertightness of the flashings. The warranty is limited to repairs due to ordinary wear from the elements and/or due to faulty materials and workmanship.

1. Warranty Period: Five (5) years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 METALS

A. Zinc-coated Steel: Commercial quality with 0.20 percent copper. ASTM A653, G90 hot-dip galvanized, mill phosphatized where indicated for painting; not less than 22 gage thickness except as otherwise indicated. The Contractor may, at his/her option, substitute Zincalume or Galvalume, meeting ASTM A792, AZ50 requirements for galvanized finish.

2.02 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Fasteners: Same metal as flashing/sheet metal or, other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

B. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work; matching or compatible with material being installed; noncorrosive; size and gage required for performance.

C. Zinc Coated Steel Primer: Self-etching type, compatible with paint system specified in Section 09 90 00 – Painting and Coating; shop applied.

D. Mastic Sealant: Polyisobutylene, nonhardening, nonskinning, nondrying and nonmigrating sealant.

E. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07 92 00 – Joint Sealants.

F. Adhesive: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

G. Paper Slip Sheet: 5-lb/square red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.

H. Gutter Strainer: 1/4-inch hardware cloth installed in sheet metal frames. Fabricate screen and fame of same basic material as gutters and downspouts.

I. Roofing Cement: ASTM D4586, Type I, asbestos free, asphalt based.

2.03 GENERAL FABRICATION

A. Sheet Metal Fabrication Standards: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design dimensions, metal and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams and solder.

E. Expansion Provisions: Space movement joints a maximum of 10 feet with no joints allowed within 24 inches of corners or intersection. Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently weatherproof and water proof, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with mastic sealant (concealed within joints).

F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

G. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

H. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to view.

I. Fabricate cleats and attachments devices form same materials as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.04 SHEET METAL FABRICATION

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Exposed Trim and Fascia: Fabricate from the following material:

1. Galvanized Steel: 22-gauge.

C. Roof-Penetration Flashing:

1. Galvanized Steel: 22-gauge.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrate and conditions under which sheet metal flashing and trim are to be installed and verify that work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify dimensions, tolerances and method of attachment with other work.

3.02 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual". Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Install exposed sheet metal work that is without excessive oil canning, buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Expansion Provisions: Space movement joints a maximum of 10 feet with no joints allowed within 24 inches of corners or intersection. Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently weatherproof and water proof, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with mastic sealant (concealed within joints).

D. Soldered Joints: Do not solder the following materials:

1. Aluminum

2. Coil-coated galvanized sheet.

E. Sealed Joints: Form nonexpanding, but moveable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joints with sealant and form metal to completely conceal sealant.

F. Separation: Separate metal from noncompatible metal or corrosive substrate by coating concealed surfaces, at location of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrate, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.

2. Bed flanges of work in a thick coat of roofing cement where required for waterproof performance.

G. Roof-Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof.

H. Downspout: Shall be set plum and not less than 0.5 inches from the wall. Leaders shall connect gutters on overhanging eaves to downspouts. Leaders shall be set with a slope not less that 1/8-inch per foot or more than 1/2-inch per foot below the horizontal line. Leaders shall fit over the outlet tube in gutter bottom and shall fit into and be riveted to the downspout. Rivet spacing shall be not more than 2 inches. Strainers shall be set loosely in the eave tube opening in gutter. Downspout shall be one continuous piece from leaders to ground termination. Downspouts terminating in drainage lines shall be neatly fitted into downspout boots and filled. Downspout hangers shall be 16-gauge by 1-inch flat stock of the same material as the downspout.

I. Gutters: Brackets and spacers shall be fastened to roof nailer by screws and shall interlock with or be fastened to the leading edge of gutter. Brackets and spacers shall be alternated at not more than 36 inches on centers.

3.03 ADJUSTING, CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

C. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 07 62 00

SECTION 07 92 00 – JOINT SEALANTS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work consists of furnishing all labor, materials, and equipment for the complete installation of sealant and caulking as indicated on the Plans and specified herein. Work is primarily at perimeter of hollow metal doorframes, interior and exterior, and windows, and other penetrations in outside walls of buildings.

B. The required applications of sealants include, but is not necessarily limited to, the following general locations:

1. Joints between louvers, window frames, door frames, and other construction.

2. Masonry control joints.

3. Roof penetrations and other required sheet metal/flashing locations.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedures

B. Section 07 62 00 – Sheet Metal Flashing and Trim

C. Section 08 11 13 – Hollow Metal Doors and Frames

D. Section 09 90 00 – Painting and Coating

E. Section 13 34 19 – Pre-Engineered Metal Building System

1.03 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit product data.

C. Submit manufacturer's surface preparation and installation instructions.

D. Submit samples of sealant colors.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Name and addresses of manufacturers of products specified herein are as follows:

1. Dow Corning Corporation, Midland, Michigan.

2. General Electric Company, Silicone Products Division, Waterford, New York.

3. Mameco International, Cleveland, Ohio.

4. Pecora Corporation, Harleysville, Pennsylvania.

5. Sika Chemical Corporation, Lyndhurst, New Jersey.

6. Sonneborn Building Products Division, Contech, Minneapolis, Minnesota.

7. Tremco, Cleveland, Ohio.

8. Woodmont Products Incorporated, Huntingdon Valley, Pennsylvania.

2.02 SEALANT SYSTEMS

A. Type 1: Vertical joints 1- inch or less in width

1. Silicon rubber (nonsag)

a. Silpruf Sealant: General Electric Company, Silicon Products Div., Waterford, New York.

b. 790 Building Sealant: Dow Corning Corp., Midland, Michigan.

c. 864 Architectural Silicone: Pecora Corp., Harleysville, Pennsylvania.

B. Type 2: Interior nonmoving joints

1. Silicone rubber (at wet interior areas)

a. 786 Mildew-Resistant Silicone Sealant: Dow Corning Corp., Midland, Michigan.

b. Sanitary Sealant: General Electric Company, Silicone Products Div., Waterford, New York.

c. Chem-calk 1200: Woodmont Products, Inc., Huntingdon Valley, Pennsylvania.

2.03 ACCESSORIES

A. Primer: Nonstaining type, recommended by sealant manufacturer to suit application.

B. Joint cleaner: Noncorrosive and nonstaining type, recommended by sealant manufacturer and compatible with joint substrates.

C. Joint filler: Round, opened or closed-cell, foam rod, as recommended by sealant manufacturer, diameter oversized 30 percent greater than the width of joint to be filled.

D. Bond breaker: Pressure-sensitive tape recommended by sealant manufacturer to suit application.

PART 3 – EXECUTION

3.01 INSPECTION

A. Verify that joint dimensions and physical and environmental conditions are acceptable to receive work of this section.

B. Beginning of installation means acceptance.

3.02 PREPARATION

A. Clean, prepare, and size joints in accordance with manufacturer's instructions. Remove any loose materials and other foreign matter which might impair adhesion of sealant.

B. Verify that joint substrates and release tapes are compatible with sealant.

C. Examine joint dimensions and size materials to achieve required width/depth ratios.

D. Use joint filler to achieve required joint depths, to allow sealants to perform properly.

E. Where joints are more than 3/4-inch deep, install joint filler to within 1/2-inch of surface.

F. Where joint is more than 1/2-inch deep, install joint filler to within 1/4-inch of surface.

G. Where joint is less than 1/2-inch deep, apply bond breaker tape to bottom of joint to prevent adhesion of sealant to joint bottom.

H. Prime or seal joint surfaces wherever recommended by the sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.

3.03 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions.

B. Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature ranges.

C. Tool joints: Concave.

D. Joints: Free of air pockets, foreign embedded matter, ridges, and sags.

E. Install sealant before painting only if it is recommended as paintable by the sealant manufacturer, otherwise do all sealing after painting is completed.

3.04 CLEANING

A. Remove excess and spillage of compounds promptly as the work progresses. Clean the adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage, without damage to the adjoining surfaces of finishes.

END OF SECTION 07 92 00

DIVISION 08 – OPENINGS

SECTION 08 11 13 – HOLLOW METAL DOORS AND FRAMES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work consists of furnishing all labor, materials, and equipment for the installation of hollow metal doors and frames, and relights, as shown on Plans.

B. Work included:

1. Standard, insulated core steel doors; standard frames, unless otherwise detailed.

2. Prepare doors and frames to receive hardware specified in Section 08 71 00 – Door Hardware.

3. Provide lights in doors where indicated.

4. All steel doors and door frames on this project are to be hot-dip galvanized and factory primed for field finish painting.

5. Certain openings require custom doors and frames, see elsewhere for details.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 08 71 00 – Door Hardware

C. Section 09 90 00 – Painting and Coating

D. Division 26 – Electrical

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

2. C1363 – Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit product data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.

C. Shop Drawings: Submit shop drawings for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements and details of joints and connections. Show anchorage and accessory items

1.05 QUALITY ASSURANCE

A. Provide doors and frames complying with ANSI/SDI 100 “Recommended Specifications for Standard Steel Doors and Frames” as specified.

B. Certification of label construction: For components exceeding Underwriters Laboratories, Inc. (UL), furnish inspection certificate stating that components construction conforms to UL rating requirements only if Engineer is aware of such a limitation and has allowed the non-labeled unit.

C. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E 152, and are labeled and listed by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies provide certification by a testing agency acceptable to authorities having jurisdiction that doors conform to all standard construction requirements of tested and labeled fire-rated door assemblies except for size.

2. Temperature-Rise Rating: Where required by code, provide doors that have a temperature-rise rating of 450 °F maximum in 30 minutes of fire exposure.

D. Single Source: Provide doors, frames, and builders hardware through one source.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames in cartons or crates to provide protection during transit and storage. Adequately protect factory finished paint surfaces from damage during shipment, storage, construction and installation of door hardware and accessories.

B. Inspect hollow metal work for damage upon delivery and during construction. Field repair of damage(s) will not be allowed. Remove and replace any damaged items as directed by the Engineer.

C. Store doors and frames at the building site under cover. Place units on minimum 4-inch high wood sills or on floors in a manner that will prevent rust and damage. Avoid the use of non-vented plastic or canvas shelters which could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to promote air circulation.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, equivalent products by the following manufacturers are acceptable.

1. Steel Doors and Frames:

a. Ceco Corporation.

b. Curries Company.

c. Republic.

d. Steelcraft.

e. Stiles.

2.02 MATERIALS

A. Steel sheets: All doors and frames shall be constructed of galvanized steel sheets conforming to the requirements of ASTM A653, G90 minimum coating thickness.

B. Paint: All hollow metal doors and frames on this project shall be factory primed and field finish painted with paint as specified in Section 09 90 00 – Painting and Coating. Factory paint and field finish paint shall be spray-applied to achieve a smooth and uniform finish. Brush and roller applied finishes will not be accepted.

2.03 METAL DOOR FABRICATION

A. General: Fabricate doors in accordance with SDI 100-1991, Grade II, Model 2 seamless design, to sizes shown, providing necessary clearances and bevels to permit operation without binding. Door shall be free from warp, wave, buckle and other defects.

B. Door Construction:

1. Thickness: 1-3/4 inches, unless indicated otherwise.

2. Fabricated with face sheets of 18-gauge steel.

3. Both lock edge and hinge rail edge of the door shall be continuous welded and ground smooth the full height of the door.

4. Bevel lock and hinge edges 1/8-inch in 2 inches.

5. Provide with top and bottom inverted 16-gauge steel channels welded within the door to both face sheets.

6. Reinforce, stiffen and sound deaden with self-extinguishing, non-toxic, polystyrene foam core completely filling inside of door and laminated to the inside faces of panels.

7. Closer Reinforcement Channel: 12-gauge reinforcement in doors with closers.

C. Thermal Rated Assemblies: Provide door and frame assemblies tested in accordance with ASTM C1363 at exterior locations. Unless otherwise indicated, maximum apparent U factor for thermal-rated assemblies is 0.39 BTU/hr (ft^2) °F.

D. Preparation for Hardware:

1. Reinforce components for hardware installation in accordance with SDI 107.

2. Door shall be mortised, reinforced, drilled and tapped at the factory for templates for all mortise hardware listed in the hardware schedule.

3. Door shall be reinforced only for surface applied hardware such as closers, checks, escutcheons and kick plates, the drilling and tapping for which is to be done in the field by the door erector.

4. Door shall be provided with reinforcing unit as recommended by lock manufacturer.

5. Hardware Mounting Height and Door Clearances: In accordance with ANSI industry standards.

E. Electric Door Position Switches: Provide cutout and 12-gauge reinforcing tabs for electric door position switches. Location as recommended by position switch manufacturer.

2.04 METAL FRAME FABRICATION

A. General: Pressed, double rabbeted metal frames shall be formed to shapes and sizes shown. Head and jambs are to be notched, mitered, welded and finished to present a smooth surface for painting.

B. Frames shall be fabricated from 16-gauge steel and shall be designed with integral stop and trim. Mitered corners shall be reinforced with 18-gauge channel shaped reinforcements.

C. Jamb Anchors: Frame anchors shall provide stiffness and rigidity to keep frames square, in accurate position without twisting, buckling or warping.

1. Provide minimum of three anchors at jamb end of frames.

2. Wood stud construction: 18-gauge galvanized steel sheet, U-shaped type to engage stud, welded to back of frame. Loose anchors are not acceptable.

3. Concrete masonry: Adjustable galvanized “tee” anchors. Install in course mortar as work progresses.

4. Cast-in-place concrete walls: Use cabinet type frames anchored to concrete as per manufacturers printed recommendations, using expansion bolts.

D. Floor Anchors: For each jamb which extends to floor, provide clip-type anchors formed of not less than 14-gauge galvanized steel sheet, welded to back of frame, with two holes to receive fasteners.

E. Preparation for Hardware: Frame shall be prepared at the factory for all hardware using templates furnished by hardware supplier. Locations of miscellaneous hardware shall conform to the recommendations for the Door and Hardware Institute (DHI). Mortise, reinforce, drill and tap for all mortise type hardware. Reinforce for surface applied hardware, the drilling and tapping for which is to be done in the field by door erector.

1. All hardware cutouts shall have steel plate reinforcements with tapped holes welded to frame. Reinforcement shall include 3/16-inch butt reinforcement; 12-gauge lock strike; 12-gauge for surface applied items.

2. Provide strike stops at frames to receive metal doors with holes for three rubber door silencers. On double doorframes, provide for two silencers per door at head. Omit holes at frames to receive unitized weather stripping.

F. Removable Spreaders: Provide removable metal spreaders for frames to prevent damage during shipment and handling. Removal of spreaders shall be possible without damage to the finished surface.

G. Plaster Guards: Provide 26-gauge steel plaster guards or mortar boxes, welded to frame at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation.

H. Electric Door Position Switches: Door frames shall be provided with cutout, 12-gauge reinforcing tabs, and 16-gauge grout guard cover box/junction box with electrical conduit knockout for electric door position switch. Location as recommended by position switch manufacturer. Coordinate with Electrical.

2.05 ACCESSORIES

A. Cement Grout: Portland cement, sand and water; with minimum compressive strength of 3000 psi at seven days.

B. Bituminous Paint: Coal Tar Epoxy. Factory coat inside of frame profile with bituminous coating to a thickness of 1/16-inch.

C. Louvers: Door louvers shall be supplied and installed by the door manufacturer. Louvers shall be galvanized 18-gauge steel with 50 percent free area, and integral stainless-steel mesh insect screen, model AFDL as manufactured by Anemostat®, or approved equal. Louvers for fire-rated doors shall be UL rated fusible-link type, constructed of galvanized 18-gauge steel with optional framed attached stainless-steel mesh insect screen, Anemostat® model FLDL-UL, or approved equal. Refer to the door and HVAC schedules on the Plans for sizes and additional requirements.

PART 3 – EXECUTION

3.01 INSTALLATION

A. General: Install steel doors, frames and accessories according to shop drawings, manufacturer's data and as specified.

B. Placing Frames: Comply with provision of SDI 105 “Recommended Erection Instructions for Steel Frames,” unless otherwise indicated. Set frames accurately in position, plumbed, aligned and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders, leaving surfaces smooth and undamaged. Install silencers.

1. In masonry construction, install at least three wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb.

2. At existing concrete or masonry construction, install at least three completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb.

3. In metal stud partitions, install at least three wall anchors per jamb at hinge and strike levels. In steel stud partitions, attach wall anchors to studs with screws.

4. Grout all frames unless noted otherwise. Coat inside of frames with bituminous paint.

5. Install fire rated frames in accordance with the requirements of NFPA 80.

C. Door Installation: Fit steel doors accurately in frames, within clearances specified in ANSI/SDI 100.

1. Fire-Rated Doors: Install in accordance with requirements of NFPA 80.

D. Install hardware in accordance with Section 08 71 00 – Door Hardware.

3.02 PROTECTION, ADJUSTING AND CLEANING

A. Protection: Immediately before final inspection, remove protective wrapping from doors and frames.

B. Remove and replace defective work, including doors which are warped, bowed, dented, buckled or otherwise unacceptable.

C. Final Adjustments:

1. Check and readjust operating finish hardware items just prior to final acceptance. Leave work in complete and proper operating condition.

END OF SECTION 08 11 13

SECTION 08 30 00 – ROLLING SERVICE DOORS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this section includes the following:

1. Upward acting springless rolling service doors, including, but not limited to, upward-coiling service doors, hardware, and electric door operator.

B. Manufacturers offering products to comply with the requirement for insulated rolling service doors include the following:

1. Overhead Door Corporation

2. Clopay Building Products

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 78 00 – Operation and Maintenance Manuals

C. Section 05 50 11 – Miscellaneous Metals

D. Division 26 - Electrical

1.03 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Product Data: For each type and size of rolling service door and accessory. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, operating instructions, and maintenance information.

C. Shop Drawings: Submit shop drawings for review prior to fabrication. Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, anchors and accessories. Include relationship with adjacent construction.

D. Color Selection Chart: Manufacturer’s standard color selection to be selected by the owner in conjunction with the Architect/Engineer.

E. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

F. Closeout Data:

1. Operation and Maintenance Data.

2. Warranty: Submit specified warranty.

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide coiling service door capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:

1. Wind Load: Uniform pressure (velocity pressure) of 20 lbs/sq. ft., acting inward and outward.

1.05 QUALITY ASSURANCE

A. Single-Source: Obtain coiling doors, guides, and related primary components from one manufacturer. Provide secondary components from source acceptable to manufacturer of primary components.

B. Installer's Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.

C. Regulatory Agency Requirements: Company with IBC and local Building Code requirements if more than those specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. 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. Store products in manufacturer's unopened packaging until ready for installation.

1.07 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Manufacturer's Product Warranty: Submit a written warranty, for Owner's acceptance, executed by the manufacturer agreeing to repair and replace faulty material or workmanship within the specified warranty period.

C. Warranty Period (from the date of installation)

1. Ten (10) years for delamination of door sections.
2. Three (3) years for all other components.
3. Two (2) years for electric operator.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, equivalent products by the following manufacturers are acceptable.

1. Overhead Door Corporation: 2501 South State Highway 121 Bus. Ste. 200 Lewisville, TX 75067; 1-800-275-3290; http://www.overheaddoor.com/

2. Clopay Building Products Company: 8585 Duke Boulevard Mason, OH 45040; 1-800-225-6729; http://www.clopaydoor.com/

3. Engineer approved equal.

B. Door assemblies shall be heavy-duty commercial roiling service door products equivalent to Overhead Door 627 Series or approved equal, subject to compliance with these specifications.

2.02 SPRINGLESS ROLLING SERVICE DOORS

A. Flat profile door slats shall be fabricated of insulated 18 gauge galvanized steel.

B. Curtain and hood finish shall be galvanized in accordance with ASTM A 653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat. Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.

C. Door shall be weather-sealed with vinyl bottom and guide seals.

D. Bottom bar shall include two stainless steel angles, minimum thickness 3/16 inch, bolted back to back to reinforce curtain in the guides.

E. Guides shall include three structural steel angles provided with high usage guide wear strip to minimize wear and reduce sound.

F. Brackets shall be galvanized steel to support counterbalance, curtain, and hood.

G. Finish for bottom bar, guides, and backets to be powder coat in color as selected by owner and Engineer.

H. Door Roll: Chain and gear driven, springless roll to be steel tube with integral shafts, keyed on the Drive End and supported by self-aligning greaseable sealed bearings. Door shall not require any counterbalance device.

I. Hood: Protecting barrel, chain, and sprocket from dirt and debris and extending between the support brackets. Fabricated of 24 stainless steel with intermediate supports as required.

2.03 ANCHOR BOLTS

A. Equipment manufacturer shall furnish all anchor bolts of ample size and strength required to securely anchor each item of equipment. Anchor bolts, hex nuts, and washers shall be stainless steel. Anchor bolts shall be wedge or epoxy type. The location, diameter, and minimum embedment of the anchor bolts shall be designed by the equipment manufacturer.

B. Anchor bolts shall be set by the contractor. Equipment shall be placed on the foundations, leveled, shimmed, bolted down, and grouted with a non-shrinking grout.

PART 3 – EXECUTION

3.01 PREPARATION

A. Take field dimensions and examine conditions of substrate, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install door, track, and operating equipment complete with necessary hardware, jamb, and head mold strips, anchors, inserts, hangers, and equipment supports according to Shop Drawings, manufacturer’s written instructions, and as specified.

B. Fasten vertical track assembly to framing at not less than 24 inches o.c. Attach hood assembly from structural overhead framing with angle or hangers welded and bolt fastened into place. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.

3.03 ADJUSTING, CLEANING, AND PROTECTION

A. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

B. Touch-up damaged coatings and finishes and repair minor damage. Clean exposed surfaces using non-abrasive materials and methods recommended by the manufacturer of material and product being cleaned.

C. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 08 30 00

SECTION 08 71 00 – DOOR HARDWARE

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work covered by this section of the specifications consists of furnishing and delivering to the job site for fitting and installation, all finish hardware complete, in accordance with this section and applicable Plans. It is intended that the following list of hardware will cover all finish hardware to complete the project. Omissions and discrepancies shall be brought to the Engineer's attention during the bidding period. Hardware for labeled openings shall meet U.L. requirements.

B. Work included

1. Templates for doors and frames.

2. All required screws, bolts, anchors, and the like, for proper fastening of each item of hardware.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 78 00 – Operation and Maintenance Manuals

C. Section 08 11 13 – Hollow Metal Doors and Frames

D. Division 26 – Electrical

1.03 REFERENCE STANDARDS

A. International Building Code (IBC), latest edition.

B. Washington Industrial Safety and Health Act of 1973.

C. State Building Code Act.

D. Washington State Barrier-Free Regulations (WAC 51-30).

E. ANSI / BHMA A156.1 through A156.24 - Product Standard for Builders Hardware.

F. National Fire Protection Association (NFPA) [www.nfpa.org]80 - Fire Doors and Windows.

G. National Fire Protection Associations (NFPA) 101 - Life Safety Code.

H. Door and Hardware Institute (DHI) [www.dhi.org] - Hardware for Labeled Fire Doors.

I. Door and Hardware Institute (DHI) - Recommended Locations for Architectural Hardware for Standard Hollow Metal Doors and Frames.

J. Door and Hardware Institute (DHI) - Abbreviations and Symbols.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements. Furnish five (5) typewritten hardware schedules for approval with attached cut sheets. Approval of schedule shall not relieve the contractor of responsibility for errors or omissions therein.

B. Submit schedule in accordance to DHI publication on "Sequence and Format for the Hardware Schedule" and include explanation of all abbreviations, symbols and codes.

C. Include cross-reference to hardware groups in the hardware schedule. Mark openings with the Engineer's numbering and indicate each door and frame.

D. Indicate type, style, function, size, hand, means of fastening and manufacture for each hardware item.

E. Quantities listed are for the Contractor's convenience only and are not guaranteed. Items not specifically mentioned, but necessary to complete the work shall be furnished matching in quality, finish and design those items specified for similar locations.

F. Submit one (1) copy of catalog cuts for each hardware item listed in the schedule. Catalog cuts must be of good reliable quality. Highlight each cut to readily show compliance with project requirements.

G. Provide samples if required by the Engineer. Samples will be returned to be incorporated into the work.

H. Furnish a complete and current set of templates to all other related material suppliers.

I. Keying requirements will be discussed with the owner, finalized and documented for submittal to the owner.

J. At the completion of the project, submit the following in accordance with Section 01 78 00 – Operation and Maintenance Manuals:

1. As-built hardware schedule, including keying information.

2. Operation and maintenance data as specified.

3. Warranty data as specified.

1.05 QUALITY ASSURANCE

A. The "scheduled" manufacture's names and numbers shown in the hardware schedule are for the purpose of establishing quality, design and function. Only approved Manufacturers and model numbers will be accepted. A request for approval, in writing, indicating the "scheduled" manufacture's catalog number and "substitution" manufacture's proposed substitution catalog number must be submitted. In addition, catalog cuts, and physical samples (if requested), clearly labeled, must accompany the request for approval. All physical samples must be left with the Project Manager for whatever time that is required for his evaluation.

B. Single Source: Provide doors, frames and hardware through one source.

C. Only recognized builders' hardware suppliers who have regularly engaged in furnishing hardware in the project vicinity for a minimum of five (5) years will be acceptable. This supplier must have in its employ a locksmith along with a Hardware Consultant currently a member of the American Society of Architectural Hardware Consultants, who is available at reasonable times, during the course of the work for consultation about the projects hardware details, installation or adjustment. Suppliers without certified consultants may be required to furnish a letter of qualification, listing similar projects furnished, including the Architects name, date and year and the project location.

Provide hardware for fire rated openings in compliance with NFPA - 80 latest edition.

1.06 DEFINITIONS

A. ANSI American National Standards Institute.

B. BHMA Builders Hardware Manufacturers Association.

C. CABO Council of American Building Officials.

D. DHI Door and Hardware Institute.

E. ICC International Code Council.

F. NFPA National Fire Protection Association.

G. UBC Uniform Building Code.

1.07 DELIVERY, STORAGE AND HANDLING

A. Hardware shall be delivered to the project site in the manufacturer's original packaging, with appropriate markings indicating the location in accordance with the approved hardware schedule.

B. Jointly inventory the hardware upon delivery with the Contractor and or Installer.

C. Store all hardware in a clean, dry and secure room to prevent hardware from damage and loss.

1.08 WARRANTY

A. The following items shall have warranty in excess of Division 01.

1. Door Closers: 10 years.

2. Locks and Latches: 5 years.

B. Warranty period shall begin from the date of substantial completion.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Materials, equipment, and accessories specified under this section shall be products of:

1.	Hinges	ST	Stanley
2.	Locksets	SC	Schlage
3.	Deadbolts	SC	Schlage
4.	Cylinders	SC	Schlage
5.	Latch Protection	DJ	Don-Jo
6.	Flush Bolts	IV	Ives
7.	Closers	SA	Sargent
8.	Wall Stops	TR	Trimco
9.	Door Silencers	TR	Trimco
10.	Overhead Stops	SA	Sargent
11.	Thresholds	P	Pemko
12.	Gasketing, Sweeps, Astragals	P	Pemko
13.	Overhead Rain Drip	p	Pemko
14.	Kickplates/Protective Items	TR	Trimco
15.	Door Position Switches (By Electrical)	SE	Sentrol (GE-Interlogix)

2.02 MATERIALS

A. The following products have been selected to establish a level of quality, design and function. Furnish either the designated item or the approved alternate. Plans show the direction of slide, swing and hand of each door. Furnish each item of hardware for proper installations and operation. Check door and frame types to ensure all additional installation accessories are included with the specified item.

B. Related items: All necessary fastenings, brackets, clips, and other items necessary to install the hardware items in the best manner shall be furnished in the same material and finish as the related item and shall be furnished as a part of the project.

2.03 DOOR HANDLES

A. All door handles on the project shall be lever-type. If lock cylinders are called for on the Door Schedule, they shall be in the handle.

2.04 FASTENERS

A. All screws shall be of matching finish to their product and shall be manufacturers standard.

2.05 HINGES AND PIVOTS

A. Doors 1-3/4 inches thick minimum use 4-1/2-inch hinges.

B. Each door shall have three hinges. Doors 7 feet 6 inches in height, and over shall have an additional hinge for each 30 inches of additional height, or fraction thereof.

C. Exterior doors over 3 feet 2 inches wide and/or 7 feet 6 inches high shall have heavy weight hinges. Hinges shall be non-ferrous with non-removable stainless-steel pins.

D. Interior reverse bevel doors with lockable hardware shall have non-removable pin hinges.

E. Hinges shall be sized in width to clear all trim.

2.06 LOCKSETS

A. Locks, cylinders and trim shall be the product of one manufacturer.

B. Functions as shown in hardware sets.

C. Provide 3/4-inch minimum latch throw for mortise locks, 1/2-inch for cylindrical locks and 1-inch throw for deadbolts.

D. Provide locks with standard 6-pin cylinder with a replaceable core.

E. Unless otherwise noted, locksets shall have freely rotating locked levers for added security and vandalism protection.

2.07 DOOR CLOSERS

A. Door closers shall be fully adjustable type with complete spring power adjustment, sizes 2-6 and field adjustable according to door size and frequency of use. Closer shall have adjustable back-check.

B. Where closers are indicated to be delayed action, provide units with adjustable delay. Where doors are indicated to be accessible to the physically handicapped, provide units that comply with ANSI A117.1 provision for door opening force and delayed action for closing.

C. Provide all accessories for mounting required by door and frame types.

2.08 DOOR TRIM UNITS

A. Fabricate protection plates not more than 1 inches less than door width on stop side of door and not less than 1 inch less than door width on pull side of door.

B. Metal plates shall be of stainless steel and 0.050 or 18 gauge.

C. Provide manufacturers standard exposed fasteners with through bolting on matched pairs.

2.09 FLUSH BOLTS

A. Provide manual, self-latching or automatic flushbolts where listed in hardware sets. Flushbolts for fire rated doors shall be approved and shall have U.L. label.

B. Provide minimum 1/2-inch diameter rods of brass, bronze or stainless steel with a minimum 3/4-inch throw.

C. Provide 12-inch rods for doors less than 7 feet 0 inches. Provide longer rods as necessary for doors taller than 7 feet 0 inches.

D. Provide dust proof strikes at all locations except where thresholds are shown.

2.10 THRESHOLDS AND WEATHERSTRIP

A. Provide continuous weather-stripping at the edge of every exterior door leaf. Provide non-corrosive fasteners as recommended by manufacturer.

B. Provide thresholds with flat head sleeve anchors on all exterior doors.

C. Provide PemKote™ anti-slip surface on all exterior thresholds.

2.11 ASTRAGALS

A. All double doors shall be provided with a removable astragal. Astragals shall be constructed of galvanized steel, painted to match door finish. Astragal shall be trimmed as recommended by the manufacturer to clear strike lip or other hardware.

B. Astragals for exterior double doors shall be supplied with weather-stripping at edge where doors meet.

2.12 SILENCERS

A. All interior wood and metal doors shall have silencers, unless specified otherwise.

B. Three per single door and two per pair.

2.13 FINISHES

A. The designations used in hardware sets indicate hardware finishes are to be industry recognized standard commercial finishes established by BHMA.

1.	Hinges	630
2.	Locks	626
3.	Flushbolts	626
4.	Push/Pull/Kicks	630
5.	Closers	689
6.	Door stops	626

2.14 KEYING

A. Keying Schedule: After receipt of approved finish hardware schedule, hardware supplier shall prepare a keying schedule. Keying schedule shall then be discussed with Engineer and Owner to ensure all locksets are functionally correct and keying fulfills desires of Owner. Copies of proposed keying schedule shall be given to Engineer and/or Owner with all corrections inserted into proposed schedule.

B. Establish system to integrate with existing system.

C. All keyed cylinders shall be subject to existing Masterkey system. The hardware supplier shall be responsible for obtaining all keying information from the Owner.

D. Keys shall be furnished in the following quantities:

0	each	Grandmaster
6	each	Master keys
3	each	Change keys per cylinder
2	each	Control keys
6	each	Construction keys

E. Construction Keying: Furnish all standard cylinder items with construction cores. Following construction, the hardware shall provide permanent cores as part of this contract. The hardware supplier shall insert all permanent cylinder cores into the locks and try each permanent key for operation before turning the permanent keys over directly to the Owner.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Mount hardware units at heights indicated in “Recommended Locations for Builders Hardware for Standard Steel Doors and Frames,” By DHI. The local Authority having jurisdiction may have specific requirements that may apply.

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Whenever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure place during the finish application. After completion of the finishes, reinstall each item. Do not install surface-mounted items until finishes have been completed on the substrate.

C. Vision Panels: Mounting is custom. The vision panel is to be located 40 inches maximum above finish floor, governed by ADA regulations.

D. Set all hardware plumb and true to locations specified in the installation instructions.

E. Set thresholds for exterior doors in a bed of butyl-rubber sealant.

F. Upon completion of installation, verify hardware has been installed in accordance with the approved finish hardware schedule. Check hardware for proper placement and operation. Hardware found to be incorrectly installed or damaged, will be repaired or replaced.

3.02 ADJUSTMENT

A. After inspection of the installation and operation by Engineer, the Contractor shall readjust all items of operating hardware as required.

B. Wherever hardware installation is made more than four (4) weeks prior to acceptance or occupancy of a space or area, return to work prior to acceptance of occupancy and make final check and adjustment of all hardware. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of air conditioning and ventilating equipment. Hardware to be found defective shall be repaired or replaced.

C. Instruct Owner's personnel in proper adjustment and maintenance of hardware and finishes during the final adjustment period.

3.03 PROTECTION AND CLEANING

A. After installation, all hardware surfaces shall be cleaned on both interior and exterior of all mortar, plaster, paint and other contaminants. After being cleaned, all work shall be protected against damage.

3.04 SPECIAL TOOLS

A. Provide three (3) sets of any special tools, required for installation and maintenance of hardware to Owner.

3.05 SCHEDULE

A. Refer to the Door Schedule on the Plans to relate the hardware group to specific doors.

D-02, D-05

Hinges (3)	TA2714 4 ½ x 4 ½ NRP
Lockset – Entrance/Office	D91PD LHO (Vandlgard)
Deadbolt	B660P
Latch Guards (2)	LP-111
Closer with Stop and Hold-Open	351-CPS H
Kick Plate	K0050 10” x 2” LTD
Threshold	272A FHSL14200Z
Weatherstripping	S88D
Sweep	18062CNB
Rain Drip	346C (door opening width + 4”)

END OF SECTION 08 71 00

DIVISION 09 – FINISHES

SECTION 09 90 00 – PAINTING AND COATING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work covered by this section includes all labor, materials, and equipment required for surface preparation and application of protective coatings as indicated on the Plans and as specified herein.

B. It is the intent that all new interior and exterior metal and submerged metal surfaces be painted, whether specifically mentioned or not.

C. Unless specifically indicated in the Technical Specifications, the following items shall not be painted:

1. Nonferrous and corrosion-resistant alloys such as copper, bronze, monel, aluminum, chromium plate, stainless steel, except where:

a. Required for electrical insulation between dissimilar metals.

b. Aluminum and stainless steel that is embedded in concrete or masonry, or aluminum in contact with concrete or masonry.

c. Color coding of equipment is required.

2. Nonmetallic materials such as glass, PVC, wood, porcelain, and plastic except as required for architectural painting or color coding.

3. Prefinished electrical and architectural items such as motor control centers, switchboards, switchgear, transformers, disconnect switches, acoustical tile, cabinets, elevators, wall panels, except where color coding of equipment is required.

4. Nonsubmerged electrical conduits attached to unpainted concrete surfaces.

5. Cathodic protection anodes.

6. Insulated piping or insulated piping with jacket, except as required for architectural painting or color coding.

7. Moving parts of operating units such as valve and damper operators, linkages, sensing devices, motor and fan shafts, unless otherwise specified.

8. Code required labels, such as Underwriters Laboratories, or any equipment data plates.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 78 00 – Operation and Maintenance Manuals

C. Section 08 11 13 – Hollow Metal Doors and Frames

1.03 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Manufacturer’s Certification: Contractor shall submit certification that states that the factory applied coating system meets or exceeds the requirements specified herein.

C. Technical Data Sheets: For each paint system used herein, Contractor shall submit a technical data sheet from each paint manufacturer and paint colors available for each product used in the paint system. The technical data sheet shall at minimum provide the paint material name, manufacturer name, product name and number, material specification, minimum coats of coverage and thickness.

D. Paint Schedule: Contractor shall submit a complete and detailed paint schedule showing, at a minimum, product name and number (including required primer or ty-coat), number of coats, thickness of each coat, colors, and locations each paint system will be used.

E. Contractor Qualifications: Submit coating applicator name and qualifications, including references and manufacturer’s certification as applicable and specified in this section.

F. Maintenance Instructions: Contractor shall submit Manufacturer’s instructions for procedures and products required for re-coating of finish coat. Submit maintenance data in accordance with Section 01 78 00 – Operation and Maintenance Manuals.

1.04 QUALITY ASSURRANCE

A. Contractor Qualifications: All painting specified in this section shall be accomplished by an applicator qualified in the field of protective coatings for a water and wastewater systems, with a minimum of five (5) years of experience, including specific experience in application of the specified product systems. The Contractor shall maintain qualified personnel who have received training by the manufacturer or manufacturer’s representative and shall be certified or licensed by the coating materials manufacturer as a qualified applicator.

1.05 DELIVERY AND STORAGE

A. Deliver all materials to the job site in original, new, and unopened packages and containers bearing manufacturer's name and label.

1. Provide labels on each container with the following information:

a. Name or title of material.

b. Federal Specification number, if applicable.

c. Manufacturer's stock number.

d. Manufacturer's name.

e. Contents by volume, for major pigment and vehicle constituents.

f. Thinning instructions.

g. Application instructions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.

1.06 GUARANTEE/WARRANTY

A. The Contractor shall provide a Manufacturer's guarantee as specified in the General Conditions for all labor, materials, and equipment required herein.

1.07 JOB CONDITIONS

A. Do not apply paint when conditions are such that dust, dirt, or other deleterious substances which may impair the quality of coats or the finish are present or will be present before the coating is fully dry.

B. Comply with manufacturer's recommended limitations for ambient and surface temperature and humidity. No painting is to be done when the relative humidity exceeds 85 percent.

C. Comply with manufacturer's recommendations for minimum and maximum times between applications.

PART 2 – PRODUCTS

2.01 PAINT AND COATING SUPPLIERS

A. Specifications for paint of this section are based on products of the Sherwin-Williams Company, unless otherwise specified. Equivalent products are acceptable only with Engineer’s approval.

B. Paint finish coats shall be by the same Manufacturer of the prime coat and shall be compatible. Contractor shall be responsible for verifying compatibility of finish coatings used with shop coating system used by manufacturers of prefinished materials and equipment.

2.02 COLOR REQUIREMENTS

A. Each coat of paint shall be darker than the preceding coat such that the finish coat is the darkest coat.

B. Colors shall be formulated with colorants free of lead and lead compounds.

C. Fiberglass reinforced plastic (FRP) equipment with an integral colored gel coat shall not require painting, provided the color is approved by the Engineer.

D. Colors shall be selected from “deep” pigments.

2.03 PAINT SYSTEM SCHEDULE

A. All colors will be selected by the Owner based on the color charts and samples submitted by the Contractor.

B. The Contractor will be required to prepare and paint the following areas of construction:

1. All ceilings and interior walls (unless otherwise noted).

2. All hollow metal doors and frames (unless otherwise noted).

3. Any miscellaneous metal work which is not galvanized, aluminum or stainless steel, including, but not necessarily limited to, pipe and valve supports, and equipment stands and supports.

C. The following types of paints in the schedule below, as manufactured by the Sherwin-Williams Company, have been used as a basis for the paint schedule:

PAINTING SCHEDULE				
LOCATION	ITEM	TYPE OF COATING	FINISH	PRODUCT SYSTEM
Solids Handling Building Electrical Rooms	Ceiling, walls and trim	Latex Enamel	Eggshell	ProMar 200 EG-SHEL Enamel, B20W200 Series, including ProMar 200 Interior Latex primer, B28W02600 Series
All Project Areas	D.I., Steel, and PVC pipe, fittings, and valves	Alkyd	Gloss	INDUSTRIAL ENAMEL VOC, B54Z Series, including manufacturer recommended primer/ty-coat
All Project Areas	Hollow metal doors and frames, misc. steel fabrications	Aliphatic Acrylic Polyurethane	Semi-Gloss	HI-SOLIDS POLYURETHANE, B65-350 Series, including manufacturer recommended primer/ty-coat

D. For all product systems in the above schedule, primer shall be provided that is appropriate for the substrate and compatible with the specified finish coat. If substrate conditions are not appropriate for the primer specified, the manufacturers recommended primer and/or ty-coat shall be provided. The manufacturers recommended (suggested) dry film thickness shall be provided for all product systems.

PART 3 – EXECUTION

3.01 INSPECTION

A. All work performed under this section shall be carefully inspected by the Contractor and Engineer for rejections or flaws to be corrected, and for proper compliance with Plans and Specifications. Owner furnished equipment shall be inspected by Contractor for compliance with this specification. If surface damage to paint system occurs prior to delivery, and if the Engineer determines that the damage cannot be repaired at the job site, the equipment will be returned to the factory for repair and returned to the job site at no cost to the Owner.

B. Visual Inspection: The paint system will be visually inspected by the Engineer and/or Contractor. Show-through of substrate or previous coating will be grounds for rejection.

C. Testing: Dry Film Thickness (DFT) in mils on steel and galvanized substrates will be measured with a calibrated magnetic non-destructive testing apparatus. Holiday testing of concrete primary digester coating systems shall be as specified in paragraph 2.04.

D. Coverage rates for concrete and masonry surfaces will be determined by a count of empty containers. Remove or permanently deface labels of empty containers after counting by the Engineer. Remove empty, counted containers from the job site.

E. All pipe testing shall be done prior to any finish painting.

F. Leak tests and all functional tests shall be completed prior to painting unless permitted otherwise by the Engineer.

G. Starting of painting work will be construed as the installer's acceptance of the surfaces and conditions within any particular area.

H. Factory Finished/Prefinished items:

1. Unless otherwise indicated, do not include painting when factory finishing, or installer finishing is specified for such items as (but not limited to) toilet accessories, partitions, lab equipment, furnishings, cabinetwork, acoustical materials, acoustical ceilings, and metal surfaces of aluminum louvers and similar finished materials.

2. For factory finished items that require additional field painting see painting schedule, Paragraph 2.03.

I. Remove all hardware, hardware accessories, machine surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted or provide surface-applied protection prior to surface preparation and coating operations. Remove, if necessary, for the complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, reinstall the removed items by workmen skilled in the trades involved.

3.02 SURFACE PREPARATION

A. General: Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.

B. Installer must examine the areas and conditions under which painting work is to be applied. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

C. Test previously painted or primed surfaces for compatibility with painting systems.

D. Masking: Remove, mask, or otherwise protect surfaces or hardware not specified or intended to be painted or blasted, or surfaces which have received the finish coat.

E. Clean surfaces to be painted before applying coating or surface treatments. Remove oil and grease prior to mechanical cleaning. Program the cleaning and painting so that contaminants from the cleaning process will not fall onto wet, newly coated surfaces.

F. Metal Surface Preparation: All workmanship for metal surface preparation shall be in conformance with the current Steel Structures Painting Council (SSPC) specifications as listed in Table 09 90 00-1. All oil, grease, welding fluxes, and other surface contaminants shall be removed prior to blast cleaning. All surfaces shall be cleaned of all dust and residual particles of the blast cleaning operations prior to painting. Surfaces that have started to rust before they are painted shall be re-blasted.

Table 09 90 00-1. SSPC Specification Numbers	
Solvent Cleaning	SP 1
Hand Tool Cleaning	SP 2
Power Tool Cleaning	SP 3
White Metal Blast Cleaning	SP 5
Commercial Blast Cleaning	SP 6
Brush-Off Blast Cleaning	SP 7
Pickling	SP 8
Near-White Blast Cleaning	SP 10

G. Plastic Surface Preparation: All plastic surfaces to be coated shall be hand sanded to provide tooth for the coating system. Larger areas may be power sanded, or brush-off blasted, provided sufficient controls are employed so that the surface is roughened without removing excess material. Wash sanded surfaces with detergent and rinse.

H. Concrete and Masonry Preparation:

1. Prepare surfaces of concrete and masonry to be painted by removing all efflorescence, chalk, dust, dirt, grease, oils, through etching, wire brushing, fiber brushing, stoning or scraping to remove glaze.

2. Determine the alkalinity and moisture content of the surfaces to be painted by performing appropriate tests. Do not paint over surfaces where the alkalinity or moisture content exceeds that permitted in the manufacturer's printed directions.

I. Previously primed or painted surfaces. Sand lightly to remove gloss then wash with detergent and rinse.

J. Wood Preparation:

1. Touch up knots, pitch streaks and sappy spots with shellac where finish calls for interior enamel or paint. Sand all surfaces smooth and wipe clean before applying specified primer. Putty or spackle holes, splits, and scratches smooth after primer application.

2. Staining: Clean soiled surfaces, sand smooth and even and vacuum clean where finish calls for stain. Putty all nail holes, cracks, and the like with colored putty matching that of finish, after first coat has been applied. Bring putty flush with adjoining surfaces in neat, workmanlike manner. After "setting", wipe wood-paste filler across open grain wood. Wipe with grain and obtain clean surface.

3. Back prime interior and exterior trim before installation with wood prime paint.

K. Gypsum Wallboards Preparation: Fill narrow, shallow cracks and small holes with spackling compound. Rake deep wide racks and deep holes. Dampen with clear water. Fill with thin layers of drywall joint compound. Allow to dry. Sand smooth. Do not raise nap of paper.

L. Protection from sandblasting: Thoroughly mask and protect from dust all mechanical and electrical equipment in vicinity of sandblasting. Repair all painted surfaces and equipment damaged by sandblasting.

M. Non-ferrous metals shall not be painted, except where directed or called for.

N. Hot-dip galvanized items shall not be painted except where directed or called for. See elsewhere in these specifications for special treatment of hollow metal doors and frames.

3.03 APPLICATION

A. General:

1. Apply paint in accordance with the manufacturer's directions. Use applicators and techniques best suited for the type of material being applied. Do not exceed manufacturer's recommended coverage per gallon.

2. Apply additional coats when undercoats, stains, or other conditions show through the finish coating, until the paint film is of uniform finish color and appearance.

3. Apply paint to surfaces behind movable equipment and furniture the same as similar exposed surfaces. Coat surfaces behind permanently fixed equipment or furniture with prime coat and base coat only.

4. See elsewhere in these specifications for special requirements and treatment of hollow metal doors and frames.

B. Back priming: Ungalvanized structural steel, miscellaneous steel and iron work shall be back-primed prior to erection. Galvanized steel surfaces need not be back primed or painted. All ungalvanized metal brackets, angles, mechanical equipment mounting plates and miscellaneous devices mounted against concrete or masonry surfaces shall be back primed before installing.

C. Factory Finished Items (including factory primer):

1. The Contractor shall repair or have repaired all surface damage to factory finished items. The Engineer shall determine if damage can be repaired at job site or if item is to be returned to the factory. Any coating done shall be equal to the original coating in every way and compatible with the shop coats.

2. Where additional coats of paint are required, the factory applied primer shall be from the paint system selected or be compatible with it. This finish coat will be field applied. Coordinate this work with equipment manufacturers. Colors will be selected by the Engineer.

D. Hollow Metal Doors and Frames: All hollow metal doors and frames on this project shall be factory primed and field finish painted as specified in Section 08 11 13 – Hollow Metal Doors and Frames. Factory paint and field finish paint shall be spray-applied to achieve a smooth and uniform finish. Brush and roller applied finishes will not be accepted.

E. Coating inspection: Each coat of material shall be inspected and approved by the Engineer before applying succeeding coats; otherwise no credit for coats applied will be given, and Contractor assumes recoat responsibilities.

3.04 CLEANUP

A. Cleanup: During the progress of the work, remove from the project daily all discarded coating materials, rubbish, cans and rags.

B. Cleaning: Upon completion of painting work, clean all window glass and other spattered surfaces. Clean by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. Corrected Work: Correct any damages by cleaning, repairing, or replacing and painting as directed by the Engineer. Provide "Wet Paint" signs as required to protect newly-coated finishes. Remove temporary protection wrappings provided by others for protection of their work, after completion of painting operations.

D. Repair of Defective Work: Where any painted surface exhibits rust through its finished coat, all layers of primer and paint shall be removed down to the bare metal. The metal surface shall be prepared again to receive a completely new paint system. The new system shall be the same as the one removed or as selected by the Engineer.

END OF SECTION 09 90 00

DIVISION 13 – SPECIAL CONSTRUCTION

SECTION 13 34 19 – PRE-ENGINEERED METAL BUILDING SYSTEM

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The work includes the manufacture, delivery, and certification of installation of one pre-engineered metal building of the nominal length, width, eave height, and roof pitch as indicated on the drawings that accompany this bid package. The new building will not include walls, and the existing Sludge Dewatering Area will have new walls added.

1. Biosolids Storage and Handling Area: 50' span x 50' length x 17' eave height. Bay spacing as shown on the drawings.

a. Provide eave gutters and downspouts full length of each eave. Space gutters as required to handle precipitation. See section 07 62 00 – SHEET METAL FLASING AND TRIM for gutter and downspouts.

2. Sludge Dewatering Area: 50' span x 50' length x 18' eave height. Existing metal building with new stud walls to enclose space as shown on the drawings.

B. Roof and wall panels and building framing are to be sized to accommodate a dual-layer insulation system, complying with the Washington State Energy Code (2021) minimum thermal resistance requirements. See section 07 21 00 – THERMAL INSULATION for insulation specifications, and section 07 41 11 – METAL ROOF AND WALL PANELS for building sheet metal panels.

C. Provide standard wall panels for the existing Sludge Dewatering Area, to be attached to framing members using exposed fasteners. Wall panels are fastened through the insulation specified in section 07 21 00 – THERMAL INSULATION. See section 07 41 11 – METAL ROOF AND WALL PANELS for building sheet metal panels.

D. Roof system is to consist of standard roof panels with special coatings which will be attached to framing members using exposed fasteners. Roof panels are fastened through the insulation specified in section 07 21 00 – THERMAL INSULATION. See section 07 41 11 – METAL ROOF AND WALL PANELS for building sheet metal panels.

E. All parts of the metal building system envelope shall adhere to Washington State Energy Code for Commercial Building’s latest edition (2021). The metal building shall also comply with Washinton State Building Code’s latest edition (2024).

F. Endwalls are to be post and beam standard endwalls.

G. Building package is to include framed openings for all doors and other openings as shown on the drawings referenced above.

H. Manufacturer’s standard building components and accessories are to be used, provided components and accessories conform to the design indicated and specified requirements.

I. Manufacturer is to include in bid and furnish all fasteners necessary to erect the building except those needed to secure it to the concrete foundation such as anchor bolts, which will be by Contractor. Fasteners included in the bid are to be clearly identified in the bid detail.

J. Payment for all work covered by this section shall be included in the Total Bid Price for this section.

1.02 RELATED WORK

A. Section 01 30 00 – Submittals

B. Section 03 20 00 – Concrete Reinforcing

C. Section 03 30 00 – Cast-in-place Concrete

D. Section 07 21 00 – Thermal Insulation

E. Section 07 41 11 – Metal Roof and Wall Panels for building sheet metal panels

F. Section 07 62 00 – Sheet Metal Flashing and Trim

G. Section 07 92 00 – Joint Sealants

H. Section 08 11 13 – Hollow Metal Doors and Frames

I. Section 08 30 30 – Rolling Service Doors

1.03 REFFERENCE STANDARDS

A. American Institute of Steel Construction (AISC)
   1. 360, Specification for Structural Steel Members.

B. American Iron and Steel Institute (AISI)
   1. AISI North American Specification for the Design of Cold-Formed Steel Structural Members.

C. American Welding Society (AWS):
   1. AWS D1.1/D1.1M – Structural Welding Code – Steel.
   2. AWS D1.3/D1.3M – Structural Welding Code – Sheet Steel.

D. ASTM International (ASTM):
   1. ASTM A36 – Standard Specification for Carbon Structural Steel.
   2. ASTM A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
   3. ASTM A475 – Specification for Zinc-Coated Steel Wire Strand.
   4. ASTM A500 – Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   5. ASTM A529 – Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
   6. ASTM A572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
   7. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   8. ASTM A992 – Standard Specification for Structural Steel Shapes.
   9. ASTM A1011 – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
   10. ASTM A1018 – Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
   11. ASTM A1039 – Specification for Steel, Sheet, Hot Rolled, Carbon, Commercial, Structural, and High-Strength Low-Alloy, Produced by Twin-Roll Casting Process.
   12. ASTM F3125 – Standard Specification for High Strength Structural Bolts.

E. Metal Building Manufacturers Association (MBMA):

1. MBMA Metal Building Systems Manual.

F. Washington State Energy Code for Commercial Buildings (WSEC), 2021

G. Washington State Building Code, 2021

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Engineer, design, fabricate and deliver as specified herein the pre-engineered metal building systems to withstand loads from winds, gravity, structural movement including movement thermally induced, and to resist in-service use conditions that the building will experience, including exposure to the weather, without failure.

B. Design each member to withstand stresses resulting from combinations of loads that produce the maximum allowable stressed in that member as prescribed in MBMA's "Design Practices Manual."

C. Design Codes: Structural design for the metal building structural system shall be provided by the metal building system manufacturer for the following design criteria:

1. Governing building code: Washington State Building Code, 2021

2. Occupancy category: U – Utility and Miscellaneous

D. Design Loads: Basic design loads are as follows:

1. Risk Category III

2. Roof load 30 psf (snow)

3. Seismic Zone C

4. Wind load of 110 mph, Exposure "C"

5. Live Load is to include weight produced by maintenance activities, rain, erection activities, and other movable or moving loads. Wind, snow, seismic, crane or dead loads do not apply to the live load.

6. Dead Load is to include self weight of all framing members and sheeting plus a collateral load of 5 psf to account for lighting and other miscellaneous loads.

E. Structural Framing and Roof and Siding Panels: Design primary and secondary structural members and exterior covering materials for applicable loads and combinations of loads in accordance with the Metal Building Manufacturers Association's (MBMA) "Design Practices Manual."

1. Structural Steel: Comply with the American Institute of Steel Construction's (AISC) "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" for design requirements and allowable stresses.

2. Light Gage Steel: Comply with the American Iron and Steel Institute's (AISI) "Specification for the Design of Cold Formed Steel Structural Members" and "Design of Light Gage Steel Diaphragms" for design requirements and allowable stresses.

3. Welded Connections: Comply with the American Welding Society's (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures.

F. General Serviceability Limits:

1. Deflection Limits shall be in accordance with the applicable provisions of the MBMA, in the latest edition.

2. Vertical deflection limits apply for snow load (50-year mean-recurrence interval) plus collateral load, or the code required live load. The horizontal drift and deflections limits apply for the loads induced by a basic wind speed corresponding to a 10-year mean-recurrence interval.

1.05 SUBMITTALS

A. Submittals shall be provided in accordance with Section 01 33 00.

B. Product Data: Metal building system manufacturer is to submit the following items:

1. Metal building system manufacturer's product information data sheets for all building components and accessories, including trim. Accessories which are part of the bid shall be clearly identified.

2. Preparation instructions and recommendations for each product, component, and accessory to be used.

3. Storage and handling requirements and recommendations.

4. Installation methods to be used.

C. Shop Drawings: Shop drawing submittals shall be complete with one submittal for each building, for the proper identification and assembly of all building components. Submittals shall be in accordance with Section 01 33 00, Paragraph 2.03, SHOP DRAWINGS. Shop drawings shall include the following features:

1. Structural Framing: Furnish complete erection drawings stamped and prepared by or under the supervision of a professional engineer legally authorized to practice in the State of Washington. Include details showing fabrication and assembly of the metal building system. Show anchor bolts settings and sidewall, endwall, and roof framing. Include transverse cross-sections. Provide detailed information about painting of structural members, including surface preparation.

2. Roofing and Siding Panels: Provide layouts of panels on walls and roofs, details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details.

3. Piping Connections: Provide details showing how piping may be suspended from purlins and structural steel.

4. Building Accessory Components: Provide details of metal building accessory components to clearly indicate dimensions, and methods of installation.

5. Sheet Metal Accessories: Provide layouts at 1/4-inch scale. Provide details of gutters, downspouts, and other sheet metal accessories at not less than 1-1/2-inch scale showing profiles, methods of joining and anchorages.

6. Calculations prepared and signed by a Professional Engineer, legally authorized to practice in the State of Washington. Engineer shall certify that the structural framing and covering panels meet indicated loading requirements and codes of authorities having jurisdiction. Include reactions for building columns, bracing, and all applicable load cases, and calculations for rigid frames and purlins.

D. Samples: Submit samples for approval in accordance with Section 01 33 00, Paragraph 2.04, SAMPLES. Samples shall also include the following features:

1. Samples for initial selection purposes in form of manufacturer's color charts or chips showing full range of colors, textures and patterns available for metal roofing and siding panels with factory-applied finishes.
2. Samples for verification purposes of roofing and siding panels. Provide sample panels 12-inch long by actual panel width, in the profile, style, color and texture indicated. Include clips, battens, fasteners, closures and other panel accessories.

E. Certifications: The following certifications of qualifications shall be submitted:

1. Installation Certificates: Provide installation certificates signed by the metal building manufacturer certifying that the installer complies with requirements included under the "Quality Assurance" Article.

2. Welder's Certificates: Certification of welder qualifications shall be furnished as specified by the Project Engineer.

F. Bill of Materials: Bill of Materials shall be furnished and shall include item weights.

1. Preventative Maintenance Manual.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide pre-engineered metal buildings manufactured by a firm experienced in manufacturing metal buildings systems that are similar to those indicated for this project and have a record of successful in-service performance.

B. Weldments, Welder, and Weld Inspection Qualifications: Welding inspection and welding inspector qualification for structural steel shall be in accordance with AWS D1.1, "Structural Welding Code – Steel", latest edition. Welding inspection and welding inspector qualification for cold-formed steel shall be in accordance with AWS D1.3, "Structural Welding Code – Sheet Steel", latest edition.

C. Design Criteria: The drawings indicate sizes, profiles and dimensional requirements of the pre-engineered metal building system. Metal building systems having equal performance characteristics with deviations from indicated dimensions and profiles may be considered, provided deviations to not change the design concept or intended performance. The burden of proof for equality is on the proposer.

D. Erector Qualifications: All products listed in this section are to be installed by a single installer who has demonstrated experience in installing products of the same type and scope as specified.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver prefabricated components, sheets, panels, and other manufactured items so they will not be damaged or deformed. Package wall and roof panels for protection against transportation damage.

B. Store and handle materials in accordance with manufacturer's instructions. Store materials on a flat, level surface, raised above the ground with adequate support to prevent sagging. Protect materials and finish during storage, handling, and installation to prevent damage.

C. Maintain environmental conditions (temperature, humidity, ventilation) within limits recommended by the manufacturer for optimum results. Do not install products under environmental conditions outside of the manufacturer's absolute limits.

1.08 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Building System Warranty: The manufacturer shall warrant the metal building system against failure due to defective material or workmanship for a period of one (1) year from date of shipment.

C. Roof Weathertightness and Roof and Wall Panel Finish Warranty: See Section 07 40 00.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with specified requirements, provide metal building systems provided by one of the following, or approved equal:

1. Butler Manufacturing Co.
2. CECO Building Systems
3. Star Building Systems, H. H. Robertson Co.
4. American Buildings
5. Nucor Building Systems

2.02 MATERIALS

A. Hot-Rolled Structural Steel Shapes: Steel for hot rolled shapes must conform to the requirements of ASTM A36, A572 or A992, with minimum yield of 36 or 50 ksi, respectively.

B. Steel for built-up sections must conform to the requirements of ASTM A1011, A1018, A529, A572 or A36 as applicable, with minimum yield of 36, 50, or 55 ksi as indicated by the design requirements

C. Steel Members Fabricated from Plate or Bar Stock: Provide 50,000 psi minimum yield strength. Comply with ASTM A529, ASTM A1011 or ASTM A572.

D. Square and Rectangular Tube must conform to the requirements of ASTM A500 Grade B with a minimum yield strength of 46 ksi.

E. Steel Members Fabricated by Cold Forming: Comply with ASTM A607, Grade 50, galvanized. Steel for Cold-Formed sections must conform to the requirements of ASTM A1011 or A1039 Grade 55 or ASTM A653 Grade 55 with minimum yield strength of 55 ksi.

F. Bolts for Structural Framing: Comply with ASTM A307 or ASTM F3125 as necessary for design loads and connection details.

G. Shop Primer for Ferrous Metal: Fast-curing, lead-free, abrasion-resistant, rust-inhibitive primer selected by the manufacturer for compatibility with substrates with types of alkyd finish paint systems indicated and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure. Comply with FS TT-P-86, Types I, II or III.

H. Primary structural steel, including rigid frames and endwalls is to be hot-dip galvanized. Clean surfaces to be galvanized of loose mill scale, rust, dirt, oil, grease and other matter precluding galvanizing bond. Follow procedures of SSPC-SP6 for Commercial Blast Cleaning.

I. Steel used to form purlins, girts, and eave struts must meet the requirements of ASTM A1011 or ASTM A1039 Grade 55 for primed material or ASTM A653 Grade 55 for galvanized material with a minimum yield of 55 ksi. Gauge to be determined by design to meet specified loading conditions. Minimum hot-dip galvanized coating thickness shall be G90.

J. X-bracing will comply with ASTM A529 for rod bracing, ASTM A992 for angle bracing, or ASTM A475 for cable bracing.

2.03 PRIMARY FRAMING

A. Rigid Frames: Fabricated as a welded built-up “I” sections or hot-rolled sections.

1. Frame Design: Symmetrical Gable.
2. Frame Type: Clear-Span.

B. Rigid Frame Columns and Rafters: The frame columns are to be of a uniform depth, and the rafters tapered.

C. End Wall Frames and Roof Beams: End wall columns are to be fabricated of cold-formed sections, mill-rolled sections, or built-up “I” sections, dependent on design requirements. Roof beams are to be fabricated of either mill-rolled sections or built-up “I” sections, depending on design requirements.

D. Finish: Primary framing finish is to be hot-dip galvanized.

E. Field Bolted Connections: All field bolted connections shall be designed and detailed utilizing ASTM F3125 Grades A325 or A490 as required by design.

2.04 SECONDARY FRAMING

A. Purlins and Girts: Purlins and girts shall be cold-formed "Z" sections with stiffened flanges. Flange stiffeners shall be sized to comply with the requirements of the latest edition of AISI S100. Purlins and girts shall be pre-punched at the factory to provide for field bolting to the rigid frames. They shall be simple or continuous span as required by design. Connection bolts will be installed through the purlin or girt webs, not purlin or girt flanges. Purlins and girts shall comply with the following criteria:

1. Purlin Criteria:

a. Depth: 8”
b. Maximum Length: To be determined by design.
c. Finish: Gray Primer

2. Girt Criteria:

a. Depth: 8”
b. Maximum Length: To be determined by design.
c. Finish: Gray Primer

B. Eave Struts: Equal flange, cold-formed “C” sections, with the following criteria:

1. Depth: 8”
2. Maximum Length: To be determined by design.
3. Finish: Gray Primer

C. Base Framing: Base framing shall comprise of a base girt with flashing. Flashing shall comply with Section 07 62 00, SHEET METAL FLASHING AND TRIM.

2.05 ROOF PANELS

A. Roof Assembly Performance Requirements: Provide roof products and assemblies meeting the following requirements:

1. Assemblies meet UL-580, Class 90.
2. Assemblies meet Class A rating in accordance with UL-790 for External Fire.

B. Roof panels comply with Section 07 41 11 – Metal Roof and Wall Panels.

2.06 WALL PANELS

A. Wall panels will comply with Section 07 41 11 – Metal Roof and Wall Panels.

2.07 SHEET METAL ACCESSORIES

A. Provide coated steel sheet metal accessories with coated steel roofing and siding panels.

2.08 ACCESSORIES

A. Walk Doors: Refer to Section 08 11 13, and reference contract drawings.

B. Rolling Service Doors: Refer to Section 08 30 00, and reference contract drawings.

C. Metal Building Insulation: Refer to Section 07 21 00, and reference contract drawings.

2.09 FABRICATION

A. General: Design prefabricated components and necessary field connections required for erection to permit easy assembly and disassembly. Additional requirements are as follows:

1. Fabricate components in such a manner that once assembled, they may be disassembled, repackaged and reassembled with a minimum amount of labor.

2. Clearly and legibly mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams and instruction manuals.

3. Shop Connections: Provide bolted, or welded shop connections.

4. Field Connections: Provide bolted field connections.

B. Structural Framing:

1. Shop-fabricate framing components to indicated size and section with base plates, bearing plates and other plates required for erection, welded in place.

2. Provide holes for anchoring or connections, shop-drilled or punched to template dimensions.

3. Secondary structural connections (purlins and girts) to be ordinary bolted connections, which may include welded clips.

a. Zee Purlins: Fabricate purlins from cold-formed "Z" sections with stiffened flanges. Size flange stiffeners to comply with the requirements of the latest edition of AISI. Connection bolts will install through the webs, not the flanges.

b. Girts: Girts must be simple or continuous span as required by design. Connection bolts will install through the webs, not the flanges.

4. The manufacturer is responsible for all shop welding inspections in accordance with the manufacturer's IAS Accreditation. Special inspections by the buyer or owner may be done in the manufacturer's facility and must be noted on the contract documents.

5. Non-Destructive Testing (NDT) – NDT shall be performed and documented as required by the governing building code for this project.

C. Bracing:

1. Diagonal Bracing:

a. Longitudinal bracing in the roof and/or walls need not be furnished where it can be shown that the diaphragm strength of the roof and/or wall covering is adequate to resist the applied wind or seismic forces. Diagonal bracing in the roof and sidewalls may be used to resist longitudinal loads (wind, crane, etc.) in the structure if diaphragm action cannot be used.

b. Diagonal bracing will be furnished to length and equipped with hillside washers and nuts at each end. It may consist of rods threaded at each end or galvanized cable with suitable threaded end anchors. If load requirements dictate, bracing may be of structural angle and/or tube, bolted in place.

PART 3 – EXECUTION

3.01 PREPARATION

A. Confirm field dimensions and examine substrates, areas, and conditions within which work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

B. Before erection proceeds, survey elevations and locations of concrete and masonry bearing surfaces and locations of anchor rods, bearing plates and other embedment's to receive structural framing, with Erector present, for compliance with requirements and metal building system manufacturer's tolerances.

C. Provide temporary shores, guys, braces, or other supports as necessary during construction to keep structural framing secure and in alignment against temporary construction loads equal in intensity to design loads. Remove temporary supports when permanent structural framing connections and bracing are in place, unless otherwise indicated.

3.02 INSTALLATION

A. The erection of the building system shall be performed by a qualified erector, in accordance with the appropriate erection drawings, erection guides and /or other documents furnished by manufacturer, using proper tools, equipment and safety practices.

B. Erect framing in accordance with MBMA Metal Building Systems Manual, Chapter IV Common Industry Practices.

C. There shall be no field modifications to any primary structural members except as authorized and specified by the building manufacturer.

3.03 PROTECTION AND CLEANING

A. Protect installed components until completion of the project.

B. Touch-up damaged coatings and finishes and repair minor damage. Replace damaged products, if necessary, prior to substantial completion. Clean exposed surfaces using non-abrasive materials and methods recommended by the manufacturer of material and product being cleaned.

C. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 13 34 19

DIVISION 22 – PLUMBING

SECTION 22 00 00 – PLUMBING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work shall consist of all labor, materials, equipment and incidentals necessary to completely furnish, install, test and clean all plumbing systems. The systems shall include, but not be limited to, all piping, fittings, hangers, valves, fixtures and equipment indicated on the Plans and/or specified herein including all appurtenances necessary to make the systems complete and fully operational.

B. Plumbing systems shall be, but not be limited to, the following:

1. Potable water to 5 feet outside of buildings.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 03 30 00 – Cast-In-Place Concrete

C. Division 26 – Electrical

D. Division 33 – Utilities

E. Division 40 – Process Interconnections

1.03 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit product data sheets for all plumbing materials and equipment used on the project.

1.04 QUALITY ASSURANCE

A. Comply with the requirements of Section 40 02 11 – Process System Basic Materials and Methods.

B. All work shall be done by people fully qualified and experienced in the work to be performed.

C. Provide the services of a manufacturer's representative to completely inspect and start up the pumps after installation.

1.05 PROJECT CONDITIONS

A. Obtain exact location and mounting heights of fixtures from details on Plans. Do not order any fixtures until casework shop drawings have been reviewed. Coordinate all fixture locations with casework manufacturer.

B. Where trim and rough-in is not specified, furnish as necessary for the completion of job and of same quality as elsewhere specified.

C. All trim chrome plated.

D. Escutcheon plates for all lines through cabinets and walls.

E. All counter top sinks set on bead of clear silicone sealant.

F. Install trim as specified and connect to equipment furnished by others, and equipment furnished by Owner.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Specifications are based on products of the following manufacturers:

American Standard	Nibco-Scott
Josam	BEECO
Epco	Fee & Mason
Bradley	Precision Plumbing Products
Eljer	Kohler
Zurn	

B. Equivalent products by the following manufacturers are acceptable, subject to approval of the Engineer.

Capitol Manufacturing	Watts
American Granby Co.	Neptune
Crane	ITT Grinnell
Unistrut	Wade
Hammond Valve Corp.	Speedstrut
Zurn	Cla-Val
J.R. Smith	

C. Each type of equipment shall be by a single manufacturer, for example, all plumbing fixtures, roof and floor drains, water heaters, etc.

2.02 DRAIN, WASTE, AND VENT PIPE AND FITTINGS, BELOW GROUND

A. Below ground drain pipe and fittings shall be as called out on the Plans, in accordance with Section 40 20 11 – Process Piping, and as specified herein.

B. Below ground drain pipe shall be ductile iron, cast iron, or ABS as indicated on the Plans and specified in Section 40 20 11 – Process Piping.

2.03 DRAIN, WASTE, AND VENT PIPE AND FITTINGS, ABOVE GROUND

A. Above ground pipe and fittings shall be as called out on the Plans, in accordance with Section 40 20 11 – Process Piping, and as specified herein.

B. Above ground pipe and fittings shall be solvent weld DWV PVC, conforming to ASTM D2665 and ASTM D3311.

2.04 WATER PIPING AND FITTINGS, BELOW GROUND

A. Below ground water pipe and fittings shall be as called out on the Plans, in accordance with Section 40 20 11 – Process Piping, and as specified herein.

B. Below ground water pipe shall be PEX or as indicated on the Plans and specified in Section 40 20 11 – Process Piping.

C. Disinfection shall be done in accordance with Section 33 13 00 – Disinfecting of Water Utility Distribution.

2.05 WATER PIPING AND FITTINGS, ABOVE GROUND

A. Above ground water pipe and fittings shall be as called out on the Plans, in accordance with Section 40 21 11 – Process Piping, and as specified herein.

B. Dielectric connections: EPCO Sales, Inc.

1. Unions: 2 inches and smaller, 175 psi minimum working pressure, ends to match connections.

C. Disinfection shall be done in accordance with Section 33 13 00 – Disinfecting of Water Utility Distribution.

2.06 WATER ACCESSORIES

A. Water hammer arrestor: All stainless-steel construction with welded nested bellows, sized and located in accordance with Plumbing and Drainage Institute Standard PDI-WH201. Josam Absorption.

B. Drain valves: 1/2-inch globe valves at low points in cold water and hot water systems.

C. Valves: In accordance with Section 40 21 12 – Process Valves and Gates.

2.07 HANGERS, ANCHORS AND GUIDES

A. Support pipe in accordance with Section 40 02 11 – Process System Basic Materials and Methods.

B. Provide galvanized pipe hangers to support horizontal piping. Secure vertical piping to wall with galvanized offset clamps or other supports as approved by the Engineer.

2.08 FLOOR DRAINS

A. As called out on the Plans; or

1. Zurn Z-551, medium duty cast iron body, outlet size of connected line, heavy duty cast iron slotted grate. Size as shown on the Drawings;

2. Zurn Z-505 heavy duty, cast iron body, outlet size of connected line, heavy duty cast iron slotted grate. Size as shown on the Drawings;

3. Zurn Z-455 drain with integral cleanout. Cast iron body, outlet size of connected line, heavy duty cast iron slotted grate. Size as shown on the Drawings.

B. Provide cast iron floor drain cleanout where indicated on Plans or required by code, Zurn Model Z-1400 or approved equal.

C. Provide acid-resistant epoxy coating where required or indicated on Plans. Coating drains shall be provided wherever corrosive liquids will be present.

D. Prefabricated Trench Drain: Prefabricated trench drain shall be ZURN Model Z-886 HD or approved equal with steel edge rail and ductile iron slotted grate, length and configuration as indicated on the Plans. Provide manufacturers standard end cap and outlet accessories as required for a complete installation.

2.09 ROOF DRAINS

A. Roof drains shall be as called out on the Plans; or

1. Zurn Z-121, 12-inch diameter cast iron roof drain with top-set deck plate, membrane flashing clamp, and low silhouette poly dome. Provide static drain body extension in length as required for the roofing system material thickness specified and shown on the Plans.

2. Provide drain with Zurn model Z-190, or approved equal, cast iron vertical expansion joint at interior connection to drain leader piping.

3. Drain outlet nozzle shall be as shown on the Plans, Zurn model Z-199, or approved equal.

2.10 HOSE BIBBS

A. Hose bibbs shall be as specified in Section 40 20 12 – Process Valves and Gates.

2.11 RUBBER HOSE

A. Interior/exterior wash down hose shall be 3/4-inch premium rubber with standard garden hose thread connections at each end. Hoses shall be suitable for use with water pressures up to 100 PSI.

B. Provide the following rubber hose lengths and quantities. Locate as directed by the Engineer:

HOSE SCHEDULE		
Type	**Length**	**Quantity**
3/4-inch Premium Rubber Hose	50-feet	2

PART 3 – EXECUTION

3.01 GENERAL

A. Install materials and equipment as shown and specified in accordance with governing codes and standards.

B. Rough in work as construction progresses to minimize cuttings, eliminating interferences.

C. Locate equipment requiring service and maintenance in fully accessible positions. Furnish access doors for this purpose if required.

D. Runs and arrangement of piping shall be as shown, subject only to such changes and modifications as may be necessary to suit actual conditions at the building, to avoid interference or conflict with work of other sections. Install piping concealed in floor or in wall construction or excavations to prevent delay to other work and to allow ample time for necessary tests and approvals.

E. Carefully check installations against structural, architectural, and mechanical drawings and note where walls, ceilings, beams, and pipe shafts are furred or enclosed. Piping shall not be furred in or covered before approval by the Engineer.

F. Hang horizontal piping runs from ceilings or construction above, located as closely as possible to structural members or bottom of slabs or beams, to obtain maximum head room. If a condition should arise where clearance below such piping would interfere with finished ceiling or wall surfaces, the Engineer shall be notified, and no work shall be installed until approved.

G. Connections as shown are intended that waste, soil, water, and other services be fully connected to each individual piece of apparatus with required piping, unions, flanges, valves, check valves, and other needed appurtenances.

H. Each branch pipe shall be controlled by a gate valve where it connects to the supply main or riser. Each toilet room, group of fixtures, or isolated fixture shall be separately controlled by valves in an accessible location and provided with access doors where necessary.

I. Install swing joints or expansion loops to allow for pipe expansion where necessary. Securely anchor pipes so expansion can occur at these joints.

J. Make joints between dissimilar piping by dielectric unions or flanges.

K. Use reducing fittings wherever a change in pipe size occurs. The use of bushings will not be permitted.

L. Provide piping with unions to permit alterations and repairs.

3.02 INSTALLATION OF DRAINAGE, WASTE AND VENT SYSTEMS

A. Make connection to the sewer system as required.

B. All underground drainage and waste pipe shall be pitched a minimum of 2 percent slope in the direction of flow, unless otherwise indicated or approved by the Engineer. Make changes in direction of drainage and waste lines with 45 degree wyes, long turn wyes, or sweep bends. Use long turn fittings wherever space permits. Provide waterproofing around all lines penetrating through foundation walls and floor slabs.

C. Check and verify all inverts of lines within and outside the building.

D. Install traps on fixtures and equipment requiring connection to the sanitary system. Traps shall be of same size as the pipe on which they occur. Provide cleanouts for all traps. Vent traps as shown.

E. Cleanouts: Provide as shown, at the base of each stack, each change in direction, and on a minimum of 50 foot centers on horizontal runs. Cleaning screws, deckplates and other plugs shall be made up with graphite and oil only, use no grease or cement.

F. Pitch vent lines to allow for condensation drainage.

G. Where vent piping is run concealed in partitions, obtain exact dimensions and locations of partitions and use special care to assure that lines are maintained in their proper locations.

H. Joints:

1. Joints for hub and spigot pipe shall be ASTM C 564 rubber gasket or "No-Hub".

2. Cast iron “No-Hub” joints shall be made up with neoprene sleeve, stainless steel shield and clamps sized to fit “No-Hub” fittings used. Application as recommended by the manufacturer, precalibrated torque wrench shall be used to tighten clamps.

3. Copper tubing and fittings: Assembled with 50/50 tin-antimony solder. Cut copper tubing square; ream, butt, and size; clean tube ends and fittings well; apply heat, solder. Remove excess solder.

I. Flashing: Flash vents as shown on drawings penetrating the roof structure with roofing manufacture standard.

3.03 INSTALLATION OF COLD WATER SYSTEMS (POTABLE AND NONPOTABLE)

A. Install cold water system as shown. Piping shall traverse the building at the locations shown, or as required to service fixtures requiring cold water, and with the pipe sizes shown or specified. The service shall be valved at the point shown. Locate underground service a minimum of 30 inches below grade. Fit pipe connections to mechanical equipment with unions for ease of dismantling.

B. Conceal cold water piping in finished areas.

3.04 INSTALLATION OF HOT WATER SYSTEMS (POTABLE AND NONPOTABLE)

A. Begin the installation of the hot water piping system at the water heater and traverse the building at the locations shown, or as required to service fixtures requiring hot water, and with the pipe sizes indicated. Fit piping around the heater and equipment with sufficient number of unions to assure easy dismantling for maintenance.

B. Conceal hot water piping in finished areas.

3.05 HANGERS, ANCHORS, GUIDES

A. Support piping to maintain required grading and pitching of lines, to prevent vibration, and to secure piping in place. Provide for expansion and contraction.

B. The spacing of hangers shall be not greater than 10 feet on center for pipe larger than 1 inch; 8 feet for 1-inch pipe; 6 feet for pipe 3/4 inch and smaller.

C. Support vertical lines at bases by an approved hanger placed in the horizontal line near the riser.

D. Do not hang piping from the ductwork or piping of other trades. A common trapeze, properly supported and pitched, may be used.

E. Make pipe sleeves watertight with caulked lead joints on both sides of a foundation wall. Pipe and hangers of dissimilar material shall have a plastic sleeve heat shrunk on pipe in contact with hanger.

3.06 INSTALLATION OF PLUMBING FIXTURES

A. Protect fixtures and equipment during construction. Replace if damaged.

B. Verify all dimensions by field measurements. Verify that all plumbing fixtures may be installed in accordance with pertinent codes and regulations. Exact location and mounting height of plumbing fixtures shall be obtained from the architectural drawings.

C. Fasten plumbing fixtures securely to supports or building structure. Secure supplies behind or within wall construction to provide rigid installation.

D. Set fixtures level and square, in accordance with fixture manufacturer’s written instructions, with relation to interior finish, floor, and wall lines and pertinent codes and regulations. Space toilet room fixtures equidistant and at the same height from floor as shown.

E. Install stop valve in an accessible location in the water connection to each fixture.

F. Seal fixtures to walls and floors using clear silicone sealant.

G. When installed, cover metal fixture trimmings with noncorrosive grease or approved protective tape and maintain until construction work is complete. Upon completion, remove labels, clean and polish fixtures and trimmings.

3.07 TESTS AND ADJUSTMENTS

A. Test piping in accordance with Section 40 01 11 – Process System Testing in the presence of the Engineer.

1. Correct leaks in joints or evidence of defective pipe or fittings by replacing defective parts with new joints and materials.

2. Adjust apparatus to function as specified

3. Apply water test to all parts of the drainage waste and vent system before pipes are concealed or fixtures are set in place. Test may be applied in sections. Close openings of each system to be tested except the highest openings on the finished system. Fill system with water to the highest opening plus 6 feet. Water shall remain in the system for at least 24 hours, after which time no leaks at any joint or lowering of the water level at the overflow shall be visible.

4. Hydrostatically test cold and hot, potable and nonpotable water supply systems in accordance with Section 40 01 11 – Process System Testing.

B. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning units, then retest.

C. Adjust water pressure at faucets, shower valves, and flush valves to provide proper flow and stream.

3.08 PAINTING AND MARKING

A. Painting shall be in accordance with Section 09 90 00 – Painting and Coating.

B. Marking shall be in accordance with Section 40 03 11 – Process System Coding and Identification.

END OF SECTION 22 00 00

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

SECTION 23 00 00 – HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work included: Provide heating, ventilation, and air conditioning systems where shown on the Plans, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:

1. Heating and cooling units.

2. Heating and cooling controls.

3. Ductwork, registers and grilles.

4. Exhaust Systems.

5. Permits.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 78 00 – Operation and Maintenance Manuals

C. Section 03 30 00 – Cast-In-Place Concrete

D. Section 05 50 11 – Miscellaneous Metals

E. Section 07 62 00 – Sheet Metal Flashing and Trim

F. Section 08 11 13 – Hollow Metal Doors and Frames

G. Division 26 – Electrical

1.03 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit the following product data:

1. Manufacturer’s catalogs, samples, and other items needed to fully demonstrate the quality of the proposed materials and equipment.

C. Record Drawings:

1. Comply with provisions of Division 01.

2. Include a copy of the record drawings in each copy of the operation and maintenance manual described below.

D. Upon completion of this portion of the work, and as a condition of its acceptance, deliver to the Engineer six copies of an Operation and Maintenance Manual compiled in accordance with the provisions of Section 01 78 00 – Operation and Maintenance Manuals.

1.04 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

B. Codes and regulations:

1. In addition to complying with the specified requirements, comply with pertinent regulations of governmental agencies having jurisdiction.

2. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirement will govern when so directed by the Engineer.

C. Without additional cost to the Owner, provide such other labor and materials as are required to complete the work of this section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.

D. The material specified shall be furnished by reputable manufacturers, qualified and experienced in the manufacture of such equipment. All equipment specified shall be designed, constructed, and tested in accordance with the best practices and methods of the trades involved.

E. Electrical wiring and equipment with electrical connections, including the motors, and control and safety devices, shall be Recognized Electrical Testing Laboratory (RETL) listed and labeled, or the Contractor shall obtain approval from the Washington State Department of Labor and Industries for the electrical portions of the equipment.

1.05 PRODUCT HANDLING

A. Comply with provisions of Division 01 and manufacturer's recommendations.

PART 2 – PRODUCTS

2.01 DUCTWORK – LOW VELOCITY

A. Material: Galvanized steel or aluminum sheet; steel of following gauges when longest dimension of duct cross section is stated:

Under 12 inches	26 ga.
13 inches to 30 inches	24 ga.
31inches to 60 inches	22 ga.

B. Hangers and Joints:

1. Rectangular Ducts: Longitudinal joints at corners Pittsburgh Lock or double seam, longitudinal joints in flat surface double break.

2. Over 15 Inches: Sides, top, bottom diamond break stiffening.

3. Up to 24 Inches: Transverse joints in wide surface 1-1/4 inches standing seam or button punched every 6 inches or "S" cleat, seams not over 36 inches apart; transverse joints on narrow surface same as wide surface except drive cleats instead of "S" cleats; hanger 1-inch x 1/8-inch strap iron screwed to duct or saddle type hanger of 1-inch x 1-inch x 1/8-inch angle with 3/16-inch rods.

4. Plenum Changers: Joints, seams and stiffening same as ductwork of equivalent dimensions.

5. Ductwork: Made as airtight as possible.

C. Mitered elbows shall have turning vanes as manufactured by Barber-Colman Co. or equal.

2.02 DUCT SEAMS

A. Seal all duct seams, transverse and longitudinal, air tight with 6-ounce canvas secured in place with “EC8OO” or equal duct sealing compound, an approved lagging adhesive, or duct tape.

2.03 FLEXIBLE CONNECTION TO EQUIPMENT

A. All types of fan units, unless specifically detailed otherwise, shall be isolated from the ductwork with flexible connections. Connections shall have at least 4 inches of flexible material between the metal parts being isolated and shall be installed with approximately 1 inch of slack flexible material. Flexible connectors shall be of canvas cloth and carry the UL label and be approved by the State of Washington Fire Marshal with a copy of the approval enclosed with submittal.

2.04 VIBRATION ISOLATION AND FLEXIBLE CONNECTIONS

A. At duct connection to equipment, provide vent-fabric, approved by the governmental agencies having jurisdiction, flexible connections with a minimum of 6 inches full length. Vent-fabric, Duro Dyne or equal.

B. Support all compressors or other motor bearing equipment via vibration isolation pads, unless noted otherwise. Place pads under equipment in accordance with manufacturer’s recommendations. Amber/Book “Ampad” type NR pad or equal.

C. Provide additional sound isolation as required to limit the noise level in conditioned space to a maximum of NC-40.

D. Mount larger vibrating equipment when so noted on “ThyCurb Vibrocurbs” with a minimum static deflection of 1 inch.

E. Isolate piping from the structure in a manner to prevent transmission of vibration.

2.05 PREFABRICATED ROOF CURBS

A. Prefabricated roof curbs shall be constructed of 18-gauge galvanized steel or 0.063-inch thick aluminum formed on three sides with only one welded seam to ensure a strong square curb. Wood nailers for attaching fan and/or vent hood shall have notched and lapped joints to ensure strength and durability. A rubber seal shall be provided between the curb and fan/vent hood housing to ensure proper performance of the fan, prevent insects and moisture from entering, and to reduce vibration transmission to the ductwork. Curbs shall have 1-inch minimum thick fiberglass insulation, securely attached at top and bottom with an insulation tray. An optional liner shall be provided to protect the insulation from the airstream. Roof curbs shall also be provided with an optional damper tray.

B. Prefabricated roof curbs shall be as manufactured by Greenheck Fan Corporation, Schofield Wisconsin, or Engineer approved equal. Roof curbs shall be of a model, size and configuration as called out on the Plans, or recommended by the manufacturer. Roof curb configuration and height shall be suitable for the type of roof being installed on. An optional raised cant shall be provided at insulated flat roofs, or where indicated on the Plans.

2.06 INSULATION

A. General:

1. Provide materials complying with NFPA Bulletin 90-A, as determined by UL method NFPA-ASTM E84, and complying with the governing code, with flame spread rating under 25 and smoke developed rating under 50.

2. Where vapor barriers are used, provide intact and continuous throughout.

3. Acceptable manufacturers:

a. Owens/Corning Fiberglass.

b. Johns-Manville

c. Certainteed

B. Application:

1. Provide duct insulation as required per table 5-11 of Washington State Energy Code, latest revision.

2.07 BALANCING DAMPERS

A. Provide balancing dampers, splitter dampers, or adjustable turning vanes as indicated on the Plans.

2.08 FIRE DAMPERS

A. Provide fire dampers as indicated on the Plans. Provide UL rated static fire dampers, Greenheck model FD-150X with integral sleeve or engineer approved equal.

2.09 BACKDRAFT DAMPERS

A. Backdraft dampers shall be suitable for mounting inside fabricated wall collar or damper tray, or for direct mounting in wall with louver assembly.

B. Exhaust dampers shall be Greenheck Model WD-300 series for sidewall fans and WD-100 series for roof mounted fans.

C. Supply dampers shall by Greenheck Model VCD-23 series low-leakage dampers with 115-volt motor packs. Motor pack torque and model selection shall be based on the damper size. Unless otherwise specified or shown on the Plans, damper motors shall operate on a power open and spring return principle to assure damper closure in the event of an electrical failure.

D. Materials:

1. Frame: 16-gauge galvanized steel.

2. Blades: 16-gauge galvanized steel with TPE seals.

3. Axles: 1/2-inch Type 304 stainless steel with synthetic bushings.

4. Linkage: Type 304 stainless steel.

2.10 AIR OUTLETS

A. Ceiling Diffusers: Unless otherwise specified or called out on the Plans, ceiling diffusers shall be adjustable curved blade four-way diffuser, with 0.055-inch minimum T6 extruded aluminum, Shoemaker CB40 Series, or approved equal. Color: White. Provide square to round duct adapter as required. See Plans for required sizes. Provide optional adjustable apposed-blade damper where indicated on the Plans.

B. Supply Diffusers/Registers: Supply diffusers shall be double-deflection type, constructed of heavy gauge aluminum with individually adjustable airfoil blades, 3/4-inch maximum blade spacing, vertical front blades, and nylon blade bushings, Shoemaker 904 Series, Titus model 300FS, or approved equal. Color: White. Provide square to round duct adapter as required. See Plans for required sizes. Provide optional adjustable apposed-blade damper where indicated on the Plans.

C. Return Air Grilles: Unless otherwise specified or called out on the Plans, return air grilles shall be 1/2-inch x 1/2-inch x 1-inch aluminum lattice (egg crate) with 20-gauge minimum extruded aluminum frame, 90 percent free area, Shoemaker 600 Series, Titus model 50F, or approved equal. Color: White. See Plans for required sizes.

D. Provide factory-applied or site-applied black coating on the inside of all air outlets and connecting plenums.

2.11 EXTERIOR LOUVERS

A. Exterior wall louvers shall be extruded aluminum stationary louvers, Greenheck Model ESD-435.

B. Materials:

1. Frame: Heavy gauge 6063T5 extruded aluminum, 4-inch x 0.081-inch nominal.

2. Blades: J style, 6063T5 extruded aluminum, 0.081-inch nominal thickness, positioned at 45-degree angle, 4-inch centers.

3. Birdscreen: 1/2-inch x 0.063-inch aluminum square mesh wire.

4. Louvers shall be installed flush to exterior wall surface with internal clip angles, or other means of attachment to wall. Exterior perimeter flanges will not be allowed.

5. Finish: Kynar 70% (2 coat), color as selected by the Engineer from manufacturer’s standard colors.

C. Performance:

1. Static Pressure Drop, Intake: 0.04-inch WC at 530 fpm free area velocity.

2. Static Pressure Drop, Exhaust: 0.04-inch WC at 500 fpm free area velocity.

3. Water Penetration: 0.02 ounce per square foot at 705 fpm free area velocity.

D. Door louvers shall be as specified in Section 08 11 13 - Hollow Metal Doors and Frames and as called out on the Plans.

2.12 SUPPLY AND EXHAUST FANS

A. General:

1. All supply and exhaust fans and accessories shall be as manufactured by Greenheck Fan Corporation, Schofield Wisconsin, or Engineer approved equal.

2. All fans shall bear the AMCA certified ratings seal for air and sound performance and shall be UL listed.

3. Fans installed in hazardous locations shall be constructed entirely of spark-resistant materials and shall be provided with explosion proof motors and disconnect switches.

4. Belt drive fans shall be supplied with an auto belt tensioner.

5. Provide OSHA compliant motor-side guard on fans where indicated on the Plans or required by code.

6. Spare Parts:

   a. Belt drive fans shall be supplied with and one spare set of all drive belts.

   b. Fans with filters or filter boxes shall be supplied with one spare set of all filters.

   c. Spare parts shall be packaged with protective coverings for storage and identified with labels describing the contents.

B. Centrifugal Inline Fans:

1. Centrifugal inline fans shall be backward inclined direct drive units, as called out on the Plans. Inline fans shall be supplied with fan housing, housing supports, and dampers, as called out on the Plans. Discharge configuration shall be as shown on the Plans.

2. Fan Wheel: The fan wheel shall be a non-overloading, backward inclined centrifugal wheel constructed of aluminum. The wheel cone and fan inlet shall be matched and have precise running tolerances for maximum performance and operating efficiency. Single thickness blades shall be securely riveted or welded to a heavy gauge back plate and wheel cone. Fan wheel shaft shall be constructed of stainless steel. Fan rub ring and motor cover shall be constructed of aluminum. All fasteners shall be stainless steel.

3. Fan Housing: The fan housing shall be square design, constructed of heavy gauge aluminum and provided with duct mounting collars. The housing shall be insulated with 1-inch fiberglass duct liner for noise reduction. The housing and bearing supports shall be constructed of heavy gauge bolted and welded steel construction to prevent vibration and to rigidly support the shaft and bearing assembly. Housing supports shall be constructed of structural steel with formed flanges. The drive frame shall be constructed of welded steel and support the motor. Adequate access panels shall be provided to permit easy access to internal fan components. All fasteners shall be stainless steel. Provide neoprene mounts/hangers for vibration isolation. The Contractor shall provide inlet and outlet flexible duct connections as specified and shown on the Plans.

4. Dampers: Back draft dampers shall be as specified and may be factory-mounted to the fan or field-installed within the duct.

5. Fans shall be statically and dynamically balance in accordance with AMCA Standard 204-05 and bear the AMCA certified ratings seal for specified air and sound performance.

C. Fan Motors:

1. Fan motors for direct-drive supply and exhaust fans shall be an electronic commutation (EC) type specifically designed for fan applications, Greenheck Vari-Green, or approved equal. AC induction type motors are not acceptable. Motors shall be permanently lubricated with heavy-duty ball bearings to match the fan load and prewired to the specific voltage and phase. Internal motor circuitry shall convert 120V, single phase, 60 Hz AC power supply 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 a potentiometer dial mounted on the motor, or a remote dial where indicated on the Plans. Motor shall be a minimum of 85 percent efficient at all speeds.

2. Fan motors on belt drive supply and exhaust fans shall be squirrel cage induction type motors suitable for use on a 120V single-phase or 480V three-phase (as indicated on the Plans), 60 Hz AC power supply. Motors 1 HP and greater in size shall be NEMA Premium® efficient.

3. Fans located in hazardous locations, or where required by code, shall be provided with explosion-proof motors, suitable for use in Class 1, Group D, Division I or Division II classified locations.

4. All motors shall be mounted on vibration isolators and be out of the air stream.

2.13 DUCT-FREE SPLIT AIR CONDITIONER SYSTEMS

A. Duct free split air conditioner systems shall be provided at the locations shown on the Plans and shall provide combination cooling and reverse cycle heating (heat pump). System shall be as manufactured by Mitsubishi, or Engineer approved equal, model number and nominal capacity as called out on the Plans. All system units shall be constructed in accordance with ANSI/ASHRAE standards, latest edition, and shall be AHRI certified, listed, and rated in accordance with Standard 210/240. Minimum system energy efficiency rating shall be 13 SEER, or as required by the Washington State Energy Code, latest edition.

B. The indoor fan coil unit shall be a wall-mounted design, complete the cooling/heating coil, fan, fan motor, electrical controls, integral temperature sensing, and microprocessor-based controls. The indoor unit shall be powered by the outdoor unit. Connecting refrigerant lines shall be insulated as recommended by the manufacturer. A condensate pump shall be supplied where required. Drain location to be determined in the field. The microprocessor-based control system shall control space temperature, determine optimum fan speed, and run self-diagnostics, for a temperature control range of 62 °F to 84 °F. The control settings and system operation modes shall be changeable with a factory-supplied wireless remote thermostat.

C. The outdoor condensing unit shall be air-cooled, horizontal discharge, split system compressor, suitable for installation on the ground, rooftop, or wall hung, as shown on the Plans. The unit shall consist of a rotary compressor, air-cooled coil, propeller-type draw-through outdoor fan, reversing valve, accumulator, metering device(s), and control box. The outdoor unit shall be suitable for operation on a single-phase, 60 Hz AC power supply at 120V or 208/230 V, as indicated on the Plans. The unit power supply shall be a single point connection and control voltage to the indoor fan coil shall be 24 VDC.

D. Duct-free split systems shall be supplied with optional low-ambient kit and controls to regulate fan-motor cycles in response to saturated condensing temperature of the unit. The control shall be capable of maintaining a condensing temperature of 100 °F ± 10 °F with outdoor temperatures to -20 °F. The system shall also be supplied with an optional crankcase heater and wind baffle.

2.14 THERMOSTATS

A. Thermostats shall be provided where shown on the Plans and as specified in this Section.

B. Thermostats for ventilation fans (cooling only) shall be SPST line voltage type, rated for 16.0 FLA and 96.0 LRA at 120 VAC, Dayton model 1UHH4, or approved equal. The temperature control range shall be 30˚F to 110˚F.

C. Thermostats for unit heaters shall be integral to the unit.

PART 3 – EXECUTION

3.01 GENERAL

A. All equipment shall be installed in strict accordance with the manufacturer's specifications.

B. Openings required in building construction for heating and ventilation work shall be provided by the General Contractor. Locations of all openings shall be as shown on the Plans and required for the installation of the equipment and systems and verified by this Contractor.

3.02 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.03 COORDINATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this section.

B. Coordinate installation of factory assembled fan and air handling units and accessories with louver, damper and duct installations. The contractor shall provide all additional materials required for a complete installation as specified and shown on the Plans.

C. Louvers, wall collars, dampers and wall openings shall be coordinated with the requirements for fan installation.

D. Provide sufficient wall collar length to meet minimum distance recommended between damper and fan.

3.04 EQUIPMENT INTERFACE

A. For electrically operated equipment, verify the electrical characteristics actually available for the work of this section and provide equipment meeting those characteristics.

3.05 EQUIPMENT

A. The exhaust fans shall be mounted and flashed as shown on the Plans. Care shall be taken to ensure a watertight installation. Backdraft dampers shall be installed so there is free movement and air does not leak back in the wrong direction.

3.06 PAINTING

A. Touchup scratches and abrasions to be invisible to the unaided eye from a distance of 5 feet 0 inches.

3.07 INSULATION

A. Wrap insulation firmly around all ductwork, covering all surfaces including seams, and with all joints lapped at least 2 inches.

B. Securely fasten the insulation in place with 16-gauge soft annealed black or galvanized wire, spaced approximately 12 inches on center for straight runs and 3 inches on center for elbows and fittings.

C. Take special care to avoid excessive stretching and compressing, and to achieve securing at lapped sections where possible.

3.08 TESTING AND ADJUSTING

A. Test and adjust each piece of equipment and each system as required to assure proper balance and operation.

1. Test and regulate ventilation systems to conform to the air volumes shown on the Plans or specified herein.

2. Make tests and adjustments in apparatus and ducts as required to provide proper volume and face distribution of air for each grille and ceiling outlet.

3. Where required, at no additional cost to the Owner, provide pulleys, belts etc. as required to set fan drives at the speed needed to give the indicated volume.

4. For each system, record the following data in tabulated form that is applicable to equipment and systems installed on this project:

a. Air volumes at all supply, return, outside air inlets, and exhaust outlets.

b. Total CFM supplied.

c. Total CFM returned.

d. Total CFM exhausted.

e. Total static air pressure across fan.

f. Motor speed, fan speed, and input ampere load for each fan motor.

g. Air/water temperature entering and leaving for heating and cooling cycles.

h. Compressor ampere loading.

i. Temperature/pressure readings across any heat exchangers, including any that may be located in packaged equipment.

B. Submit test and balance reports to the Engineer for review in accordance with Section 01 33 00 – Submittals Procedure.

C. Eliminate noise and vibration, and assure proper function of all controls, maintenance of temperature, and operation in accordance with the approved design.

D. Secure required approval from governmental agencies having jurisdiction.

END OF SECTION 23 00 00

DIVISION 26 – ELECTRICAL

SECTION 26 05 01

BASIC ELECTRICAL REQUIREMENTS

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. General requirements for electrical work.

    a. Systems Descriptions
    b. Area classifications
    c. Submittals
    d. Records
    e. Coordination

B. Related Sections include but are not necessarily limited to:

1. General Conditions.
2. Division 40 – Process Integration.
3. Division 46 – Water and Wastewater Equipment

C. Installation of systems and equipment is subject to clarification as indicated in reviewed shop drawings and field coordination drawings.

1.3 WORK DESCRIPTION

A. Provide the labor, materials, and equipment necessary to furnish, install, and place into operation the power, lighting, instrumentation, control, alarm, and associated electrical systems of this Contract.

B. Provide functioning systems in compliance with manufacturer's instructions, performance requirements specified or indicated, and modifications resulting from reviewed shop drawings and field coordinated drawings.

C. Provide electrical connections to motors, instrumentation, controls, meters, and any other electrical device installed or provided as part of the project.

D. Test, adjust and calibrate equipment and start-up all electrical equipment, instrumentation equipment, and its associated mechanical attachments as necessary to place the project into operation.

E. Mark and identify circuits, equipment, and enclosures with wire numbers, nameplates, and warning signs.

1.4 SYSTEMS DESCRIPTIONS

A. Provide complete 480Y/277-volt and 208Y/120-volt power distribution systems including raceways, wiring, and power supply to equipment:

B. Provide complete interior lighting system including all lighting equipment, raceways, wiring, and switching/control equipment.

C. Provide complete process control systems including programmable logic controllers (PLCs), individual controllers, monitoring and/or metering equipment, instrumentation equipment, and associated raceways, wiring, control panels, enclosures, and similar items.

1.5 AREA CLASSIFICATIONS

A. Areas of the project are classified as “damp” or “wet” as defined in Article 100 - Definitions of the NEC. For the purposes of this specification, areas considered as damp under the NEC shall be considered wet. Areas are also classified as wet as listed below:

1. Areas outdoors or underground.
2. Areas in below grade vaults, manholes, or pullholes.
3. Areas in buildings or structures that are below grade.

B. Hazardous (Classified) Areas: Areas of the project may be classified as hazardous in accordance with NFPA standards. Hazardous (Classified) locations are generally indicated on the plans and/or noted in these specifications. Refer to Appendix for area classification letter giving details of each classification area.

1. Hazardous areas may also be considered corrosive.

C. Corrosive Areas: Corrosive areas are those areas where equipment or devices will be exposed to gases, fumes, vapors, liquids, or other agents that have a deteriorating effect on the device or equipment. Corrosive areas are generally indicated on the drawings and/or noted in these specifications. The following shall be considered Corrosive Locations:

a. Solids Handling Building

1. Corrosive areas may also be considered hazardous.

D. Process Areas:

1. Solids Handing Building

E. Finished Areas: Areas that will require concealed construction in walls and ceilings. Finished areas are generally indicated on the drawings and/or noted in these specifications. The following shall be considered Finished Areas:

1. None

1.6 DEFINITIONS

A. Outdoor Areas:

1. Those locations on the Project site where the equipment is normally exposed to wind, dust, rain, snow, or similar natural environmental conditions.

B. Indoor Areas:

1. Those locations on the Project site where the equipment is normally protected from wind, dust, rain, snow, and similar natural environmental conditions by a building or structure with a complete floor-wall-roof/ceiling enclosure.

C. Shop Fabricated:

1. Manufactured or assembled equipment for which a NRTL test procedure has not been established.

D. NRTL: Nationally Recognized Testing Laboratory.

E. NEC: National Electrical Code

F. NFPA: National Fire Protection Association

G. NECA: National Electrical Contractors Association

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7, or a full member company of the InterNational Electrical Testing Association (NETA).

1. Testing Agency Field Supervision: Use persons currently certified by NETA or the National Institute for Certification in Engineering Technologies, or equal, to supervise on-site testing specified in Part 3.
2. Comply with NEC for components and installation.
3. Comply with WAC and RCW requirements.

B. Listing and Labeling: Provide products specified in these specifications that are listed and labeled.

1. The Terms "Listed and Labeled": As defined in the NEC, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
3. Comply with WAC and RCW requirements.

C. Electrical Component Standard: Provide components that comply with NFPA 70.

D. When a specific code or standard has not been cited, the applicable codes and standards of the following code-making authorities and standards organizations apply:

1. American Association of State Highway and Transportation Officials (AASHTO).
2. American Iron and Steel Institute (AISI).
3. American National Standard Institute (ANSI).
4. American Society for Testing and Materials (ASTM).
5. ETL Testing Laboratories, Inc (ETL).
6. Insulated Cable Engineers Association (ICEA).
7. Institute of Electrical and Electronic Engineers (IEEE).
8. Illuminating Engineering Society of North America (IES).
9. Instrument Society of America (ISA).
10. Joint Industrial Council (JIC).
11. Lightning Protection Institute (LPI).
12. National Electrical Manufacturers Association (NEMA).
13. National Fire Protection Association (NFPA).
14. Occupational, Health and Safety Administration (OSHA).
15. Underwriters Laboratories, Inc. (UL).

E. In case of conflict or disagreement between codes, standards, laws, ordinances, rules, regulations, plans and specifications, or within either document itself, the more stringent condition governs.

1.8 SUBMITTALS

A. See Section 01 33 00.

B. Make submittals as soon as practical after the date of notice to proceed, but prior to purchase, fabrication, or installation of materials or equipment. Make submittals as a single package for each specification section or group related sections in one submittal, with proposed products and materials grouped according to the sections specified in Division 26. Do not split submittals having a common bill of materials. Group Division 26 submittals with other Division submittals where submittals have related items.

C. Submit only one manufacturer for each product type. Multiple manufacturers for the same product will be rejected.

D. Submit Electrical System Study Report (ESSR) with or before the submittal information for switchboards, motor control centers, panelboards, variable frequency drives and circuit breakers and similar items that may affect or be affected by each study. Equipment that is submitted prior to ESSR will not be reviewed and will be returned as “Not Reviewed”. Equipment shall not be ordered until the ESSR has been reviewed and approved.

E. Product Data:

1. Provide manufacturer's product technical data, including, but not limited to:

a. Identification of the manufacturer.
b. Manufacturer’s product descriptive bulletin.

c. Current, voltage, nameplate, load, impedance, and other electrical data pertinent to the Project and necessary to assure compliance with the Specifications and Plans.
d. Equipment weights and dimensions.

2. Clearly indicate by using arrows or brackets precisely what is being submitted on. Designate optional accessories, which are being included and those which are excluded in the submittal.

F. Shop Drawings: Submit Shop Drawings containing detailed drawings, diagrams and instructions for installing, operating and maintaining the material and equipment proposed for installation in the electrical work.

1. See individual Division 26 sections for specific additional requirements.
2. Prior to submittal, coordinate the electrical equipment (particularly motor control equipment, switchboards, control panels, and instrumentation) and materials, with other applicable equipment and systems of the contract documents, particularly process equipment and systems. Any modifications to the electrical equipment or other equipment, due to the use or submittal of process or other equipment which is different from that specified, shall be reflected in the submittal of the electrical equipment so affected. (Refer also to section 01 33 00 , 1.1 SCOPE and Section 01 33 00 , 3.5 PREQUALIFICATION AND SUBSTITUTION.)

a. Where electrical equipment submitted by the Contractor is a different size than the scaled dimensions shown on the plan, section or elevation drawings of the Contract Documents or requires clearance (for Code compliance, ventilation or other reasons), the Contractor shall mark and submit copies of the Contract Documents (or provide a modified AutoCAD drawing) showing the actual size of the proposed equipment, its placement drawn to scale in red pencil on the copies and any necessary clearances which demonstrate the suitability of the proposed equipment for the conditions of installation i.e. adequate space, clearance etc.. Submittals which do not meet this requirement will be rejected as incomplete.
b. Where equipment dimensions, layout, conduit connection routing, or conductor and conduit quantities, sizes or types are required to be different than indicated on the Contract Plans to accommodate the submitted equipment, the submittal shall clearly indicate the required changes (increased sizes, ratings of equipment or devices) and shall note that they are being provided to accommodate the submitted equipment without additional cost. The submittal shall indicate increased ratings, sizes. Submittals which do not meet this requirement will be rejected as incomplete.

c. Enclosures for equipment submitted by the Contractor shall be able to accept the quantities and sizes of conduits as shown on the Contract Plans. Submittals which do not meet this requirement will be rejected.

d. Lugs or connections for equipment submitted by the Contractor shall be able to accept the quantities and sizes of conductors as shown on the Contract Plans. Submittals which do not meet this requirement will be rejected.

3. Provide technical drawings as follows:

a. Provide diagrams and drawings similar to the Contract Plans and named in a similar fashion for all technical drawings submittals.

b. Use diagrams and symbols for shop drawings that conform to Joint Industry Conference (JIC) Electrical Standards for Industrial Equipment and/or NEMA, Industrial Control Systems, ANSI and IEEE standards, latest revisions. Prepare drawings on size A, B or D sheets in a format similar to the Contract Plans or other nationally recognized drawing standard.

c. Provide electrical elementary wiring diagrams for the electrical control systems showing the interconnecting wiring of electrical control items, such as motor starters and controllers, control systems, interlocks, switches, programmable controllers, microprocessor controllers, and relays. Use equipment manufacturer's approved submittal drawings as a reference for motor control centers, variable frequency drives, control panels, field instruments etc.

d. Provide scaled and dimensioned panel or enclosure face layout drawing; panel/subpanel material of construction, dimensions, and weight; conduit and wiring access locations; and material wiring and terminal block drawings for each control panel.

e. Provide schematic interconnection diagrams and/or Process Instrumentation Drawings (PID) diagrams for each separate control system or control panel. Each control diagram shall show a schematic representation of process equipment and locations of switches, meters, automatic valves, and indicators, controllers and recorders. Correct operating settings and ranges for each control instrument shall be marked on these diagrams.

G. Clearly indicate on submittals that equipment or material is NRTL listed or is constructed utilizing listed or recognized components. Where a NRTL standard has not been established clearly identify that no NRTL standard exists for that equipment.

H. Operation and Maintenance Manuals:

1. See specific sections for information specific to each type of equipment which is to be included in O&M manuals.
2. Provide preliminary manuals of each equipment item to the Owner for review no later than when the electrical equipment is submitted for approval and accepted.
3. Provide final manual copies before the equipment is shipped to the job site. For equipment which also requires third part (NETA) testing, provide reports with O&M manuals after installation but before equipment is put into use. Equipment installation will not be accepted without O&M manuals and third-party testing reports.
4. Drawings and Bill of Materials included in final manuals shall show "as shipped" wiring and components. Provide updates to the final manuals with Record Drawings of the work upon completion of the work, folded and punched for insertion into the manual after they are reviewed by the Owner.
5. Clearly indicate by using arrows or brackets precisely what has been provided. Designate optional accessories, which are being included and those which are excluded in the manual.
6. Final manuals for the electrical system shall consist of 3-post, expandable metal hinge binders labeled with the job name and the Contractor's name with tab dividers for each major type of equipment.
    a. Provide manufacturer's installation, operation, maintenance, and service information for each item of equipment furnished under Division 26.
    b. Assemble and index each section listing the contents individually on the tab divider for that section.
    c. Compile a spare parts list and a supplier's index for each section and assemble in the section provided.
    d. Assemble records of tests, measurements, and calibration settings made for each device. Provide Record Drawings of the work upon completion of the work. Fold, punch, and insert these records into the manual after they are reviewed by the Owner.

1.9 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 plan drawings including: routing of raceways, stubups, actual equipment and fixture locations, equipment sizes and dimensions and building or structure outline changes. Review the drawings with the Owner as the work progresses whenever requested and provide color copies of record drawings when requested. At the end of the project, forward to the Owner a complete set of drawings marked in red pencil in a manner consistent with the Contract Plans, indicating the changes made on the job.

B. Equipment furnished under this Contract for use on future work and all concealed materials, including conduits, shall be dimensioned from visible and permanent building/structure features or drawn to scale on the record drawings.

C. Record voltage, current, and megohmeter and ground ohmer resistance test measurements made on the electrical work, the size, type and settings of trip units, fuses, and overload relay elements installed in the equipment. Record the setting of all pressure, temperature, level, and similar instrumentation and control devices. When the project is operating, turn over these records to the Owner.

D. Digital Record Photographs

1. Requirements for the Photographs

a. Digital photographs shall be at the native resolution of the camera or smart phone. The file format of the photographs shall be JPEG using the modest compression. (Where the compression levels are described, the typical description of the compression level might be “good”.)

b. JPEG files shall be stored so that the EXIF (Exchangeable Image File Format) data is maintained. Prior to taking any photographs, the camera time should be set so that EXIF data includes the time and date of the photograph. The JPEG files shall be stored so that the creation (or modification) time and date of the file also reflect the time and date of the photograph. (The EXIF data should be viewable under Windows 10.)

c. The camera shall have a native resolution of at least 8.0 megapixels.

d. Photographs of signs, nameplates, or labels shall be taken using macro modes. The photographs shall be taken so that settings, serial numbers, catalog numbers, order numbers, etc. are legible. The photographs of reflective items shall ÷be taken at an angle to the item to reduce glare.

2. Take photographs of electrical equipment possibly requiring coordination when the equipment arrives on site. The photographs shall include nameplates and labels if available. The equipment shall include but not necessarily be limited to, the following:

a. Motors
b. HVAC equipment
c. Motorized actuators
d. Control Panels

3. Take photographs of conduits prior to concealing them. The photograph files shall be labeled with location or shall contain adequate context to

determine location such as a tape measure showing distance from a wall or depth below grade. The photographs shall include the following:

a. Conduit placement prior to pouring concrete or backfilling
b. Conduit placement prior to covering walls

4. Take photographs of electrical equipment following installation or modification. The photographs shall include nameplates, labels, and similar identifiers. The equipment shall include but not necessarily be limited to, the following:

a. Motors and motor drive equipment.
b. Control Stations
c. Control Panels
d. Instrumentation providing electrical signals including transmitters, sensors, and switches.
e. Motor Control Centers
f. Panelboards
g. Safety Disconnect Switches
h. Circuit Protective Devices showing catalog number, serial number and adjustable trip settings.
i. Motor Overload showing catalog number, serial number and adjustable trip settings.

5. Photographs shall be supplied to the Owner at least once every day. Photographs shall be supplied to the Owner no later than one day after they are taken. Photographs shall be supplied via cloud storage shared folder (OneDrive, Google Drive, etc.) or by another method prior approved by the Engineer.

1.10 COORDINATION

A. 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.

B. Coordinate the interruption of electrical systems to any part of the facility in use by the Owner at least 48 hours before interruption of the system.

C. Coordinate the cutting of existing structures with the new and existing electrical systems. Identify, locate, and protect existing and underground, underslab or embedded conduits/cables where excavation or cutting of existing structures is to be performed.

D. Coordinate installing electrical identifying devices and markings prior to installing acoustical ceilings and similar finishes that conceal such items.

E. Coordinate installing electrical identification after completion of finishing where identification is applied to field-finished surfaces.

F. Coordinate requirements for access panels and doors where electrical items requiring access are concealed by finished surfaces.

G. Coordinate the electrical work with the requirements of equipment provided under other Divisions. Portions of the electrical design are based upon the equipment specified in other Divisions. Where modifications to the specified electrical systems or equipment devices or materials are required to accommodate actual electrical requirements of equipment which is specified under other Divisions of the Contract but which has electrical requirements different from those specified under those Divisions for the equipment, make modifications to the electrical system or systems required to accommodate the equipment, and pay for all such changes. No additional payment, "extras", or additive change orders are allowed for changes required to accommodate substitutions or changes proposed by the Contractor.

H. Where changes in the work, or substitutions in material or equipment specified under this Division are proposed, ensure that sizes, weights, openings, etc., are provided that do not require changes in the work outside this Division. If changes to work outside this Division are required to accommodate substitutions or changes proposed by the Contractor, submit complete descriptions of these changes for approval by the Owner, and pay for all such changes. No additional payment or "extras" are allowed for changes required to accommodate substitutions or changes proposed by the Contractor.

I. Coordinate the installation of electrical equipment with other trades:

1. Arrange for the building-in of equipment and materials during structure construction. Arrange for the building in of anchors, supports, sleeves, or other equipment and materials during concrete placement, framing, precasting or other structure construction. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed. Install sleeves 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 gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls. Gypsum wall sleeves may be cut-in after erection if desired.
2. Where equipment or materials cannot be built-in during construction, arrange for chases, slots, box-outs or other openings in the structure, as required to allow installation of equipment after structure construction is complete.
3. Where penetration of completed or permanent construction elements such as walls, beams, ceilings, floors, etc. is required, obtain approval from Owner for penetration (drilling, cutting, shooting, punching) of structural components prior to penetrating the element or component.

4. Accurately locate panelboards, outlets, switches, control stations and similar devices with respect to equipment and the finished work of others. Verify dimensions and locations with the general, civil, structural, mechanical, process, architectural and other Contract plans as well as shop drawings/supplier's drawings and trades.
5. Coordinate installing large equipment requiring special access openings or positioning prior to closing in the building.

J. Coordinate electrical work with work under other Divisions. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Cooperate in locating equipment to avoid interference with work of others, and plan this work to harmonize with the work of other trades so that all work may proceed as expeditiously as possible. No extras are allowed because of moving work required to avoid interference with work of other trades or contractors.

K. Coordinate connecting electrical circuits to components furnished under other Divisions. Coordinate the location of motors, switches, panel connections and other points of connection with the equipment manufacturers or vendors prior to conduit installation, and route circuits to the actual connection point. Remove and reinstall conduit, outlet boxes and other electrical connections, even if removal and reinstallation of building materials is necessary, where electrical connections are not made to the appropriate equipment location.

1.11 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 66 00 .

B. Receive, handle, and store electrical materials and equipment in accordance with the manufacturer's instructions.

C. Protect materials and equipment from damage, corrosion, or disfiguring; protect nameplates on electrical equipment from defacing. Deliver equipment to their final locations in protective wrappings, containers, and other protection that will exclude dirt and moisture and prevent damage from construction operations. Remove protection only after equipment is safe from such hazards. Field repair of material or equipment made defective by improper storage or site construction damage by other trades is not acceptable.

D. Repair, restore, or replace damaged, corroded and rejected items at no additional cost to the Owner.

E. Provide dry, heated storage for materials and equipment intended to be installed indoors which is not protected by packaging suitable for outdoor storage by the manufacturer and for equipment that requires an electrical connection or heater to mitigate water condensation and like hazards.

F. Keep electrical equipment rooms clean and vacuumed after each day when work is performed in the area. Do not place electrical equipment rated for indoor installation into its final location until this location is weathertight and heated with openings to the outside closed with temporary weather barriers or with the installation of permanent doors, fans, and ducts. (The final location shall be the electrical equipment location shown on the Contract Plans or otherwise described in the Contract Documents.)

G. Ensure that equipment is not used as steps, ladders, scaffolds, platforms, or for storage - either inside or on top of enclosures.

H. Protect nameplates on electrical equipment from defacing.

I. Repair, restore, or replace damaged, corroded and rejected items at no additional cost to the Owner.

1.12 EXTRA MATERIALS

A. Provide extra materials including spare parts where noted in individual specification sections.

B. Extra materials including spare parts shall be provided with the equipment or like materials at the time the equipment or materials arrive on site. It is not acceptable to provide extra materials after the equipment or materials are delivered to the site or house equipment in a storage area not accessible to the Owner. Provide an inventory and listing of the spare parts to the Owner when the parts (and spares) arrive onsite.

PART 2 — PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Refer to individual Division 26 sections.

1. Provide equipment, which is of a similar type, made by one manufacturer throughout the project unless otherwise noted in the Specifications.

B. Submit requests for substitution in accordance with Specification Special Provisions Section 1-05.3(3).

2.2 MATERIALS

A. Except as otherwise indicated, provide new materials and equipment which are standard products of manufacturers regularly engaged in production of such equipment. Provide similar items of equipment of the same manufacturer and quality. Where systems are specified, provide components of the system from one manufacturer.

B. 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. If no other manufacturer is listed then any manufacturer of equal equipment may be acceptable.

C. Provide material or equipment approved and labeled for the purpose for which it is to be used by a nationally recognized electrical testing laboratory (NRTL) or other organization acceptable to the State of Washington Department of Labor and Industries.

1. Where NRTL test procedures have been established for the product type, provide electrical equipment approved under that procedure and bearing the NRTL label.

D. 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 increases the capacity of the device or material in question.

E. Furnish materials, devices, equipment or supplies of materials that are inherently non-corrosive or are coated or covered in a manner, acceptable to the Owner, which renders them non-corrosive. Do not provide materials which contain polychlorinated biphenyls, asbestos or other hazardous or detrimental materials. Do not install materials in a manner, location or construction that produces galvanic action or any other materials corroding or eroding action. Material that may cause rusting or streaking on a building/structure surface shall not be used.

F. Fabricate equipment or devices in the field equivalent in every respect to manufactured items used for the same purpose. Where cutting, drilling, grinding, or similar actions are performed on galvanized or painted metal, regalvanize or repaint, respectively, to match original finish.

G. When equipment is shop fabricated for the Project, use electrical devices and enclosures which are NRTL listed and labeled or recognized.

2.3 ELECTRICAL SYSTEM STUDY REPORT (ESSR)

A. The short circuit calculation and withstand evaluation report, circuit protective device coordination studiesand arc flash studies shall comprise the Electrical System Study Report (ESSR).

B. Create reports for existing, new and modified electrical distribution equipment including the Utility Point of Service and submit reports of equipment submittals for approval. Distribution equipment shall include switchboards, panelboards, motor control centers, dry type transformers, etc.

C. short circuit calculation and withstand evaluation report, circuit protective device coordination studiesand arc flash studies shall be stamped and signed by an electrical engineer registered in the State of Washington.

D. short circuit calculation and withstand evaluation report, circuit protective device coordination studiesor arc flash studies shall be submitted with or before the distribution and control equipment being provided on the project (switchboards, motor control centers, variable frequency drives, panelboards, etc.). It is not acceptable to submit the ESSR after the distribution equipment has been submitted. As a minimum, include the following in the report:

1. Utility source information including primary system & service transformer impedance, X/R ratio, symmetrical and asymmetrical fault currents for 3 phase, line-to-line and line-to-neutral faults.
2. Equipment manufacturer's information used to prepare the study.
3. Assumptions made during the study.
4. Short circuit calculations listing short circuit levels at each bus.
5. Evaluation of the electrical power system and the model numbers and settings of the protective devices associated with the system.
6. Time-current curves including the instrument transformer ratios, model numbers of the protective relays or trip devices, and the relay or trip device settings associated with each breaker.
7. Comparison of short circuit duties of each bus to the bracing and interrupting capacity of the equipment connected to that bus.

E. Elements of short circuit calculation and withstand evaluation report

1. One-line Diagram:

    a. Location and function of each protective device in the system, such as relays, direct-acting trips, fuses, etc.
    b. Type designation, current rating, range or adjustment manufacturer's style and catalog transformers.
    c. Power, voltage ratings, impedance, primary and secondary connections of all transformers.
    d. Nameplate ratings of all motors with their subtransient reactances.
    e. Sources of short circuit elements such as utility ties, generators, and induction motors.
    f. All significant circuit elements such as transformers, cables, breakers, fuses, reactors, etc.
    g. Standby as well as normal switching conditions.

2. Impedance Diagram

    a. Available MVA or impedance from the utility company.
    b. Bus impedance.
    c. Transformer and/or reactor impedances.
    d. Cable impedances.
    e. Equipment impedances.
    f. System voltages.

g. Grounding scheme (solid grounding, resistance grounding, or no grounding).

3. Calculations:

a. Determine the paths and situations where short circuit currents are the greatest. Assume bolted faults and calculate the 3-phase and line-to-ground short circuits of each case.
b. Calculate the maximum and minimum ground-fault currents.

F. Circuit Protective Device Coordination Study

1. Provide the model numbers and recommended settings of the protective devices associated with the system to achieve full circuit coordination. Unless noted otherwise, full circuit coordination shall include amperages up to the maximum instantaneous fault current available from the standby power source (e.g., engine generator) from 0.1 seconds and longer.

a. Zone Selective Interlocking is acceptable for circuit breaker coordination for circuit breakers located within the same electrical or adjacent enclosures where each breaker is provided by the same manufacturer.
b. Full coordination is not required for circuit breakers during the timeframe a reduced (electric arc flash) energy level maintenance bypass switch is activated.
c. Series rating of equipment is not acceptable.

2. As a minimum, include the following on 5-cycle, log-log graph paper:

a. Time-current curve for each protective relay or fuse showing graphically that the settings will allow protection and selectively within Industry standards. Identify each curve and specify the tap and time dial setting.
b. Time-current curves for each device to be positioned for maximum selectivity to minimize system disturbances during fault clearing. Where selectivity cannot be achieved, notify the Project Representative as to the cause.
c. Time-current curves and points for cable and equipment damage.
d. Time-current curves and points for standby power generation equipment (e.g., engine generator) protective relays
e. Circuit interrupting device operating and interrupting times.
f. Indicate maximum fault values on the graph.
g. Sketch of bus and breaker arrangement.

3. The circuit breaker sizes shown on the contract drawings are for a basis of design power distribution system from a single Manufacturer. The Contractor is free to select breakers and enclosures that achieve selective coordination, have sufficient fault current interrupting capacity

from any generator or utility services, and all the required breakers are enclosed in distribution equipment of the same size or smaller in each dimension than shown on the Contract Drawings.

G. Arc Flash Study

1. Prepare a report summarizing the arc flash study and conclusions or recommendations which may affect the integrity of the electric power distribution system.
2. Determine the incident energy, arc flash boundary, and minimum PPE requirements for locations throughout the studied portions of the power system. Arc flash warning labels are to be produced and attached to the electrical equipment. These labels must indicate approach boundaries, incident energy level, and the minimum PPE that is required when servicing the equipment within the arc flash boundary.
3. As a minimum, include the following in the report:

    a. Assumptions made during the study.

        1) Estimated available fault current for each bus.
        2) Estimated arc fault current for each bus.
        3) Trip settings for all circuit protective devices (protective relays, circuit breaker and fuses) upstream of any bus evaluated.
        4) Material, quantity, size, and length of each conductor of feeder and raceway material of each feeder.

    b. Reduced copy of the one-line drawing.
    c. Arc flash evaluations summary spreadsheet

        1) Bus name.
        2) Upstream protective device name, type, settings.
        3) Bus line to line voltage.
        4) Bus bolted fault.
        5) Protective device bolted fault current.
        6) Arcing fault current.
        7) Protective device trip/delay time.
        8) Breaker opening time.
        9) Solidly grounded column.
        10) Equipment type.
        11) Gap.
        12) Arc flash boundary.
        13) Working distance.
        14) Incident energy.
        15) Suggested electric arc rated PPE rating.

    d. Arc flash warning labels printed in color on adhesive backed labels.

4. Provide the arc flash warning labels containing information suggested by NFPA 70E and affix warning labels to each piece of electrical equipment evaluated in the Arc Flash Study. In addition to the information suggested by NFPA 70E, the arc flash warning labels shall also indicate the report date and date of circuit protective device testing (as of the time of the arc flash study). Arc Flash Warning labels shall be installed prior to the Contractor energizing the equipment. The third-party testing agency shall confirm the circuit protective devices (protective relays, circuit breakers and fuses) match as recommended in the arc flash study prior to equipment energization.
5. The Contractor shall provide four hours (minimum) of arc flash training to the Owner at an Owner's designated facility prior to the Contractor energizing the electrical equipment. Arc Flash training shall include consultation with facility manager regarding plant safety plan based on NFPA 70E, Handbook for Electrical Safety in the Workplace.
    a. Arc Flash training shall be based on the latest edition of NFPA 70E, Handbook for Electrical Safety in the Workplace.
    b. Training shall include site specific features, such as arc flash mitigation procedures, electrically safe procedures, Owner provided personal protective equipment (PPE) use and care procedures.

PART 3 — EXECUTION

3.1 INSTALLATION

A. Make arrangements for and pay for necessary permits, licenses, and inspections.

B. Equipment shall be installed in accordance with the requirements of the National Electrical Code, National Electrical Safety Code, and applicable state and local regulations and ordinances.

C. Install equipment in accordance with the manufacturer's instructions and the NECA "NEIS" (National Electric Installation Standards).

D. Provide on-site testing as listed in individual specification sections. Test results shall be in writing.

E. Equipment Dimensions and Clearances:

1. Dimensions indicated for electrical equipment and dimensions indicated for the installation of electrical equipment are restrictive dimensions. Verify that equipment will fit within the indicated locations and spaces. Do not use equipment that impinges upon the required clearance, reduces actual clearance, or exceeds the indicated dimensions:
    a. Except as approved in writing by the Owner.

2. Do not use arrangements of equipment that impinge upon the required clearance, reduce actual clearances or exceed the space allocation.

F. Equipment Access:

1. Install equipment so it is readily accessible for operation and maintenance.
2. Access to equipment shall not be blocked or concealed by conduits, supporting devices, boxes, or other items.
3. Do not install electrical equipment such that it interferes with normal maintenance requirements of other equipment.

G. Install materials and equipment in a manner, location and construction that does not produce galvanic action or any other materials corroding or eroding action. Equipment fabricated from aluminum shall not be placed in direct contact with earth or concrete.

H. Screen openings and seal all raceways into equipment to prevent the entrance of moisture, rodents and insects.

3.2 DEMONSTRATION

A. Demonstrate equipment in accordance with Division 1.

B. 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. Adjust installed equipment for proper operation of all electrical and mechanical components.

3.3 ASSISTANCE

A. Provide assistance to the Owner during the demonstration or testing of equipment by operating devices and equipment, during construction observation by opening enclosures for inspection, checking record drawing information, and similar tasks, as necessary, in the Owner's judgment to verify all work provided.

END OF SECTION

SECTION 26 05 02

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Supporting devices.
2. Electrical identification.
3. Electrical demolition.
4. Cutting and patching
5. Cleaning and finish touchup painting.
6. Testing

1.3 SUBMITTALS

A. General: Submit each item in this Article as described in Section 26 05 01 and Division 1 Specification Sections.

B. Product Data: For each type of material specified.

1. In addition to the requirements of 26 05 01 and Division 1 Specification sections, submit only one manufacturer for each product type. Multiple manufacturers for the same product will be rejected.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1. Testing Reports. (See section 3.8 for further information)

1.4 QUALITY ASSURANCE

A. Refer to Section 26 05 01 paragraph 1.7.

PART 2 — PRODUCTS

2.1 SUPPORTING DEVICES

A. Provide tubing, channel and angle support systems, hangers, sleeves, brackets, fabricated items, and fasteners for secure support of electrical equipment, devices, components and materials:

1. Material:

a. Wet locations (including outdoors and in below-grade structures): Stainless steel or hot-dipped galvanized.

b. Class II Hazardous locations and/or Corrosive areas: 304 stainless steel or 40 mil PVC coated galvanized steel.
c. Other locations: Steel, except as otherwise indicated, protected from corrosion with zinc coating, cadmium plating, or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.

B. Conduit clamps: one hole or beam clamps

1. Rigid Steel Conduit: cast iron hot dipped galvanized clamps with cast iron hot dipped galvanized clamp back (AKA foot or spacer).
2. PRMC: cast iron PVC coated or stainless-steel clamps with cast iron PVC coated or stainless steel clamp back (AKA foot or spacer).
3. EMT: stamped steel clamps – cad plated or galvanized.

C. Anchors: stainless steel in wet, hazardous or corrosive areas; cadmium plated or galvanized steel in dry areas.

1. lag screws or Type A tapping screws for wood.
2. Toggle bolts with springhead for light loads in masonry.
3. thru-bolt with fender washers for loads in masonry.
4. toggle bolts with springhead for hollow partitions.
5. epoxy set or self-drilling anchors with threaded studs for concrete.
6. clamps or U-bolts for structural steel.
7. Epoxy set or self-drilling anchors with extension rods for hollow tile over concrete.
8. hanger rods: 1/4-inch diameter or larger threaded steel, except as otherwise indicated.

D. Sleeves:

1. Wet, hazardous or corrosive areas:

a. ASTM A 53, Type E, Grade A, Schedule 40, hot dipped galvanized steel, plain ends.
b. Hot dipped galvanized cast iron, with weep rings.

2. Dry Areas:

a. PVC, schedule 40.
b. 0.0276-inch or heavier galvanized sheet steel, round tube, closed with welded longitudinal joint.

2.2 ELECTRICAL ENCLOSURES

A. Enclosures for use with Electrical Equipment:

1. Standards:

a. NEMA ICS-6, Enclosures for Industrial Controls and Systems.
b. UL 508, Industrial Control Equipment.

c. UL 698, Industrial Control Equipment for Use in Hazardous Locations.

2. Provide NEMA enclosure types as indicated on the Contract Documents. Where the enclosure type is not indicated by the Contract Documents provide enclosures as follows:

a. NEMA 1: Use in electrical rooms and in dry indoor finished areas.
b. NEMA 12: Use in unclassified (non-hazardous and non-corrosive) indoor locations which are neither wet nor damp.
c. NEMA 4X: Use in all non-hazardous wet or corrosive locations.
d. NEMA 7: Use in all hazardous locations.

B. Shop or Factory Finishes:

1. Exteriors of painted enclosures shall be ANSI gray.
2. Interiors of painted enclosures shall be either white or light gray.

2.3 ELECTRICAL IDENTIFICATION

A. Manufacturer's Standard Products: Where more than one type is listed for a specified application, selection is Contractor's option, but provide single type for each application category. Use colors prescribed by ANSI A13.1, NEC, and these 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: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:

1. Size: Not less than 4 mils thick by 6 inches wide.
2. Compounded for permanent direct-burial service.

D. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.

E. Engraved, Plastic-Laminated Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched for mechanical fasteners 1/16 inch minimum thick for signs up to 20 sq. in., 1/8 inch thick for larger sizes. Engraved legend in white letters on black face.

F. Fasteners for Plastic-Laminated and Metal Signs: Self-tapping stainless-steel screws or stainless-steel No. 10/32 machine screws with nuts and flat and lock washers.

G. Wire markers: machine printed, black ink, alpha-numerical identifiers on yellow polyolefin shrink tubing. Kroy K4350 Shrink Tube, or approved equal.

1. Where it is not possible to use shrink tubing (i.e. on pre-terminated cables) it is acceptable to use the following:

a. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

2.4 TOUCHUP PAINT

A. For Equipment: Provided by equipment manufacturer and selected to match equipment finish.

B. For Non-equipment Surfaces: Matching type and color of undamaged, adjacent finish.

C. For Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 — EXECUTION

3.1 INSTALLATION

A. Comply with NECA's "Standard of Installation."

B. Install the equipment and materials in a neat and workmanlike manner employing workmen skilled in the particular trade and in accordance with the manufacturer's instructions and industry standards. Maintain adequate supervision of the work by a person in charge at the site during any time that work under this division is in process or when necessary for coordination with other work.

C. 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 fifty-four inches above floors to centerline of controls.

D. Install items level, plumb, parallel and perpendicular to other building systems and components, except where otherwise indicated.

E. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

F. Give right of way to raceways and piping systems installed at a required slope.

G. Make all penetrations of electrical work through floors, walls and roofs water, rodent, insect and weather-tight.

3.2 ELECTRICAL SUPPORTING METHODS

A. Support electrical equipment, devices and materials from framing members or structure with sufficient clearance for maintaining and servicing.

1. Provide backing plates, and/or framing material to support equipment, devices and materials which are located between the framing members which are part of the building or facility structure.
2. Provide metal structure fabricated of structural shapes such as C-channel or square tubing (not strut channels, unistrut, b-line, etc.) for

mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other equipment and devices except where components are mounted directly to structural features of adequate strength.

B. Fastening and Supports: Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building/structure/support.

1. Use supports as detailed on the Plans and as specified:

a. Where not detailed on the Plans or specified, use supports and anchoring devices rated for the equipment load and as recommended by the manufacturer.

2. Attach enclosures mounted on equipment with machine screws or clamps as required. Do not drill equipment frames or sheets without permission of the equipment supplier/manufacturer and the Owner. Do not mount safety switches or external equipment to other equipment enclosures, unless enclosure mounting surface is adequately reinforced structurally to accept mounting of external equipment.
3. Base rating and size of supports and anchoring devices on dimensions and weights verified from approved equipment submittals. Attach wall mounted enclosures with a minimum of three fasteners, and more if the manufacturer so recommends.
4. Standoff outdoor wall-mounted equipment and indoor equipment mounted on earth or water bearing walls a minimum of one-quarter inch where enclosures are mounted on walls in wet areas (outdoors, below grades, etc.). Use corrosion resistant spacers such as neoprene, or fiberglass or plastic shim washers to maintain ¼ IN separation between the equipment and the wall.
5. Do not cut, or weld to, building structural members without permission of the owner. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or any other items.
6. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof-test load.

C. Raceway Supports: Comply with NEC and the following requirements:

1. Conform to manufacturer's recommendations for selecting and installing supports.
2. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U bolts, clamps, attachments and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
3. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
4. Spare Capacity: Size supports for multiple conduits so capacity can be increased by a 25 percent minimum in the future.

5. Support individual horizontal raceways with separate, malleable iron pipe hangers or clamps.
6. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports, with no weight load on raceway terminals.
7. Use double nuts or jam nuts with regular nuts on threaded rods and bolts.
8. Trim rod ends to within ¼ inch after installation of last nut, clamp or similar hardware; smooth cut ends or install cap nut.

D. Provide concrete foundations or pads required for electrical equipment:

1. Floor-mounted equipment shall be mounted on a concrete base except the concrete base shall be shortened in height by the thickness of the channel base when the equipment is provided with channel bases such as can be provided with control panels, motor control centers and switchboards. Pad shall be poured on top of the finished floor or slab.
2. Install concrete pads and bases according to requirements of Division 3 and per structural plans and specifications.

E. Install hangers, inserts, supports, and anchors prior to installation of fireproofing.

F. Cable supports - provide cable ties and straps for clamping, tying, securing and banding wires and cables in all junction boxes, panelboards and terminal cabinets. Support each circuit independently; group phases of three phase circuits.

3.3 IDENTIFICATION

A. Install labels where indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated on the Plans 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. Tag or label power circuits in enclosures using tags or adhesive marking tape. Identify source and circuit numbers in each cabinet, pull box, pull hole, vault, maintenance hole, junction box, and outlet box. Color coding may be used for voltage and phase indication.

E. 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.

F. Provide engraved phenolic name plates (white with black background) on equipment enclosures giving the name and circuit identification (Panel/ Enclosure served from and circuit location or ID) of the enclosed device/equipment in one-quarter inch letters.

G. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

H. Provide electrical danger, caution, warning or safety instruction signs including arc flash signs in accordance with WAC/RCW, WISHA/OSHA and other applicable state/federal safety requirements.

3.4 DEMOLITION

A. Demolish all existing electrical devices and circuits which are noted for demolition. Demolition includes, but is not limited to:

1. Remove all conduit, conductors, fittings, device boxes, hangers, panels, devices, etc., which are not concealed in the building structure or below grade/slab.

B. Do not remove or damage fireproofing materials. Repair or replace fireproofing removed or damaged.

C. Locate, identify, and protect electrical equipment and materials to remain. Where existing work to remain is damaged in the course of the work, remove damaged portions and install new products of equal capacity, quality, and functionality at no additional cost to the Owner.

D. Remove existing conductors from conduits or other enclosures, unless otherwise indicated, where existing work is to be abandoned in place. Cut and remove buried cable or raceway indicated to be abandoned in place at the point where it stubs up or emerges from burial 12 inches below the surface of adjacent grade or construction; cap and patch surface to match existing finish.

E. Remove demolished material from the Project site and legally dispose of demolished material by wastehaul to approved landfill or recycling facility.

F. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation and/or reconnection. Coordinate the process, mechanical, HVAC, and other equipment scheduled to be relocated and/or reused with other Divisions and disconnect the equipment from and reconnect the equipment to the electrical systems.

3.5 CUTTING AND PATCHING

A. 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.

B. Repair disturbed surfaces to match adjacent undisturbed surfaces.

3.6 CLEANING AND TOUCHUP PAINTING

A. Clean dirt and debris from all surfaces. Thoroughly vacuum the interior of enclosures to remove dirt and debris.

B. Replace nameplates damaged during installation.

C. Apply touch-up paint as required to repair scratches, etc. Field paint in accordance with Section 09 09 91 00. 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.

3.7 TESTING

A. Testing shall be performed by a person currently certified by the InterNational Electrical Testing Association.

B. Additional testing requirements specific to other sections are specified in those sections.

C. Test electrical equipment as described in individual specification sections after installation but before it is energized and placed in service. All equipment shall be tested as recommended by the manufacturer. Report all test results in writing. Where tests disclose a defect in the work, rework or repair equipment which performs unsatisfactorily during or as a result of system testing at no additional expense to the Owner and retest to confirm the rework or repair until retesting 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, IEEE, ISA, ANSI, or other) for the class of equipment. If equipment or system fails retest, replace it with products which conform with Contract Documents. Continue remedial measures and retests until satisfactory results are obtained. Remedial measures and retests will be done at no cost to the Owner.

D. Test motor driven equipment motors before energization. Insulation test shall consist of megohmeter check phase–to–ground, per IEEE Standard 43, and polarization index test per the manufacturer’s recommendations.

1. Perform load tests of each motor and prepare a written report of the findings showing the following:

    a. Nameplate Ratings (horsepower), (speed), (voltage), (phase), (ampere rating of motor at full load).

b. Measured Load in amperes on each phase at full speed.

2. For load tests for each pump/blower/ process equipment motor:

a. Note the operating conditions at the time of the test.
b. Note the suction and discharge conditions (pressure, water level, temperature, humidity, where such conditions affect load).

3.8 DEMONSTRATION

A. Demonstrate equipment in accordance with Section 26 05 01 .

END OF SECTION

SECTION 26 05 19

CONDUCTORS AND CABLES

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

A. General: Submit each item in this Article as described in Section 26 05 01 and Division 1 Specification Sections.

B. Product Data: For each type of conductor or cable specified.

1. In addition to the requirements of 26 05 01 and Division 1 Specification sections, submit only one manufacturer for each product type. Multiple manufacturers for the same product will be rejected.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1. NETA Testing Reports. (See section 3.5 for further information)
2. Communications Cable Testing Reports. (See section 3.5 for further information)

1.4 QUALITY ASSURANCE

A. Refer to Section 26 05 01 paragraph 1.7.

PART 2 — PRODUCTS

2.1 BUILDING WIRES AND CABLES

A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.

B. Thermoplastic Insulation Material: Comply with NEMA WC 5.

C. Cross-Linked Polyethylene Insulation Material: Comply with NEMA WC 7.

D. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 8.

E. Conductor Material: Copper.

F. Stranding:

1. Class B for power applications.
2. Class C for control applications.

G. Size and Type:

1. Stranded conductor for No. 10 AWG and smaller gauge 120 VAC branch power circuits; except receptacle, lighting and switch leg circuits which shall be solid conductor.
2. Stranded conductor for 277 or 480 VAC power circuits, and for any power circuit larger than No. 10 AWG.
3. Stranded conductors for control circuits.
4. Grounding conductors: solid conductor in sizes No. 6 AWG and smaller gauge; stranded in No. 4 AWG and larger gauge.

H. Cords: Type SO, size No. 14 AWG or larger.

2.2 INSTRUMENTATION AND SPECIALTY WIRE

A. Low voltage instrument cable: 600 volt rated, multi-conductor cable with overall neoprene or PVC jacket. Individual conductors PVC or polyethylene insulated, with or without nylon overcoat.

1. Unshielded instrument cable Belden 9486 (18 gauge), 9488 (14 gauge) or equal, Alpha or NEC.
2. Shielded single pair instrument cable (2/C#18) Belden 9341 or equal, Alpha or NEC.
3. Shielded three conductor instrument cable (3/C#18) Belden 3089A or equal, Alpha or NEC.
4. Shielded multi-pair (#18 gauge) instrument cable Belden 1048A (2 pair), 1049A (4 pair), 1050A (8 pair), 1051A (12 pair) or equal, Alpha or NEC.

B. VFD Cable:

1. Flexible
2. 3 Conductor Tinned Copper
3. Symmetrical Segmented Bare Copper Stranded Ground
4. XLPE Insulation
5. Overall 100% shield
6. Black PVC outer jacket
7. 600V rated
8. TC-ER 90C Dry/Wet rated
9. For single runs:

    a. Belden 29521C through 29532C for smaller than 4/0
    b. Belden 29534 for 350 kcmil
    c. Belden 29535 for 500 kcmil

10. For parallel runs:

    a. Upsize grounding conductors to meet NEC requirements for equipment grounding conductors in parallel circuits.

b. Belden 29528 for through 29532.

11. Or approved equivalent.

C. Category 6 Cable: Provide Category 6 cable as shown on drawings. Cable shall be UL Type CMP (plenum). For plenum cable, all 4 cable pairs shall be insulated with FEP. Cables shall be field connectorized and tested by the Contractor unless otherwise shown on the drawings. Cable shall be manufactured by:

a) Commscope

b) Berk-Tek

c) Approved Equal.

D. Category 6 OSP Cable: Provide Category 6 Outside Plant cable as shown on drawings. Cable shall be rated for indoor / outdoor use and rated for extended exposure to water. Cable shall be rated CM or CMX per NEC.

1. Berk-Tek
2. Approved Equal.

E. Specialty wire: As specified in the section describing the system it serves.

2.3 CONNECTORS AND SPLICES

A. Provide UL-listed, factory-fabricated wiring connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

B. Conductor Connections, Splices or Taps:

1. Solid Conductors size 18 through 10 AWG: Twist on insulated spring connectors.
2. Stranded Conductors size 18 through 6 AWG: insulated, solid barrel, crimp type plated copper alloy connectors.
3. Conductors size 4 AWG and larger: plated copper alloy compression splicing sleeves installed by high pressure compression tools and insulated with heat shrink Raychem sleeves.
4. Outdoors or wet areas: wire splice kits, epoxy resin, hardener, and mold. 3M Scotchcast or equal.

C. Terminations: suitable for 75-degree Celsius rated copper conductor.

1. Service and feeder circuits: compression indent barrel connectors with one- or two-hole spade lug ends.
2. Conductor size 18 through 10 AWG: insulated, solid copper barrel, crimp type, plated copper alloy spade tongue terminal, made for the wire size and terminal on which they are installed and crimped with an approved plier or tool for the connector.

3. Conductor size 8 AWG and larger: compression, indent, solid copper barrel, one- or two-hole lugs.

D. Motor connections: insulated, solid barrel, crimp type, ring tongue plated copper alloy.

2.4 INSULATING MATERIALS

A. Fillers: Scotchfill, or equal.

B. Tape: 7 mil vinyl plastic tape, logo bearing, Scotch 33+, or equal.

PART 3 — EXECUTION

3.1 EXAMINATION

A. Examine raceways and building finishes to receive 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.

3.2 WIRE AND INSULATION APPLICATIONS

A. Service/Feeders: Type USE/RHW/RHH insulated, stranded conductors, in raceway.

B. Branch circuits: Type USE/RHW/RHH insulated, stranded conductors, in raceway except Type THHN/THWN insulated, solid conductors, may be used indoors, above grade only, for 120-volt lighting and receptacle branch circuits in sizes #12 AWG and #10 AWG.

C. Equipment Grounding Conductors: Same type insulation and conductor as the circuit conductors supplying the equipment to be grounded.

D. Grounding Conductors (other than equipment grounding conductors): bare copper with varnish coat.

E. Class 1 and 2 Control Circuits: Type USE/RHW/RHH, size #14 AWG or larger, in raceway; Type MTW/THWN, size #14 AWG or larger, in raceway may be used indoors above grade or above grade in weatherproof enclosures.

F. Instrumentation Circuits: Shielded or unshielded instrument cable, as indicated on the Contract Plans.

3.3 INSTALLATION

A. Install wires and cables in raceway system, according to manufacturer's written instructions and NECA's "Standard of Installation", after raceway system is complete, and following "Examination" article of this section. Where existing conductors or cables are removed and later repulled through new or existing conduits, test the conductors after each pulling operation, and replace the conductors or cables with new conductors or cables if the test results are not acceptable per NETA standards.

B. Provide individual neutral conductors for each 120- or 277-volt circuit. Common neutral conductors for multi branch circuits are not permitted unless specifically noted and shown on the plans.

C. Install service, feeder, motor, control, instrumentation, communication and signaling circuits continuously without splices from equipment terminal to equipment terminal or motor lead. 120- and 277-volt single phase branch circuits may be spliced or connected at taps or connection for outlet devices. Do not splice circuits at other locations without written permission from the Owner.

D. Color code conductors as follows:

1. Grounding conductors: Green.
2. 480/277-volt, three phase systems:
    a. Phase A - brown
    b. Phase B - orange
    c. Phase C - yellow
    d. Neutral - gray
3. 208Y/120-volt, three phase systems:
    a. Phase A - black
    b. Phase B - red
    c. Phase C - blue
    d. Neutral - white
4. Use control wiring of colors different than power wiring (such as pink or purple). Use the same color scheme throughout each system for any control or signal wires performing the same function.
5. Use wire with insulation of required color for conductors of No. 8 AWG and smaller. For wire larger than No.8 AWG, which is not available in specified colors, use self-adhesive, wrap-around cloth type markers of solid colors to code the conductors. When conductors are marked in this manner, mark each conductor at all accessible locations such as panelboards, junction boxes, pullboxes, pullholes, auxiliary gutters, outlets, switches, and control centers.
6. Do not use white, gray, or green color for any power, lighting, or control conductor not intended for neutral or grounding purposes. Low voltage control circuits, or 18 AWG and smaller control conductors, may use gray, green or white as a trace color in addition to the base color of the conductor.
7. Connect power circuit 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, motor control centers, etc. If the phase order of the wires must be reversed to accommodate motor rotation, the adjustment shall

be made at the motor terminal box or for cord connected equipment only, at the load side of the safety disconnect switch. Reversing the phase order at the motor controller or disconnect switch is not acceptable.

E. 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.

F. Leave six inches or more of free conductor at each connected device or equipment terminal and nine inches of free conductors at each unconnected outlet. Tape free ends of conductors at unconnected outlets and coil neatly in outlet box.

G. Install wires neatly in 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.

H. Install grounding conductors according to Section 26 05 26 .

I. Pulling Conductors:

1. Make all cable pulls by hand. 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.
2. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values. Install pullboxes or pull fittings where necessary to prevent exceeding manufacturer's recommendations.
3. Cut cable or conductor ends off after pulling and clean all lubricant and/or pulling compound from conductors before terminating.

J. Support cables according to Section 26 05 02 .

K. Seal around cables penetrating fire-rated elements according to Division 7 Section "Firestopping." with approved fire-stopping materials.

L. Identify wires and cables according to Section 26 05 02 "Basic Electrical Materials and Methods" and as follows:

1. For power circuits:

a. At each connection, except at motors, tag for phase rotation and circuit number.
b. 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.

c. In each enclosure or box where more than one ungrounded power conductor is spliced or connected, tag for panelboard identification and pole number.

2. For control circuits:

   a. Tag at ends of wire. Both ends of the wire shall have the same wire label.

3. Labels shall identify circuits and signals. In the description below, equipment tag ID refers to the motor driven device controlled by the motor controller such as a Neat Polymer Pump (16NPP01). The device tag ID refers to a piece of ancillary equipment associated with the equipment reference by the tag ID, such as a disconnect switch (1DS) or solenoid valve (1SV). Labels shall be identified as follows unless otherwise noted in the specifications:

   a. Wires from motor control equipment to devices shall be labeled with the device tag (motor controller terminal #)(device terminal number) – for example, 05SV01(8)(3) - would reference a wire to solenoid valve 05SV01 landed on terminal 8 in the motor controller and landed on terminal 3 at the solenoid valve (the device end may not have a terminal number, in that case the wire label would only have one terminal label 05 SV01 (8) in the above example).
   b. Wires from control panels to devices shall be labeled with the device tag (CP terminal #)(device terminal number) – for example, 05MFM01(0501)(1) - would reference a wire to magnetic flow meter 05MFM01 landed on terminal 0501 in the control panel and terminal 1 at the flowmeter.
   c. Wires from motor controllers to control panels shall be labeled with Equipment tag ID (motor control terminal #) (CP terminal #) – for example, 16NPP01(8) (0301) - would reference a wire for pump 16NPP01 landed on terminal 8 in the motor controller and continued to terminal 0301 in the control panel.
   d. Wires from device to device (i.e. disconnect switches to control stations) shall be labelled with Device #1 tag (device #1 terminal number)-device #2 tag (device #2 terminal number) – for example, 1DS(1)-1CS(4) would reference a wire landed on terminal 1 on a disconnect switch and continued to terminal 4 in a control station.
   e. 2-conductor and 3-conductor cables to devices shall be labeled with the device tag located on a label on the outer insulation. The individual conductors will have only the motor control center/control panel terminal and the device terminal. As an example for a flowmeter circuit, “05MFM01” would be located on the outer insulation of the 2-conductor cable to flowmeter

05MFM01 and (S140)(1) would be located on one of the conductors, which would represent terminal S140 in the control panel and terminal 1 at the flowmeter.

3.4 CONNECTIONS

A. Use the proper high pressure compression tool for terminating indent type compression connectors or terminations on conductors of size #8 AWG or larger gauge. Use an approved pliers or tool for crimping connectors for conductors of size #10 AWG or smaller gauge.

B. Make splices or tap connections with filler, and tape that possess equivalent or better mechanical strength and insulation ratings than conductors being connected. Insulate to same thickness as connectors being spliced or connected.

C. Shielded cables used for analog signals shall be terminated with not greater than 1 inch of conductor left outside the shield. This applies to field wires entering the panel for termination, and to panel conductors. Conductor twist shall be maintained over the unshielded length to as close as possible to the point of termination. Where the overall jacket is cut back to expose the individual conductors, provide a heat shrink sleeve over the jacket, the signal, and the shield (drain) conductors. Insulate the shield (drain) conductor where not covered by the jacket or the sleeve. Where shield (drain) conductors are not terminated, cut the conductor even with the jacket so that it is covered by the sleeve to prevent inadvertent contact with other devices, terminals, or conductors in the panel.

D. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer, and in compliance with other Sections of Division 16.

E. 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.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform field quality-control testing.

B. Test installation of wires and cables before electrical circuitry has been energized.

1. Test wire and cable installation, when complete and seventy-two hours prior to energization of the system.
2. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.2. Certify compliance with test parameters.

3. Remove and replace conductors with visible damage on conductor insulation 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. Test Category 6 Horizontal UTP Cable for compliance to ANSI/TIA/EIA 568A, ANSI/TIA/EIA TSB67, and ISO/IEC 11801 standards after installation but prior to start/commissioning of the network system. Test with building electrical systems powered on (i.e., Lights, HVAC, etc.)

1. Test each end-to-end link, utilizing 100Mhz sweep tests, for continuity, polarity, NEXT, attenuation, installed length, wire map, impedance, resistance, and ACR. Each cable shall be tested in both directions.
2. Testing device shall be a Level 2 testing instrument, re-calibrated within the last six months, with the most current software revision based upon the most current EIA/TIA testing guidelines, 100Mhz rated, capable of storing and printing test records for each cable within the system. Device shall be a LANCAT, Microtest, Fluke, or equal.
3. Tests shall be conducted on cables terminated on a patch panel.

D. Correct malfunctioning conductors, cables, and connections at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new materials and retest.

END OF SECTION

SECTION 26 05 26

GROUNDING

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment and basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 26 05 19 for grounding conductor requirements.

1.3 SUBMITTALS

A. General: Submit each item in this Article as described in Section 26 05 01 and Division 1 Specification Sections.

B. Product Data: For each type of component specified.

1. In addition to the requirements of 26 05 01 and Division 1 Specification sections, submit only one manufacturer for each product type. Multiple manufacturers for the same product will be rejected.

C. Field Test Reports: Indicate and interpret test results for compliance with manufacturer's published standards and performance requirements. (See Section 3.4 for further information)

D. Operation and Maintenance Manual: At the completion of the project, the operating and maintenance information shall be updated to reflect any changes during the course of construction. The Operation and Maintenance Manual shall include the following:

1. Approved testing reports.
2. Product Data

1.4 QUALITY ASSURANCE

A. Refer to Section 26 05 01 Basic Electrical Requirements 1.7 Quality Assurance

B. Comply with UL 467, "Grounding and Bonding Equipment".

PART 2 — PRODUCTS

2.1 GROUNDING AND BONDING PRODUCTS

A. Governing Requirements: Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

2.2 WIRE AND CABLE GROUNDING CONDUCTORS

A. Comply with Section 26 05 19 Conductors and Cables." Conform to NEC Table 8 (Conductor Properties), except as otherwise indicated, for conductor properties, including stranding.

B. Equipment Grounding Conductors: Insulated with green color insulation.

2.3 CONNECTOR PRODUCTS

A. Pressure Connectors: High-conductivity-plated units.

B. Bolted Clamps: Heavy-duty type.

PART 3 — EXECUTION

3.1 APPLICATION

A. Equipment Grounding Conductors: Comply with NEC Article 250 for types, sizes, and quantities of equipment grounding conductors, except where specific types, larger sizes, or more conductors than required by NEC are indicated.

1. Install insulated equipment grounding conductor with circuit conductors for the items below.
    a. Feeders.
        1) Bond the conductor full size to the equipment to which the circuit connects and to any portion of the raceway where it is metallic. Provide boxes or fittings suitable for connecting equipment grounding conductors where metallic conduit transitions to non-metallic.
    b. Single or three-phase motor or appliance branch circuits.
    c. Flexible raceway runs.
2. 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 of non-metallic raceway to grounded metallic raceway or equipment.
3. Provide boxes or fittings suitable for connecting equipment grounding conductors where metallic conduit transitions to non-metallic.

B. Separately Derived Systems: Where NEC requires grounding, ground according to NEC Paragraph 250-30.

3.2 INSTALLATION

A. General: Ground electrical systems and equipment according to NEC requirements, except where Plans or Specifications exceed NEC requirements.

B. Ground the secondary electrical system to the building structure, metallic piping systems and supplemental grounding electrodes. Coordinate grounding connections made to the water system with the mechanical work and install bonding jumpers wherever deemed necessary.

3.3 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 contact surfaces.

B. Equipment Grounding-Wire Terminations: Make the grounding conductor connections to motors or equipment ten horsepower and above, or twenty amperes and above, with conductor termination and a 5/16-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. Noncontact Metal Raceway Terminations: Where metallic raceways terminate at metal electrical enclosures without mechanical and electrical connection to electrical enclosures, terminate each conduit with a metallic, insulating grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in electrical enclosures. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors, except as otherwise indicated.

D. Connect discontinuous sections of metallic raceway using grounding (bonding) connections at each end of metallic raceway with equipment grounding conductor in the non-metallic portion of the raceway.

E. 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.

F. 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.

3.4 FIELD QUALITY CONTROL

A. Independent Testing Agency: Engage an electrical testing organization to perform acceptance tests described below.

B. Acceptance Tests:

1. Measure resistance of equipment grounding connections for service, feeder and motor circuits to ground at the load end with a Biddle ground ohmmeter.

C. Report: Prepare test reports, certified by the testing organization, of ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

END OF SECTION

SECTION 26 05 33

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 16740 includes specific requirements related to the installation of raceways and boxes.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1. Raceways include the following:

a. RMC.
b. PRMC.
c. LFMC.
d. PVC.
e. RTRC.

2. Boxes, enclosures, and cabinets include the following:

a. Device boxes.
b. Outlet boxes.
c. Pull and junction boxes.
d. Cabinets and hinged-cover enclosures.

B. Related Sections include the following:

1. Section 16050 for raceway and box supports.
2. Section 16120 for conductors installed in raceways and boxes.
3. Section 16140 for devices installed in boxes.

1.3 DEFINITIONS

A. LFMC: Liquidtight flexible metal conduit.

B. RMC: Rigid metal conduit.

C. PRMC: PVC coated rigid metal conduit.

D. PVC: Rigid polyvinyl chloride conduit.

E. RTRC: Reinforced thermosetting Resin Conduit (Fiberglass).

F. NPT: National Pipe Thread

G. NEMA: National Electrical Manufacturers Association

H. ANSI: American National Standards Institute

1.4 SUBMITTALS

A. General: Submit each item in this Article as described in Section 16010 and Division 1 Specification Sections.

B. Product Data: For each type raceway and box specified.

1. In addition to the requirements of 16010 and Division 1 Specification sections, submit only one manufacturer for each product type. Multiple manufacturers for the same product will be rejected.

1.5 QUALITY ASSURANCE

A. Refer to Section 16010 Paragraph 1.7.

1.6 COORDINATION

A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

B. Coordinate conduit stub up locations with approved equipment shop drawing submittals prior to locating conduit stub ups in the slab. Locate conduit stub ups per equipment manufacturer's recommendations and the requirements of the Plans and Specifications.

PART 2 — PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. RMC:

1. Conduit: Hot dipped galvanized steel with threaded ends meeting ANSI C80.1.
2. Couplings: unsplit, NPT threaded steel cylinders with galvanizing equal to the conduit.
3. Nipples: same as conduit, factory made through eight inches, no running threads.

B. PRMC (PVC-Coated Rigid Steel Conduit and Fittings):

1. Minimum 40 mil exterior PVC coating, and 2 mil interior urethane coating.
2. Conduit: PVC Coated Conduit meeting ANSI C80.1, NEMA RN-1 and UL 6.
3. Fittings: PVC Coated Conduit Bodies meeting UL 514B, IEC IP69 and UL Type 4X.
4. Hazardous Location Fittings: PVC Coated Hazardous Location Fittings (GUA outlet boxes, Sealing Fittings, Unions, and EC Series Couplings) meeting UL 1203 after coating is applied.
5. Manufacturers:

a. RobRoy Industries
b. Thomas & Betts Ocal

c. KorKap

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. The use of thinwall conduit is not permitted.
2. Connectors: Hot-Dip galvanized steel or hot-dip galvanized malleable iron, screw in ferrule which covers the end of the conduit inside and out, insulated throat, approved for grounding. Provide with gland nut with integral ground lug for connectors 1-1/2" conduit and larger. O-Z/Gedney Type 4Q series, or approved equal.

2.2 RIGID NONMETALLIC CONDUIT (RNC)

A. Rigid nonmetallic conduit (RNC) includes PVC and RTRC per NEC Article 352 (Rigid Polyvinyl Chloride Conduit: Type PVC) and NEC Article 355 (Reinforced thermosetting Resin Conduit: Type RTRC) and as follows:

1. PVC:

a. NEMA TC 2, Schedule 40 or 80 PVC.
b. Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

2. RTRC:

a. NEMA TC 14
b. UL 1684

2.3 OUTLET AND DEVICE BOXES

A. Concealed in dry indoor locations, flush mounted in walls: Stamped steel, deep drawn one piece (without welds or tab connections), galvanized, with knockouts for conduit or connector entrance, meeting NEMA OS 1, and with plaster or extension rings to suit construction and application.

B. Exposed dry locations which are not hazardous or are not in process areas: 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"x6"x4" or larger may be code gauge fabricated steel continuously welded at seams and painted after fabrication. Covers shall be of the same material and finish as the device box.

C. Exposed outdoors, below grade, wet locations, or exposed in indoor locations in process areas which are not hazardous: galvanized, cast iron alloy box, one piece, with threaded holes or hubs, integral mounting lugs and with neoprene gaskets and galvanized cast iron alloy cover (covers shall be of the same material and finish as the device box).

D. Exposed corrosive locations: PVC coated cast iron or stainless steel boxes with threaded hubs, integral mounting lugs and PVC coated covers. Covers shall be of the same material and finish as the device box.

E. Exposed hazardous locations (whether dry, wet, or corrosive): explosion proof, galvanized, cast iron alloy box, one piece, with threaded holes or hubs, integral mounting lugs and with neoprene gaskets and galvanized cast iron alloy cover. Covers shall be of the same material and finish as the device box.

F. Masonry boxes where installed per the requirements of the specifications, are not required to be drawn one piece.

2.4 PULL AND JUNCTION BOXES

A. Concealed in dry indoor locations, flush mounted in walls: Stamped steel, deep drawn one piece (without welds or tab connections), galvanized, with knockouts for conduit or connector entrance, meeting NEMA OS 1, and with plaster or extension rings to suit construction and application.

B. Exposed dry locations which are not hazardous or are not process areas: 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”x6”x4” or larger may be code gauge fabricated steel continuously welded at seams and painted after fabrication. Covers shall be of the same material and finish as the device box.

C. Exposed outdoors, below grade, wet locations, or exposed in indoor locations in process areas which are not hazardous: Cast-Metal Boxes meeting NEMA FB 1, with gasketed screw down cover. Boxes 6”x6”x4” or larger may be code gauge fabricated stainless steel continuously welded at seams and with rubber gasketed covers. Hoffman or equal. Covers shall be of the same material and finish as the device box. Device boxes associated with control stations shall be the same material as the disconnect and control station enclosure.

D. Exposed corrosive locations: PVC coated cast iron or stainless steel boxes with threaded hubs, integral mounting lugs and PVC coated covers.

E. Exposed hazardous Locations: locations (whether dry, wet, or corrosive): explosion proof, galvanized, cast iron alloy box, one piece, with threaded holes or hubs, integral mounting lugs and with neoprene gaskets and galvanized cast iron alloy cover. Covers shall be of the same material and finish as the device box.

2.5 MISCELLANEOUS FITTINGS

1. NEMA FB 1; compatible with conduit/tubing materials.
2. Deep socket PVC coupling for connecting RTRC to PVC conduit runs.

3. Conduit bodies shall be cast or malleable iron, hot dipped galvanized. Covers shall be of the same material and finish as the fitting. Appleton, Crouse Hinds, OZ Gedney, or equal.
4. Conduit bushings shall be malleable iron. Locknuts and sealing locknuts in sizes smaller than 2 ½" shall be steel. Locknuts and sealing locknuts in sizes 2 ½" and larger shall be malleable iron. Appleton, Cooper Crouse Hinds, OZ Gedney, Thomas Betts or equal.
5. Conduit sealing bushings shall be OZ Gedney Type CSM series. Cabinet sealing bushing shall be OZ Gedney Type GRK.
6. Conduit sealing fittings, drains and breathers shall be OZ Gedney Type EY and DB, or equal Appleton or Crouse Hinds.
7. Through wall and floor seals shall be OZ Gedney FS and WS series.

PART 3 — EXECUTION

3.1 EXAMINATION

A. Examine surfaces and spaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS

A. Install RMC or PRMC unless other raceways are shown on the Contract Documents, are required by Code, or are permitted under these specifications.

B. Where the manufacturer of equipment provided by the Contractor recommends or requires RMC for circuits associated with the equipment, provide RMC or PRMC for the entire circuit, even if other conduit types would otherwise be permitted under these specifications.

C. Indoors: Use the following wiring methods:

1. Exposed raceway runs in non-process areas which are dry and above grade: RMC.
2. Exposed in process areas: RMC or PRMC.
3. Exposed in corrosive areas: PRMC
4. Exposed Wet Locations: RMC or PRMC.
5. Concealed:

    a. In dry accessible building spaces (i.e. above dropped ceilings): RMC.

6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except where RMC (or PRMC) is used, use LFMC. Do not use flexible conduit in place of elbows, offsets, or fittings to attach to

equipment. See below for further requirements for the installation of raceway terminations and connections using flexible connections.

D. Outdoors: Use the following wiring methods:

1. Exposed: RMC or PRMC.
2. Exposed in corrosive locations: PRMC
3. In earth (backfill): RNC or PRMC.

a. Use PRMC where metal conduit is indicated on the Plans for underground circuits. It is not permissible to use RMC in outdoor, below grade locations.

4. Connection to Vibrating Equipment: LFMC. Do not use flexible conduit in place of elbows, offsets, or fittings to attach to equipment. See below for further requirements for the installation of raceway terminations and connections using flexible connections.

3.3 INSTALLATION

A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions. Provide a raceway for each circuit indicated. Do not gang raceway into wireways, pullboxes, junction boxes, etc., without specific approval. Do not group home runs or circuits without approval of the Owner.

B. Minimum Raceway Size: 1 inch trade size for underground or imbedded circuits, 1 inch trade size for communications circuits, 3/4 inch trade size for other circuits.

C. Provide PRMC or RTRC elbows for all RNC runs where conduit transitions horizontally or vertically. Where RTRC is used in PVC runs, provide elbows with factory attached socket PVC couplings. Coordinate the radius of all conduit bends, whether factory elbows or bends, or field bends, with the manufacturer’s minimum bend radius for the installed cable or conductor.

D. Provide long radius elbows (sweeps) for conduit runs containing multi-conductor VFD cables (sweeps shall also meet minimum bend radius requirements of VFD cables as described in Section 16120). Bend radius for conduits containing VFD cable shall not be less than 10% greater than the VFD cable manufacturer’s minimum bend radius for the installed cable.

E. Install conduit as a complete, continuous system without wires, mechanically secure and electrically connected to all metal boxes, fittings and equipment. Blank off all unused openings using factory made knockout seals.

F. Install conduit exposed unless shown otherwise on the Plans.

G. Do not install raceway in the slab or below grade/slab unless specifically shown on the Plans as being installed in the slab or below grade/slab.

H. Run parallel or banked raceways together, on common supports where practical. Use factory elbows where elbows can be installed parallel; otherwise, provide field bends for banked raceways. Make bends in parallel or banked runs from same centerline to make bends parallel.

I. Wherever practical, route conduit with adjacent ductwork or piping and support on common racks. Base required strength of racks, hangers, and anchors on combined weights of conduit and piping.

J. Exposed Conduit Installation:

1. Install exposed raceways in lines parallel or perpendicular to the building or structural members or the structure lines except where the structure is not level. Follow the surface contours as much as practical. Do not install crossovers or offsets that can be avoided by installing the raceway in a different sequence or a uniform line. Provide adequate headroom.
2. Where several circuits follow a common route, stagger pullboxes or fittings, or if shown grouped in one box, individually fireproof each conduit.
3. Support exposed raceways as specified in Section 16050.

    a. 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 ten feet.
    b. Provide sufficient clearance to allow conduit to be added to racks, hangers etc. in the future.
    c. Support raceway within three feet of every outlet box, junction box, gutter, panel, fitting, etc.
    d. Raceway in "wet" areas shall have clamp backs (spacers) or other appropriate spacers to hold them a minimum of ½ 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.

K. Raceway concealed above ceilings, in furred spaces, under slab, embedded in slab etc., which are normally inaccessible may be run at angles not parallel to the building lines.

L. 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 40° C (104° Fahrenheit). Install horizontal raceway runs above water and steam piping.

M. Where conduits cross building or structure expansion joints, use suitable sliding or offsetting expansion fittings. Unless specifically approved for bonding, use a suitable bonding jumper. For sizes one inch and smaller, a half-loop of flexible conduit between boxes or fittings may be used.

N. Underground raceway runs:

1. Run as straight as practicable. Make changes in direction and/or grade of sufficient length to allow a gradual change (three foot radius minimum). Make slight offsets with five degree couplings.
2. Run trench true, and clear of stones or soft spots. Place three inches of fine sand in the trench bottom and tamp into place. Provide preformed plastic spacers on top of sand spaced five feet on center where more than one conduit is placed in a trench. After the raceway is placed in the trench, backfill to six inches above top of conduits 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 grade. Compact the backfill as specified under Division 2.
3. Mark direct buried conduit by an underground line warning tape as described in Section 16050.
4. Clean underground and embedded conduit two-inch size and above with a wire brush or swab, followed by a mandrel not less than twelve inches long and approximately one-quarter inch smaller in diameter than the conduit internal diameter.
5. Where raceway exits from grade or concrete, provide the following:

    a. For runs exiting from grade, slabs or encasement, transition to one of the following for a minimum of 24" inches of raceway (including elbows) before exiting and for vertical runs, a minimum of 3" beyond the exiting point:

        1) RTRC (use for elbow only for PVC conduit runs)

    b. Do not extend plastic conduit (PVC or RTRC) into the slab, above grade, into buildings or into equipment.
    c. For equipment to be moved into place at a later date, install a coupling flush with the floor slab and a threaded flush plug.

O. Under slab raceway runs– not to be installed on this project.

P. Bend and offset metal conduit with hickey or power bender, standard elbows, conduit fittings or pull boxes. Bending of PVC shall be by hot box bender and, for PVC two inches in diameter and larger, expanding plugs. Make elbows, offsets and bends uniform and symmetrical. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

Q. Support conduit connections to motors or other equipment independently of the motor or equipment. Rise 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 rise 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.

R. For conduit connections to hubless enclosures, cabinets, and boxes:

1. Connect to enclosures, boxes and devices from below in exposed outdoors, below grade, or wet locations. Make conduit connections to enclosures at the nearest practicable point of entry to the enclosure area where the devices are located to which the circuits contained in the conduit will connect.
2. Connection methodology shall be determined by area classification and shall follow the most stringent applicable method from:

    a. In exposed outdoors, below grade, wet locations, or exposed in indoor locations in process areas which are not hazardous use Myers hubs or O-Z/Gedney rain tight conduit hubs.
    b. In corrosive locations areas, use PVC coated conduit hubs.
    c. In exposed dry locations which are not hazardous or are not in process areas, connect with double locknuts and with insulating type bushings. Use grounding type bushings where connecting to concentric or eccentric knockouts.

S. Penetrations for raceways:

1. Do not bore holes in floor and ceiling joists outside center third of member depth or within two feet of bearing points. Holes shall be one inch diameter maximum.
2. Penetrate through building or structure wall or surfaces with a PVC or sheet metal sleeve with at least ¼" greater interior diameter (ID) than conduit exterior diameter (OD), set flush with walls, pack with fiberglass and seal with silicone sealant and cover with escutcheon plate.
3. Penetrate through poured-in-place or below grade walls and free slabs, with a sleeve. Set sleeves flush with forms or edges of slab/wall. Pack around conduit with fiberglass and seal with silicone sealant. For penetrations below exterior grade, provide a floor or wall sealing fitting on the interior of the building wall.
4. Penetrate through roofs with core drill hole ½ inch 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.

T. Raceway terminations and connections:

1. Join raceways with fittings designed and approved for the purpose and make joints tight.

2. Make threaded connections waterproof and rustproof by application of a watertight, conductive thread compound prior to terminating conduit. Clean threads of cutting oil before applying thread compound.
3. PRMC: Use only fittings approved for use with that material. Use a manufacturer approved touch-up compound or repair kit on nicks and scrapes in PVC coating after installing conduits.
4. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
5. 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 which are cut in the field to have same effective length and same thread dimensions and taper as specified for factory-cut threads.
6. Flexible Connections: Use maximum of 18 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement, such as motors, transformers, generators or similar equipment or equipment such as instruments which must be removed for service. Install flexible conduit in a straight length. Do not use flexible conduit in place of elbows, offsets, or fittings to attach to fixed equipment such as panels, enclosures or switches. With the Owner's approval, longer lengths of flexible conduit may be used for connection to items of equipment which require longer lengths for installation (i.e. 2" conduits and larger) and removal of the equipment for maintenance or replacement purposes. Recessed and semi-recessed lighting fixtures may use up to 6 feet of flexible conduit, or 11 feet of pre-manufactured lighting "whips". Use liquid-tight flexible metal conduit in wet or damp locations. Do not strap flexible conduit to structures or other equipment.
7. 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. In "wet" areas, use Myers hubs or O-Z/Gedney rain tight conduit hubs. In "corrosive" areas, use PVC coated conduit hubs.
8. Connect conduits to enclosures at the location of the gutter or device to which the contained conductors will be routed. Route or stub conduits to motors and/or mechanical equipment directly to the connection and locate as close as possible to equipment terminals.
9. Where a device manufacturer requires a device or junction box to permit multiple conduit entries into the device from a single conduit, provide the device or junction box at no additional cost to the Owner.
10. 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.

11. Place conduits at panelboards in the rear line of knockouts where possible. Install spare conduits from flush-mounted panels up to accessible spaces. Install a minimum of one spare three-quarter inch conduit for every three single-pole spare breakers or spaces, or fraction thereof (three conduits minimum).

U. Keep conduits clean and dry and close each end left exposed. When blowing through conduits, cover electrical components installed in enclosures to avoid blowing dirt or water into equipment. Use temporary closures to prevent foreign matter from entering raceways.

V. Install pull wires in empty raceways and in empty innerduct. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 8 inches of slack at each end of the pull wire.

W. Seal interior of raceways around conductors at (1) hazardous locations, (2) where conduits pass from warm to cold locations, such as the boundaries of air conditioned, heated or refrigerated spaces and where conduits enter or exit buildings from outdoor areas, including underground ducts or conduit runs or (3) where otherwise required by NFPA 70.

1. Methods used to seal interior of raceways around conductors shall be as follows:

    a. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations. For hazardous locations, fill them with UL-listed sealing compound. For non-hazardous areas, fill with expansive foam or Ducseal. 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. Boxes that have electrical devices installed (switches, receptacles etc.) shall not be used in place of a dedicated steel box for installation of the fitting that will house the sealing material.
    b. Seal conduits using expansive foam or Ducseal where conduits enter through the bottom of motor control centers, switchboards, panelboards and control panels.
    c. Seal conduits using expansive foam or Ducseal for individual items of equipment where it is not practical to install raceway seal fittings such as building mounted lighting fixtures and convenience receptacles.
    d. As otherwise required by NFPA 70.

X. Device and Outlet Boxes

1. Coordinate box locations with building surfaces and finishes to avoid bridging wainscots, joints, finish changes, etc.
2. Use gang boxes in indoor areas wherever more than one device is used at one location. In wet, corrosive or hazardous areas, use multiple double gang boxes.
3. Boxes in wet areas shall be surface mounted on channel iron stanchions or set with spacers on walls and shall be attached with clamps or feet (drilling or punching enclosure to mount through side of box or enclosure is not permitted), and they shall have all conduit connections from below arranged to drain moisture away with suitable EYD drains installed at the bottom. It is not permissible to install conduits into the top and side of the boxes at exterior locations unless otherwise noted on Plans.
4. Attach exposed (surface mounted) boxes to building structure with a minimum of two fasteners. Provide attachments to withstand a force of one-hundred pounds applied vertically or horizontally.
5. Set exposed device boxes four feet above the finished floor to top of the box unless otherwise noted on the Plans.
6. Set exposed boxes for lighting switches at 44 inches above the finished floor and within one foot of the door opening on the strike or lock side of the door or on the side closing last.
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.

Y. Install wall or surface mounted enclosures and cabinets plumb. Support at each corner.

3.4 PROTECTION

A. Provide protection and maintain ambient conditions (in a manner acceptable to manufacturer and Owner) that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.5 CLEANING

A. 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.

END OF SECTION

SECTION 26 07 21

FIRE ALARM SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fire alarm systems, including manual stations, detectors, signal equipment, controls, and devices.

1.3 DEFINITIONS

A. FACP: Fire alarm control panel

1.4 SYSTEM DESCRIPTION

A. Provide a complete, constantly supervised, zone annunciated, continuous ringing, battery backed addressable fire alarm system with audible and visual signals and connection to the central reporting facility the Owner chooses. The system shall consist of control panels, system modules, battery pack, annunciator, remote control/annunciator, manual stations, audible/visual alarm signals, off-site transmitter and miscellaneous equipment required for a complete and operable system which complies with all applicable codes and standards in effect at the job site. All components shall meet UL, NFPA, Americans with Disabilities Act (ADA), and FM standards and be acceptable for installation in the State of Washington.

1. The system shall be interconnected to the telephone system at one of the control panels with two phone lines for alarm reporting.
2. The system shall be totally self-contained and require 120 volt control power at the control panels only.

B. Signal Transmission: Multiplex signal transmission dedicated to fire alarm service only.
C. Audible Alarm Indication: By sounding of horns and bells.
D. Visual Alarm Indication: By xenon-strobe-type units.
E. System connections for alarm-initiating and alarm-indicating circuits. Class A wiring.

1.5 SUBMITTALS

A. General: Submit each item in this Article as described in Section 26 05 01 and Division 1 Specification Sections.

1. System operation description covering this specific Project, including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are unacceptable.

B. Product Data: For each type of system components specified in the section. This includes, but is not limited to:

1. Specification sheets (cut sheets) of all proposed equipment (indicate the exact devices that are to be supplied).
2. Product certificates signed by manufacturers of fire alarm system components certifying that their products comply with specified requirements.
3. Dimensioned plans and elevations showing minimum clearances and installed features and devices. Include list of materials and Nationally Recognized Testing Laboratory (NRTL)-listing data.
4. Wiring diagrams from manufacturer differentiating clearly between factory- and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Make all diagrams specific to this Project and distinguish between field and factory wiring.
5. Provide power calculations as follows:

    a. Provide battery calculations for the fire alarm control panel. The battery calculations shall demonstrate the batteries are capable providing 24 hours of operation with standard loading and five minutes of alarm operation after 24 hours.
    b. Provide calculations showing the power consumption in milli-amperes for each horn/strobe signal circuit in the system.

6. Device Address List
7. Provide operating and maintenance instructions at the time of submittal review for each device in the system. These instructions shall detail how to install and service the equipment and shall include all information necessary for rough-in in preparation for the building facilities to receive the materials. Include data for each type of product, including all features and operating sequences, both automatic and manual. Include recommendations for spare parts to be stocked at the site. Provide the names, addresses, and telephone numbers of service organizations that carry stock of repair parts for the system to be furnished.

C. Shop Drawings:

1. Shop Drawings shall include, but not be limited to, the following:

   a. A floor plan.
   b. Locations of alarm-initiating and notification appliances.
   c. Alarm control and trouble signaling equipment.
   d. Annunciation.
   e. Power connections.
   f. Battery calculations.
   g. Conductor type and size.
   h. Voltage drop calculations.
   i. Manufacturers, model number and listing information for equipment, devices and materials.
   j. Details of ceiling height and construction.
   k. A riser diagram showing each device in the system. The riser diagram should include a signal zone number or device number for each device. The diagram should also show the room location of each device. For signal zones, the candela rating of each device shall be shown.

2. Provide a conduit routing and circuit grouping plan as follows:

   a. Provide a complete building floor plan showing each conduits routing, junction box locations, conduit sizes and circuits within conduits in a manner equal to the Contract Documents.

D. Submission to Authorities Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authorities having jurisdiction after approval by Engineer. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Upon receipt of comments from the authorities having jurisdiction, submit them for review. Resubmit if required to make clarifications or revisions to obtain approval.

E. Field Test Reports: Indicate and interpret test results for compliance with manufacturer's published standards and performance requirements. (see Section 3.6 for further information)

F. Operation and Maintenance Manual: At the completion of the project, the operating and maintenance information shall be updated to reflect any changes during the course of construction. The Operation and Maintenance Manual shall include the following:

1. Component Maintenance and Repair Manuals (specified in Division 1).
2. Spare Parts List
3. Field Test Reports
4. Product Data
5. Control Panel Programming Manual
6. Device Address List: Coordinate with final system programming.

7. Record Drawings: At the completion of the project, the drawings shall be updated to reflect any changes during the course of construction.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced factory-authorized Installer to perform work of this Section.
B. Comply with NEC, Uniform Fire Code, and NFPA 72.
C. Listing and Labeling: Provide motor controllers and circuit breakers specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the NEC, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

D. Single-Source Responsibility: Obtain fire alarm components from a single source who assumes responsibility for compatibility of system components.

1.7 EXTRA MATERIALS

A. Furnish extra materials including spare parts as described below, before installation begins, that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

1. Lamps for Strobe Units: Quantity equal to 10 percent of the number of units installed, but not less than 1.

B. Extra materials including spare parts shall be provided with the equipment or like materials at the time the equipment or materials arrive on site. It is not acceptable to provide extra materials after the equipment or materials are delivered to the site.

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, but are not limited to, the following:

1. The system manufacturer shall be Gamewell-FCI.
2. Or approved equal.

B. Functional Description of System:

1. Include the following system functions and operating features plus those additional functions and features required by the authorities having jurisdiction:

a. The activation of a manual station, detector or other initiating device shall cause the following operations:

   i. Sound all audible alarm devices and operate all visual alarm devices continuously.
   ii. Light an identifying zone LED on the control panel door and lamp on the remote zone annunciator, and remote control annunciator. Sound the tone-alert on the control panel.
   iii. Initiate a call to the off-premises monitoring company.

b. For test purposes, a test initiated from the control panel or remote control/annunciator center shall disconnect the dialer before the system test switch will function. The test operation shall operate the appropriate system trouble light and signal.

c. The alarm devices may be silenced by opening the control panel or remote control/annunciator door and operating the silencing switch.

d. Restoring the initiating device to normal will permit resetting the system by operating the system reset switch and will place the system back to normal status.

e. Opens and grounds shall indicate trouble status by zone at the control panel and sound an audible trouble signal at both the control panel and the remote control/annunciator. A trouble signal can be silenced by operating the silence button or switch at either control point. The trouble signal will resound upon restoration of the system to normal.

f. The system shall use building power for primary operation with automatically charged maintenance free batteries as secondary emergency power. Switching to battery power shall be automatic and shall sound the trouble signal when this occurs. Low battery power shall be annunciated as a trouble signal. Batteries shall be suitable for sixty hours of operation with standard loading and five minutes of alarm operation after 24 hours. Loss of primary power sounds a trouble signal at the FACP. The FACP indicates when the fire alarm system is operating on an alternate power supply.

g. Loss of primary power at the FACP sounds a trouble signal at the FACP and the annunciator. An emergency power light is illuminated at both locations when the system is operating on an alternate power supply.

h. FACP Alphanumeric Display: Displays plain-English-language descriptions and addresses of initiating devices, alarms, trouble signals, supervisory signals, monitoring actions, system and component status, and system commands.

i. Remote Detector Sensitivity Adjustment: Manipulation of controls at the FACP causes the selection of specific addressable smoke detectors for adjustment, display of their current status and sensitivity settings, and control of changes in those settings.

The same controls can be used to program repetitive, scheduled, automated changes in sensitivity of specific detectors. Sensitivity adjustments and sensitivity adjustment schedule changes are recorded by the system printer.

2.2 WIRE

A. Wiring shall be insulated copper conductor No. 14 AWG THHN or larger diameter and 2/C cable No. 18 AWG or larger as required by the manufacturer's devices. All wire installed shall be approved for fire alarm use under Article 760 of the National Electrical Code.

B. Wire markers shall be slip-on elastic neoprene with indelibly stamped block letters and numbers sized to fit outer diameter of wire or cable and applied using an expansion tool. Markers shall be BIC Industries or equal.

2.3 ADDRESSIBLE DEVICES

A. Communication Transmitter and Receiver: Integral to device. Provides each device with a unique identification and capability for status reporting to the FACP.

B. External Addressable Interface Unit: May be used where specified devices are not manufactured and labeled with integral multiplex transmitter and receiver. Arrange to monitor status of each device individually.

2.4 MANUAL PULL STATIONS

A. Station Reset: Key or wrench operated, double pole, double throw, switch rated for the voltage and current at which it operates. Stations have screw terminals for connections.

2.5 SMOKE DETECTORS

A. Factory Nameplate: Serial number and type identification.

B. Operating Voltage: 24-V dc, nominal.

C. Plug-in Arrangement: Detector and associated encapsulated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. The plug connection requires no springs for secure mounting and contact maintenance. Terminals in the fixed base accept building wiring.

D. Integral Visual Indicating Light: Connect to indicate detector has operated.

E. Remote Controllability: Individually monitor detectors at the FACP for calibration, sensitivity, and alarm condition, and individually adjust for sensitivity from the FACP.

F. Smoke Detectors shall be two wire devices. Detectors shall be of the photoelectric type. Detectors shall contain insect screen protection of the sensing chamber with no larger than a No. 30 mesh to keep out minute insects. Detectors shall be low profile. Detectors shall have a locking tamper screw preventing casual removal of the detectors head from the base. Detectors shall

be listed for operation in ten to ninety percent RH, and thirty-two to one-hundred degrees Fahrenheit. Detectors shall incorporate an approved magnetically operated functional test. Finish shall be Red.

2.6 ALARM INDICATING DEVICES

A. General: Equip alarm-indicating devices for mounting as indicated. Provide terminal blocks for system connections.

B. Alarm Signals shall be horns in combination with Xenon strobe visual signals. Visual unit candela for each unit shall be candela rated in accordance with NFPA 72 (1999 edition) as well as in accordance with the Washington State amendments to the 1994 Uniform Building Code. Finish shall be red.

2.7 FIRE ALARM CONTROL PANEL (FACP)

A. General: Comply with UL 864.

B. Cabinet: Lockable steel enclosure. Arrange panel so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control panel, provide exactly matching modular unit enclosures. Accommodate all components and allow ample gutter space for interconnection of panels and field wiring. Identify individual components and modules within the cabinets with permanent labels.

C. Panel UL listed under category "UOJZ" as a single control unit. The panel shall be UL listed for "Power Limited" applications per NEC Article 760.

D. Unit shall contain all power supplies, battery chargers, transformers, circuit boards, input-output connections, and batteries to provide the functions listed below.

E. Systems: Alarm and supervisory systems are separate and independent in the FACP. The alarm-initiating zone boards in the FACP consist of plug-in cards. Construction requiring removal of field wiring for module replacement is unacceptable.

F. Control Modules: Types and capacities required to perform all functions of the fire alarm systems. Local, visible, and audible signals announce alarm, supervisory, and trouble conditions. Each type of audible alarm has a different sound.

G. Zones: Provide for all alarm and supervisory zones indicated.

H. Indicating Lights: Provide individual LED devices for each zone. An LED test switch for each FACP section illuminates all LED devices on that section of the control panel. Manual toggle test switches or push test-buttons shall not require a key to operate. Alarm and supervisory signals light a red LED of the associated zone. Trouble signals light an amber LED for the associated zone.

I. Alphanumeric Display and System Controls: Arrange to provide the basic interface between human operator at the FACP and addressable system components, including annunciation and supervision. A display with a minimum of 32 characters shows alarm, supervisory, and component status messages. Arrange keypad for use in entering and executing control commands.

J. Sixteen (expandable to one-hundred) Style B or Style D zone modules each with red alarm and amber trouble LED's plus one spare. Addressable circuits and system software shall provide remote detector test capability.
K. Thirty (expandable to one-hundred) Style Y or Style Z signal circuits providing two amperes alarm current per circuit plus one spare. Signal Silence Inhibit and/or Time Limit Cut-out and Temporal signaling shall be programmable.
L. Two form C sets of auxiliary alarm contacts.
M. One form C set of auxiliary trouble contacts.

2.8 GRAPHIC ANNUNCIATOR

A. Indicating lights include individual LED indicators for each type of alarm and supervisory device and an LED to indicate trouble. The actuation of any alarm or supervisory signal causes the illumination of a zone light, floor light, and device light. System trouble causes the illumination of all of these lights and also the trouble light. Additional LEDs indicate normal and emergency power modes for the system. A toggle or push-button switch tests the LEDs mounted on the panel. The test switch does not require key operation.

2.9 EMERGENCY POWER SUPPLY

A. General: Components include nickel-cadmium-type battery, charger, and an automatic transfer switch. Battery nominal life expectancy is 20 years, minimum.
B. Battery capacity is adequate to operate the complete alarm system in normal or supervisory (nonalarm) mode for a period of 24 hours. At the end of this period, the battery has sufficient capacity to operate the system, including alarm-indicating devices in either alarm or supervisory mode, for a period of 5 minutes.
C. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Provide capacity for 150 percent of the connected system load while maintaining the batteries at full charge. In the event batteries are fully discharged, the charger recharges them completely within 4 hours. Charger output is supervised as part of system power supply supervision.
D. Integral Automatic Transfer Switch: Transfers the load to the battery without loss of signals or status indications when normal power fails.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL

A. Integral Automatic Transfer Switch: Transfers the load to the battery without loss of signals or status indications when normal power fails.
B. Fire Alarm Power Supply Disconnect: Paint red and label "FIRE ALARM." Provide with lockable handle or cover.

3.2 EQUIPMENT INSTALLATION.

A. Manual Pull Stations: Mount semiflush in recessed back boxes with operating handles 48“ above the finished floor to the top of the device box or lower as indicated.

B. Smoke Detectors: Install ceiling-mounted detectors per Code requirements. Install not less than 4 inches from a side wall to the near edge. For exposed solid-joist construction, mount detectors on the bottom of the joists. On smooth ceilings, install detectors not over 30 feet apart in any direction. Install detectors no closer than 60 inches from air registers.

C. Audible and/or Visual Alarm-Indicating Devices: Install between 80 and 96 inches above the finished floor. Install horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille or as indicated. Combine audible and visual alarms at the same location into a single unit.

D. Install devices and equipment at the locations designated on the drawings. Boxes shall be mounted plumb, level, square and flush with building surfaces within one-sixteenth inch for each condition. Box openings in building surfaces shall be cut within one-eighth inch of boxes, and filled tight with building materials. Provide backboxes or conduit boxes for all devices. The devices shall be at uniform mounting heights as prescribed by WAC and ADA guidelines and be of a uniform type and appearance in common applications throughout the building.

3.3 WIRING INSTALLATION

A. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceways and Boxes."

B. Wiring within Enclosures: Install conductors parallel with or at right angles to the sides and back of the enclosure. Bundle, lace, and train the conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

C. All wire installed must be approved for "Power Limited" Fire Alarm use under Article 760 of the National Electrical Code.

D. Cable Taps: Use numbered terminal strips in junction, pull or outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuit wiring and a different color code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visual alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 16 Section "Basic Electrical Materials and Methods."

3.5 GROUNDING

A. Ground cable shields and equipment according to system manufacturer's instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.

B. Pretesting: After installation, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

C. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.

D. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72. Minimum required tests are as follows:

1. Verify the absence of unwanted voltages between circuit conductors and ground.
2. Test all conductors for short circuits using an insulation-testing device.
3. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
4. Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of the initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
5. Test each initiating and indicating device for alarm operation and proper response at the control unit.
6. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications.

7. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.

E. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

F. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log upon the satisfactory completion of tests.

G. The code enforcement authorities having jurisdiction shall be requested by the Contractor in writing to witness or participate in the testing. The Contractor shall make arrangements for the authority to witness and participate in the testing outlined above.

3.7 CLEANING

A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally, using methods and materials recommended by manufacturer.

3.8 DEMONSTRATION

A. Startup Services: Engage a factory-authorized service representative to provide startup service and to demonstrate and train Owner's maintenance personnel as specified below.

1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, adjusting, and preventive maintenance. Provide a minimum of 8 hours' training.
2. Training Aid: Use the approved final version of the operation and maintenance manual as a training aid.
3. Schedule training with Owner with at least 21 days' advance notice.

B. The Owner shall be provided, at that time, with all up to date drawings, instruction manuals, O&M manuals, and information regarding the components of the system, for his use.

3.9 ON-SITE ASSISTANCE

A. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit actual occupied conditions. Provide up to 2 requested adjustment visits to the site for this purpose.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes lighting and power panelboards and associated auxiliary equipment rated 600 V and less.

B. Section Includes:

1. Panelboards specified under this Section include:

a. Panelboard HB

C. Related Sections include the following:

1. Section 26 05 02 for additional materials and installation information.
2. Section 26 28 16 for circuit breakers installed in panelboards.

1.3 SUBMITTALS

A. General: Submit each item in this Article as described in Section 26 05 01 and Division 1 Specification Sections.

B. Submit panelboard information with or after the Electrical System Study Report (ESSR) as specified under Section 26 05 01 . Equipment submitted prior to submission of the ESSR will be returned as “Not Reviewed”. Panelboard equipment shall not be ordered until the ESSR has been reviewed and approved.

C. Product Data: For each type of panelboard, accessory item, and component specified in this Section.

D. Shop Drawings:

1. Shop Drawings shall include, but not be limited to, the following:

a. Enclosure (including front, door, etc.) type and mounting.
b. Bus configuration, voltage and current ratings.
c. Short-circuit current rating.
d. Circuit breaker quantities, types and layout.
e. Dimensioned plans (showing available conduit entry locations), sections, and elevations. Enclosures which will not accept the quantities of conduits as shown on the Contract Plans will be rejected.

f. Lug configuration showing quantities and sizes of conductors the panelboard can accept. Lugs or connections panelboards which are not able to accept the quantities and sizes of conductors as shown on the Contract Plans will be rejected.

E. Panelboard Schedules: Submit circuit breaker layout as scheduled on the "Panelboard Circuit Schedule" located on the drawings.

F. Operations and Maintenance Manual: Shall include the following:

1. Testing Results (must be approved prior to energization of the system) (see Section 3.4 for further information).
2. Maintenance Data: Include manufacturer's written instructions for testing circuit breakers.
3. Panelboard Schedules: Include approved final versions of panel schedules only.
4. Electrical System Study Report
5. Shop Drawings
6. Product Data

1.4 QUALITY ASSURANCE

A. Refer to Section 26 05 01 paragraph 1.7.

B. Comply with NEMA PB 1.

C. Comply with UL 67, “Standard for Panelboards”.

D. Submit and obtain approval of shop drawings and make approved shop drawings available prior to placement of conduits in slabs to ensure placement is coordinated with panelboard access locations from approved shop drawings. Do not place conduits in slabs prior to the receipt of approved shop drawings. Any relocation of conduits that are required because of incorrectly placed conduits prior to receipt of approved shop drawings shall be completed at the Contractor’s expense.

E. Product Selection for Electrical System Selective Coordination: In accordance with the Electrical System Study Report 26 05 01 , equipment that better meets the requirements of the selective coordination requirements will be acceptable provided the interrupting capacity, normal current capacity, and voltage rating as shown on the contract drawings are also satisfied.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store equipment per requirements of Section 26 05 01 paragraph 1.11.

B. Remove equipment protection only after equipment is safe from hazards such as dirt and moisture and damage from construction operations. Field repair of material or equipment made defective by improper storage or site construction damage by other trades is not acceptable.

1.6 EXTRA MATERIALS

A. Keys: Provide 3 spares of each type for panelboard cabinet lock.

B. Extra materials including spare parts shall be provided with the equipment or like materials at the time the equipment or materials arrive on site. It is not acceptable to provide extra materials after the equipment or materials are delivered to the site.

PART 2 — PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Eaton Corp.; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Div.
3. Siemens Energy & Automation, Inc.
4. Square D Co.

2.2 PANELBOARD FABRICATION

A. Enclosures: Flush- or surface-mounted enclosures as indicated on the Plans. NEMA PB 1, 20" minimum width of NEMA type complying with Section 16050 for the location installed.

B. Front: Secured to enclosure with concealed trim clamps or screws. Front for surface-mounted panelboards shall be same dimensions as enclosure. Fronts for flush panelboards shall overlap enclosure, unless otherwise indicated. Enclosure conduit entry locations shall be able to accept the quantities and sizes of conduits as shown on the Contract Plans.

C. Directory Frame: Metal, mounted inside each panelboard door.

D. Bus: Hard drawn copper of 98 percent conductivity. Insulated, bondable, full size neutral bus unless otherwise indicated.

E. Main and Neutral Lugs: Compression type. Lugs or connections for panelboard equipment shall be able to accept the quantities and sizes of conductors as shown on the Contract Plans.

F. Main Breaker: Vertically mounted.

G. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors. Bonded to enclosure.

H. Doors: In panelboard front, with concealed hinges. Secure with flush catch and tumbler lock, all keyed alike.

I. Special Features: Include the following features for panelboards:

1. Provide same size enclosures for multi-section panelboards.
2. Feed-through Lugs: Sized to accommodate feeders indicated.

3. For panelboards with NEMA 1 enclosures, panel fronts shall be stretcher leveled steel with piano hinged door-to-box construction. The entire panel front shall be hinged to allow access to the interior of the panelboard enclosure when opened (the second door allows access to the circuit breakers only). Door-to-box construction shall not increase the width of the panelboard to a dimension greater than what is shown on the Contract Drawings.
4. Provide skirts for surface mounted panelboards located in building or structures.

J. Future Devices and Circuit Breakers: Equip for future installation of devices and circuit breakers with mounting brackets, bus connections, and necessary appurtenances, for the overcurrent protective device ampere ratings indicated.

K. Series Rating: Series rating is not permitted.

2.3 OVERCURRENT PROTECTIVE DEVICES

A. In accordance with Section 26 28 16 , except as modified herein. Coordinate circuit breaker trip sizes with equipment submittals for process, HVAC etc. equipment specified under Divisions 11 through 15 as described in Section 26 28 16 .

B. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

PART 3 — EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessory items according to NEMA PB 1.1.

1. Setup, adjust and fasten in place flush trim and interiors.
2. Install circuit breakers as shown on the "Circuit Schedule" for each panelboard except where deviations are necessary to accommodate changes in loads or equipment served.

B. Mounting Heights: Top of trim 74 inches above finished floor, unless otherwise indicated.

C. Mounting: Plumb and rigid without distortion of box. Mount flush panelboards uniformly flush with wall finish. Mount surface panelboards with spacers of neoprene or fiberglass to shim out from irregular surfaces or from damp surfaces.

D. Circuit Directory: Prepare panelboards directories neatly typewritten 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. Record all circuit breaker installation deviations from the "Circuit Schedule" and show on the Record Drawings the actual size and pole position of all circuit breakers installed.

E. Do not remove knockouts for breaker positions unless a breaker is to be installed. Where twistouts or knockouts are removed in error, provide a circuit breaker (one pole, twenty ampere) to fill each position removed.

F. 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.

3.2 IDENTIFICATION

A. Panelboard Nameplates: Label each panelboard with engraved nameplates per the requirements of Section 26 05 02 paragraph 3.3.

3.3 CONNECTIONS

A. 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.

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test panelboards and electrical circuits for proper connection, continuity, and absence of undesirable shorts and grounds. Test wire and cable installation, when complete and seventy-two hours prior to energization of the system. Check for continuity, visual damage, marking, and proper phase sequence before performing insulation testing.
2. Make insulation-resistance tests of each panelboard bus, component, and connecting supply or feeder circuit. Megger bus work, breakers and circuits phase-to-phase and phase-to-ground disconnecting and reconnecting equipment which cannot be meggered as required. The minimum acceptable steady-state value is 50 megohms. Record ambient temperature and humidity during testing.

B. Acceptance Testing: After installing panelboards and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements:

1. Provide services of a qualified independent testing agency as described in Section 26 05 01 to perform specified testing for circuit breakers.
2. Testing shall not commence until the short circuit and coordination study has been reviewed and approved.
3. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.6.1.1 for molded-case circuit breakers. Testing of circuit breakers shall only be required for

circuit breakers 200 amperes and larger. Certify compliance with test parameters.

4. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units, and retest.

C. Take load readings on each panelboard after loads are connected and panel has been energized. Record these measurements to give the maximum reading for each phase and neutral obtained with lighting, appliances, motors, and other loads, connected to the panels in service.

3.5 ADJUSTING

A. Set field-adjustable circuit-breaker trip ranges as indicated, or requested by the Owner.

3.6 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Vacuum interior and wipe clean all interior surfaces. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes various types of receptacles, connectors, switches, and finish plates.

1.3 SUBMITTALS

A. General: Submit each item in this Article as described in Section 26 05 01 and Division 1 Specification Sections.

B. Product Data: For each type of wiring device specified.

1. Specification sheets (cut sheets) of all proposed equipment (indicate the exact devices that are to be supplied).
2. In addition to the requirements of 26 05 01 and Division 1 Specification sections, submit only one manufacturer for each product type. Multiple manufacturers for the same product will be rejected.

C. Operation and Maintenance Manual: At the completion of the project, the operating and maintenance information shall be updated to reflect any changes during the course of construction. The Operation and Maintenance Manual shall include the following:

1. Maintenance and Repair Manuals (specified in Division 1).
2. Product Data

1.4 QUALITY ASSURANCE

A. Refer to Section 26 05 01 Basic Electrical Requirements 1.7 Quality Assurance.

PART 2 — MATERIALS

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. Cooper Wiring Devices.
b. Bryant Electric, Inc.

c. Hubbell Inc.
d. Killark Electrical Mfg. Co.
e. Leviton Mfg. Co., Inc.
f. Pass & Seymour/Legrand.
g. Crouse-Hinds
h. Paragon
i. Mulberry
j. Square-D

2.2 WIRING DEVICES

A. Comply with NEMA Standard WD 1 “General Color Requirements for Wiring Devices” and NEMA Standard WD 6, "Wiring Devices – Dimensional Specifications"

B. Enclosures: NEMA 1 equivalent, except as otherwise indicated.

C. Color: Ivory except as otherwise indicated or required by Code.

D. Receptacles, Straight-Blade and Locking Type: Except as otherwise indicated, comply with Federal Specification W-C-596, UL Standard 498, "Electrical Attachment Plugs and Receptacles". Receptacles shall be heavy duty specification grade. 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 5–15R or 5–20R
f. Hubbell HBL 5262 or equal

2. Special Purpose Receptacles

a. Staked screw terminals for line, neutral, and ground connections.
b. NEMA configuration as indicated.

E. 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: 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.

F. Receptacles, Industrial Heavy-Duty: Conform to NEMA Standard PK 4 "Plugs, Receptacles, and Cable Connectors of the Pin and Sleeve Type for Industrial Use."

G. 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."

H. 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: 120/277V ac only, rated 20 amperes.
2. Motor rated switches: horsepower rated for application indicated.

I. 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. For process equipment areas, or electrical rooms: Stainless steel.

J. Weatherproof exterior receptacle device covers shall be constructed entirely of cast aluminum material. The cover which encloses the cord set shall be opaque gray. Product shall be INTERMATIC Model WP1010MXD or equal.

K. Device Box Covers: Cast iron to match box to which installed.

PART 3 — EXECUTION

3.1 INSTALLATION

A. Except as otherwise indicated on Plans, surface mount, with long dimension vertical. Mount with grounding terminal of receptacles on bottom.

B. Arrangement of Devices:

1. Group adjacent switches in common boxes under single, multigang cover plates.
2. See Section 26 05 33 for mounting height of devices.
3. Verify locations of outlets and switches in cabinetry with cabinet supplier and cabinetry shop drawings prior to installation.

C. Install switches with the “Off” position down. Install three and four way switches so the load is de-energized when all switch handles are down.

D. Connect phase, neutral, and grounding wires to devices with full loops around screws installed to tighten with tightening of the screw. The use of push-in terminals are not acceptable. Trim insulation to within one-eighth inch of screw terminal.

E. Surface mounted devices and wall plates: Install devices and assemblies plumb, level and secure.

F. Use corrosion resistant devices outdoors.

3.2 GROUNDING

A. Connect receptacle or switch ground lug to device box.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing:

1. Test wiring devices for proper connections, polarity and ground continuity. Perform this testing with testing equipment designed for testing polarity and connections.
2. Operate each operable device at least 6 times.
3. 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.

B. Replace damaged or defective components, and retest.

3.4 CLEANING

A. General: Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes switches and circuit breakers, whether individually mounted or group mounted in switchboards, motor control centers, panelboards, and similar equipment.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 26 27 26 for attachment plugs and receptacles, and snap switches used for disconnect switches.
2. Section 26 24 16 for panelboards containing circuit breakers.

1.3 SUBMITTALS

A. General: Submit each item in this Article as described in Section 26 05 01 and Division 1 Specification Sections.

B. Submit circuit breaker information with or after the Electrical System Study Report (ESSR) as specified under Section 26 05 01 . Equipment submitted prior to submission of the ESSR will be returned as “Not Reviewed”. Circuit breaker equipment shall not be approved or ordered until the ESSR has been reviewed and approved.

C. Product Data: For disconnect switches, circuit breakers and accessories specified in this Section. This includes, but is not limited to:

1. Specification sheets (cut sheets) of all proposed equipment (indicate the exact devices that are to be supplied).
2. nameplate ratings
3. mounting methods
4. For units which are stand-alone mounted include dimensioned plans (showing available conduit entry locations), sections, and elevations.
5. Enclosures which will not accept the quantities and sizes of conduits as shown on the Contract Plans will be rejected.
6. Lug configuration showing quantities and sizes of conductors equipment can accept. Lugs or connections for switches and circuit breakers which are not able to accept the quantities and sizes of conductors as shown on the Contract Plans will be rejected.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. (See Section 3.2 for further information)

E. Operation and Maintenance Manual: Shall include the following:

1. Maintenance Manuals (specified in Division 1).
2. Electrical System Study Report
3. Field Test Reports (see Section 3.2 for further information)
4. Product Data

1.4 QUALITY ASSURANCE

A. Refer to Section 26 05 01 paragraph 1.7.

B. Source Limitations: Obtain disconnect switches and circuit breakers from one source and by a single manufacturer.

C. Comply with NEC for components and installation.

D. Comply with UL 98, "Enclosed and Dead-Front Switches" for safety switches.

E. Comply with UL 1066 "Standard for Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures" for low voltage power circuit breakers.

F. Comply with UL 489, "Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures" for molded case circuit breakers.

G. Submit and obtain approval of shop drawings and make approved shop drawings available prior to placement of conduits in slabs to ensure placement is coordinated with switch and circuit breaker access locations from approved shop drawings. Do not place conduits in slabs prior to the receipt of approved shop drawings. Any relocation of conduits that are required because of incorrectly placed conduits prior to receipt of approved shop drawings shall be completed at the Contractor's expense.

H. Product Selection for Electrical System Selective Coordination: In accordance with the Electrical System Study Report 26 05 01 , equipment with frame sizes or trip settings other than as specified or shown on the plans that better meets the requirements of the selective coordination requirements will be acceptable provided the interrupting capacity, normal current capacity, and voltage rating as shown on the contract drawings are also satisfied.

PART 2 — PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering switches and circuit breakers that may be incorporated into the Work include, but are not limited to, the following:

1. Disconnect switches, safety switches and circuit breakers:

a. Eaton Corp.; Cutler-Hammer Products.

b. General Electric Co.; Electrical Distribution and Control Division.
c. Siemens Energy & Automation, Inc.
d. Square D Co.

2.2 SWITCHES

A. Enclosed, non-fusible Switch, 600 A and Smaller: NEMA KS 1, Type HD, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position. Switch horsepower rated where used in motor circuits.

B. Enclosed, Fusible Switch, 600 A and Smaller: NEMA KS 1, Type HD, Class R rejection fuse clips, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position. Switch horsepower rated where used in motor circuits.

C. Enclosure: NEMA KS 1, with enclosure types as described in Section 16050, unless indicated otherwise in the Contract Documents. Enclosure conduit entry locations shall be able to accept the quantities and sizes of conduits as shown on the Contract Plans. Enclosure shall use spring loaded latches to ensure environmental protection in any position of the switch; the use of screw or bolt type securing is not acceptable for NEMA 1, 3, 3R, 4, 4X or 12 rated enclosures.

D. Lugs or connections shall be able to accept the quantities and sizes of conductors as shown on the Contract Plans.

E. Accessories:

1. Provide at least two auxiliary contacts for each switch. Where no auxiliary contacts are shown on plans, provide two normally open auxiliary contacts. Where one auxiliary contact is shown on the plans, provide indicated auxiliary contact and one additional normally open auxiliary contact. If two or more auxiliary contacts are shown on the plans, provide auxiliary contacts as shown.

2.3 ENCLOSED CIRCUIT BREAKERS

A. Molded-Case Circuit Breaker: NEMA AB 1, with lockable handle.

B. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated with interrupting rating to meet available fault current.

1. Main circuit breakers and branch circuit breakers 200 amps and larger in switchboards, motor control centers, panelboards and individual enclosed circuit breakers shall have electronic trip units, with field-adjustable, short- and long-time trip units, each separately and individually adjustable for time and pickup. Where indicated, the electronic trip units shall be suitable for monitoring with a network. Circuit breakers greater than 800 amps shall have long term settings

adjustable in 5-percent increments and shall have removable and sealable covers for the settings.

2. Feeder circuit breakers and main circuit breakers under 200 amps shall be molded case breakers with thermal magnetic trip unless otherwise noted.
3. Motor circuit breakers shall be magnetic only trip with adjustable trip setting.
4. Branch circuit breakers less than 200 amps 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 lighting loads (SWD) or heating, air-conditioning, and refrigerating equipment (HACR).

D. Coordinate circuit breaker trip sizes with equipment submittals for process, HVAC etc. equipment specified under Divisions 11 through 15 and adjust the rating/trip size as needed to conform with the manufacturer's requirements for the trip rating. Revise the Electrical System Study Report as required to coordinate with circuit breaker requirements for equipment submittals for process, HVAC etc. equipment.

E. Molded-Case Switch: Where indicated, molded-case circuit breaker without trip units.

F. Enclosure: per application, as described in Section 26 05 02 , unless otherwise specified or required to meet environmental conditions of installed location. Enclosure conduit entry locations shall be able to accept the quantities and sizes of conduits as shown on the Contract Plans.

G. Lugs: Compression lugs, mechanical lugs and power-distribution connectors suitable for conductors of the material, number and size provided. Lugs or connectors shall be able to accept the quantities and sizes of conductors as shown on the Contract Plans. Provide compression lugs for circuit breakers for the following:

1. Circuit breakers installed in switchboards and motor control centers.
2. Main circuit breakers installed in distribution and branch circuit panelboards.
3. Branch circuit breakers larger than 200 amps in distribution or branch circuit panelboards.

H. Series Rating: Series rating of circuit breakers is not permitted.

PART 3 — EXECUTION

3.1 INSTALLATION

A. Install equipment enclosures level and plumb in locations as indicated, according to manufacturer's written instructions.

B. For wall mounted equipment enclosures located at walls, bolt units to wall or mount on structural–steel channels bolted to wall. For enclosures not located at walls, provide structural stanchion supports conforming to Section 26 05 02 .

C. Install wiring between switches, circuit breakers, control, and indication devices.

D. Connect 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.

E. Identify each switch and circuit breaker according to requirements specified in Section 26 05 02.

3.2 FIELD QUALITY CONTROL

A. Acceptance Testing: After installing switches and circuit breakers and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Provide services of a qualified independent testing agency as described in Section 26 05 01 to perform specified testing for circuit breakers.
2. Third party testing shall not commence until the Electrical System Study Report has been reviewed and approved.
3. Procedures:

a. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5.1.1 for switches. Certify compliance with test parameters.
b. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.6.1.1 for molded-case circuit breakers. Certify compliance with test parameters.

4. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.3 ADJUSTING

A. Set field-adjustable circuit-breaker trip setting ranges as indicated.

1. Where circuit breakers are included in the Electrical System Study Report, set the trip as recommended in the report.

B. Provide fuses for fused disconnect switches to coordinate with manufacturer’s listed maximum fuse size for equipment supplied by the disconnect switch.

3.4 CLEANING

A. After completing system installation, including fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

END OF SECTION

SECTION 26 29 23

MOTOR CONTROLLERS

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes ac motor–control devices rated 600 V and less that are supplied as enclosed units, or as individual units for mounting in equipment specified under other sections.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 26 05 01 for general materials and installation methods.

1.3 SUBMITTALS

A. General: Submit each item in this Article as described in Section 26 05 01 and Division 1 Specification Sections.

B. Product Data: For motor controllers and accessories specified in this Section.

1. For variable frequency drives (VFD), submittals shall be custom prepared by the VFD manufacturer for this specific application, and shall include the following:

   a. Manufacturer's published installation, set-up and configuration, operation, and maintenance manuals.
   b. Wiring diagrams specific to the application of the drive under this Contract.
   c. Initial configuration and program parameters specific to the application of the drive under this Contract, including all parameters that will be set to other than manufacturer's default values, and that demonstrate the drive is capable of operating in the manner intended by the project design.

C. Shop Drawings:

1. Submit complete Elementary Wiring Diagrams and One Line Diagrams of control and power wiring, specific to the actual motor or item to be controlled, which clearly indicate and differentiate field wiring and field wired devices, and wiring provided as part of the manufacturer's assembled unit.

2. For units which are standalone mounted include dimensioned plans (showing available conduit entry locations), sections, and elevations. Enclosures which will not accept the quantities of conduits as shown on the Contract Plans will be rejected.
3. Lug configuration showing quantities and sizes of conductors the equipment can accept. Lugs or connections for motor control equipment which are not able to accept the quantities and sizes of conductors as shown on the Contract Plans will be rejected.

D. Field Test Reports: Indicate and interpret test results for compliance with manufacturer's published standards and performance requirements. (see Section 3.7 for further information)

E. Operations and Maintenance Manual: Shall include the following:

1. Field Testing Results (must be approved prior to energization of the system)
2. Maintenance Data
3. Shop Drawings
4. Wiring Diagrams
5. Product Data
6. Provide listing of motor controller settings after motors have been approved, sent to the job site and pictures of the motor nameplates are available, but prior to or with the Shop Test Notification (described in section 40 67 16 3.5).
7. Load–Current and Overload–Relay Heater List: Include the nameplate full load amperes and locked rotor amperes for the motor.
8. Over-current Device settings list: Include the nameplate full load Amperes and locked rotor Amperes for the motor. Include configured settings for motor circuit protectors or circuit breakers. Include the communications settings; if the overload is shown connected to an Ethernet switch, provide the IP address (or addresses), subnet mask and default gateway of the overload relay or communications adapter module.
9. VFD and soft starter configuration parameters summary: Document the settings of configuration parameters and switch settings for each VFD or electronic soft start. Clearly indicate settings of each parameter and/or switch as of the time the driven equipment is placed in service. Marking the setting as "default" is not acceptable. Actual settings must be documented.

1.4 QUALITY ASSURANCE

A. Refer to Section 26 05 01 paragraph 1.7.

B. Source Limitations: Obtain similar motor–control devices through one source from a single manufacturer.

C. Submit and obtain approval of shop drawings and make approved shop drawings available prior to placement of conduits in slabs to ensure placement is coordinated with motor controller access locations from approved shop drawings. Do not place conduits in slabs prior to the receipt of approved shop drawings. Any relocation of conduits that are required because of incorrectly placed conduits prior to receipt of approved shop drawings shall be completed at the Contractor's expense.

D. Product Selection for Electrical System Selective Coordination: In accordance with the Electrical System Study Report 26 05 01 , equipment with frame sizes or trip settings other than as specified or shown on the plans that better meets the requirements of the selective coordination requirements will be acceptable provided the interrupting capacity, normal current capacity, and voltage rating as shown on the contract drawings are also satisfied.

1.5 COORDINATION

A. Coordinate features of controllers and accessory devices with pilot devices and control circuits to which they connect.

B. Coordinate features, accessories, and functions of each motor controller with the ratings and characteristics of the supply circuit, the motor, the required control sequence, and the duty cycle of the motor and load.

1.6 EXTRA MATERIALS

A. Furnish extra materials including spare parts described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Spare Fuses and Indicating Lamps: Furnish 1 spare for every 5 installed units, but not less than 1 set of 3 of each kind.

B. Extra materials including spare parts shall be provided with the equipment or like materials at the time the equipment or materials arrive on site. It is not acceptable to provide extra materials after the equipment or materials are delivered to the site.

PART 2 — PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with additional requirements of the Contract, manufacturers offering motor controller products that may be incorporated into the Work include, but are not limited to, the following:

1. Allen–Bradley

2. Eaton Electrical (Cutler Hammer)
3. Square D Co.

B. Motor Controllers shall not be “integrator assembled”. Motor Controllers shall be, unless otherwise expressly noted on Contract Documents, fully manufactured and assembled at the Factory. This includes components internal to the Motor Controller enclosure, i.e. associated circuit breakers, filters, terminal strips, power supplies, fuses.

2.2 MAGNETIC MOTOR CONTROLLERS

A. Description: NEMA ICS 2, Class A, full voltage, non-reversing, across the line, unless otherwise indicated. Minimum size NEMA 1. IEC rated devices are not allowed.

B. Control Circuit: 120 V; obtained from integral control power transformer, unless otherwise indicated. Include a control power transformer with adequate capacity to operate connected pilot, indicating and control devices, plus 50 percent spare capacity.

C. Combination Controller: Factory–assembled combination controller and disconnect switch with or without overcurrent protection as indicated.

D. Lugs or connections for magnetic motor control equipment shall be able to accept the quantities and sizes of conductors as shown on the Contract Plans.

E. Overload Protection: Solid state electronic type configurable to provide Class 10 or 20 protection for the actual motor furnished. Units shall be manual reset type with an external reset mechanism provided in the starter enclosure front.

1. For non-networked overload protection, provide two separate auxiliary contacts with each overload protection unit.
   a. One normally closed for use in the motor starting circuit.
   b. One normally open for signaling overloads to plant control system.

2.3 VARIABLE FREQUENCY CONTROLLERS

A. Variable Frequency Drives (VFDs) shall have the following features:

1. The VFD shall be rated for 480 VAC. The VFD shall provide microprocessor-based control for three-phase induction motors.
2. The VFD shall be of the Pulse Width Modulated (PWM) design converting the utility input voltage to a variable voltage and frequency output via a two-step operation. Insulated Gate Bipolar Transistors (IGBTs) shall be used in the inverter section.

3. The VFD shall use an 18-pulse rectifier or have an active front end capable of harmonic reduction comparable to 18 pulse rectifier technology.
4. The VFD shall maintain the line side displacement power factor at no less than 0.95 regardless of speed and load.
5. The VFD shall have a one (1) minute overload current rating of 150% and a two (2) second overload current rating of 250% for constant torque drives. The VFD shall have a one (1) minute overload current rating of 110% for variable torque drives.
6. The VFD shall be capable of operating any NEMA design B squirrel cage induction motor, regardless of manufacturer, with a horsepower and current rating within the capacity of the VFD.
7. The VFD shall include an LCD type display with a keypad. The display shall be capable of remote mounting on the exterior of a Motor Control Center or an electrical enclosure containing the VFD.
8. Lugs or connections for variable frequency controllers shall be able to accept the quantities and sizes of conductors as shown on the Contract Plans.

B. Control Functions

1. It shall be possible to configure all of the parameters for the VFD via the keypad on the LCD type display.
2. The VFD shall be capable of being controlled locally at the keypad, via discrete or analog inputs, or remotely via a communications bus.
3. The VFD shall have at least two analog inputs as follows:
    a. A current loop analog input suitable for use with a 4-20 ma current loop.
    b. A voltage loop analog input suitable for use with a potentiometer.
4. The VFD shall have discrete inputs suitable for wiring to dry contacts. The following functions shall be assignable to the discrete inputs:
    a. Enable — This function may not be overridden when operating via the keypad or via a communications bus.
    b. External Fault — This function may not be overridden when operating via the keypad or via a communications bus. It must be possible to automatically clear faults associated with power outages without clearing faults associated with the external fault. (A magnetically or mechanically held relay may be used to provide functionality if necessary.)
    c. Force Local — This input will cause the VFD to ignore start and run signals from the keypad or a communications bus. This function may not be overridden when operating via the keypad or via a communications bus.
    d. Start (3-wire)

e. Stop (3-wire)
f. Run (2-wire) — This function will be level triggered rather than edge triggered. If the VFD is ready and this input is asserted, the VFD will be called. It is not acceptable if the VFD is only called when this input transitions from de-asserted to asserted while the VFD is ready.
g. Reset Faults
h. Setpoint Selection — One or more discrete inputs allowing the selection of the setpoint from among the following sources:

1) Fixed speed
2) current loop analog input
3) voltage loop analog input
4) Keypad
5) Communications Bus

5. The VFD shall have provisions for control via the communications bus.

a. The communications bus shall be capable of sending the following signals:

1) Start
2) Stop
3) Reset Fault
4) Speed Setpoint

b. It shall be possible to configure the VFD so that if the communications bus fails, the VFD will stop if and only if current control is via the communications bus. Units which stop the drive and/or lockout other control methods on bus communications failure are not acceptable.
c. While controlling the VFD, the communications bus shall be able to override the value of the Run (2-wire) discrete input.

C. Outputs and monitoring

1. A minimum of three (3) discrete programmable digital outputs shall be provided with the following function selectable:

a. Fault
b. Run
c. Ready
d. At speed

2. The VFD display shall be a LCD type capable of displaying at least the following status information:

a. Run
b. Stop
c. Ready

d. Alarm
e. Fault
f. Keypad
g. Bus/Communication
h. Local (LED)
i. Remote (LED)
j. Fault (LED)
k. Output frequency
l. Frequency reference
m. Motor speed
n. Motor current
o. Motor torque
p. Motor power
q. Motor voltage
r. DC-bus voltage
s. Voltage level of analog input
t. Current level of analog input
u. Discrete inputs status
v. Fault codes and fault descriptions

3. All numerical status information available via the keypad shall be available via the communications bus.

D. Communications Bus

1. The communication bus media shall be Ethernet over category cable.
2. The protocol shall be Ethernet/IP and shall allow full control of the VFD via VFD manufacturer provided Add-On Profiles or Add-On Instruction Blocks in an Allen Bradley 5380 series CompactLogix PLC.

E. VFD Programming Software

1. Provide and license to the Owner one copy of the manufacturer's software application for uploading and downloading drive parameter programming, and for reading of electronic files containing parameter dumps.

2. If programming cannot be done via the Ethernet network used for drive communications, provide any adapters and drivers required to allow communications via a USB port on a Windows 11 computer.

F. Harmonic Mitigation

1. The VFD system shall consist of the following components. All components listed including power factor correction / harmonic filter and transformer shall be integral to the VFD lineup, factory wired and tested as a complete system.

a. a power factor correction / harmonic filter unit (if required to meet these specifications), consisting of (minimally) 3% input reactor
b. output inverter
c. control logic section.

2. VFDs shall meet all requirements as outlined in IEEE 519 for each individual and total harmonic current & voltage distortion and as indicated in this specification. As per IEEE 519, individual or simultaneous operation of the VFDs shall not add more than 3% total harmonic voltage distortion while operating at full load and speed from the utility source, or more than 5% while operating from standby generator. A harmonic analysis must be submitted with the VFD product data submittal. The analysis shall include all voltage and current harmonics up to the 30th.

3. The variable frequency drive(s) when installed and operating at the Owner's facility, shall not cause excessive voltage and/or current total harmonic distortion (THD) levels greater than allowed by the serving utility on the serving utility's electrical system at the point of common coupling. The point of common coupling for this requirement is defined as the utility's revenue metering equipment.

   a. The voltage and current total harmonic distortion limits shall be as listed in IEEE 519, unless modified by the serving utility. The serving utility is Pacific Power.
   b. This item applies for operating on the power distribution system, combined with not greater than

      1) 15 kVA of linear load.

   c. The drives shall be provided with necessary harmonic mitigation equipment including, but not limited to, line reactors, active or passive filtering components, and/or isolation or phase shifting transformers, as required to meet this specification.

4. The variable frequency drive(s) when installed and operating at the Owner's facility, shall not cause the generator set (provided by the Contractor) which supplies standby power to the drive, or the generator set controls, to exceed voltage regulation of 5% or frequency regulation of 3%, nor cause the generator set to oscillate, hunt, jump or otherwise operate in a manner which damages the generator set, generator set components, or equipment to which the generator set provides power.

G. Spare Parts: Provide spare parts for each drive consisting of (at a minimum) the manufacturer's recommended spare parts, plus (if not included in the manufacturer's recommendations) one spare controller main board for each different type of board, one set of

power output semiconductor devices (IGBTs) for each different type of drive, one spare base driver board for each different type of board, one set of power semiconductor devices (diodes, SCRs, or similar) used in the power conduction path (AC to DC conversion), and spare fuses for each type of fuse in the units. If these items are not available on the smaller horsepower drives, provide a spare drive for each size or type of unit when they are not available.

H. Provide complete documentation of each drive including operation and maintenance manuals, as shipped drawings specific to the drive with non-applicable information clearly marked as non-applicable, and a listing of all configuration/programming parameters as programmed in the drive at the time of project acceptance.

1. Parameters marked as "Default" without providing actual values as well are not acceptable.

I. Lists of only modified parameters which omit unmodified default parameter values are not acceptable. The drive parameters shall be in a spreadsheet form as follows and shall be provided prior to programming the drive:

Parameters			
Motor Data:	Maximum Motor Frequency		Hertz
	Minimum Motor Frequency		Hertz
	Acceleration Time		seconds
	Deceleration Time		seconds
	Motor Thermal Current Limit		Amps
	Nominal Motor Voltage		Volts
	Nominal Motor Frequency		Hertz
	Nominal Motor Speed		RPM
	Nominal Motor Current		Amps
	Input Phase Loss Behavior		
Control:	Local Control		
	Remote Control		
	Local Reference		
	Remote Reference		
	Fault Automatic Reset		
	Retry Attempts		
	Retry Delay		Seconds
	Braking Mode		

Parameters (Continued)		
Inputs/Outputs:	Discrete Input 0	
	Discrete Input 1	
	Discrete Input 2	
	Discrete Input 3	
	Discrete Input 4	
	Discrete Input 5	
	Discrete Input 6	
	Discrete Input 7	
	Discrete Input 8	
	Analog Input 0	
	Analog Input 1	
	Discrete Ouptut 0	
	Discrete Ouptut 1	
	Discrete Ouptut 2	
	Discrete Ouptut 3	
	Analog Output 0	
	Analog Output 1	
Communications:	Protocol	
	Node/IP Address	
	Data Rate/Baud Rate	
	Stop Bits	
	Error Correction	
	16/32 Bit Data Registers	
Communications	Readable Data Register 0	
	Readable Data Register 1	
	Readable Data Register 2	
	Readable Data Register 3	
	Readable Data Register 4	
	Readable Data Register 5	
	Readable Data Register 6	
	Readable Data Register 7	
	Writeable Data Register 0	
	Writeable Data Register 1	
	Writeable Data Register 2	
	Writeable Data Register 3	
	Writeable Data Register 4	
	Writeable Data Register 5	
	Writeable Data Register 6	
	Writeable Data Register 7	

J. Any modifications of the standard drive which are necessary to meet the requirements of this specification shall be provided at the factory. Third party or distributor modifications are not allowed.

K. The variable frequency drive shall be UL or ETL listed and labeled and shall comply with the latest applicable standards of ANSI, NEMA, IEEE, and the National Electrical Code.

2.4 ENCLOSURES

A. Description: Surface–mounted enclosures per the application as described in Section 16050 unless the unit is mounted in a motor control center. Enclosure conduit entry locations shall be able to accept the quantities and sizes of conduits as shown on the Contract Plans.

2.5 ACCESSORIES

A. Devices are factory installed in controller enclosure, unless otherwise indicated.

B. Provide auxiliary devices meeting the requirements of Section 26 05 02 .

PART 3 — EXECUTION

3.1 APPLICATION

A. Select features of each motor controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, drive, and load; and configuration of pilot device and control circuit affecting controller functions.

B. Select horsepower rating of controllers to suit motor controlled.

C. Use fractional–horsepower manual controllers for single–phase motors, unless otherwise indicated.

D. Push–Button Stations: In covers of magnetic controllers for manually started motors where indicated, start contact connected in parallel with seal-in auxiliary contact for low–voltage protection.

E. Hand–Off–Automatic Selector Switches: In covers of manual and magnetic controllers where indicated for motors started and stopped by automatic controls or interlocks with other equipment.

3.2 INSTALLATION

A. Install independently mounted motor–control devices according to manufacturer's written instructions.

B. Location: Locate controllers within sight of motors controlled, unless otherwise indicated.

C. For control equipment at walls, bolt units to wall or mount on structural–steel channels bolted to wall. For controllers not at walls, provide freestanding racks conforming to Section 26 05 01.

D. Install freestanding equipment on concrete housekeeping bases conforming to Division 3.

E. Motor–Controller Fuses: Install indicated fuses in each fusible switch.

3.3 IDENTIFICATION

A. Identify motor–control components and control wiring according to Section 26 05 02 .

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between motor–control devices according to Section 26 05 19 .

B. Bundle, train, and support wiring in enclosures.

C. Connect hand–off–automatic switch and other automatic control devices where available.

1. Unless shown otherwise, connect selector switches to bypass only the manual and automatic control devices that have no safety functions when switch is in the hand position.
2. Unless shown otherwise, connect selector switches with motor–control circuit in both hand and automatic positions for safety–type control devices such as low– and high–pressure cutouts, high–temperature cutouts, and motor overload protectors.

3.5 CONNECTIONS

A. Tighten connectors, terminals, bus joints, and mountings. Tighten field–connected connectors and terminals, including screws and bolts, 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.

3.6 START-UP AND TRAINING SERVICES

A. Provide the services of the manufacturer’s factory authorized representative for start up of variable frequency drives and training of the Owner’s personnel for operation and maintenance of the drives for each drive as it is connected, started up and placed in service. Inspect the installation of each drive for conformance with the manufacturer’s recommended installation practices. Provide a minimum of 2 full days on site start-up services. These days shall be coordinated with the start-up of the facility. Travel time or unsuccessful trips due to Contractor unpreparedness shall not be counted towards the 2 full days of services.

B. Requirements for setting drive parameters:

1. The following shall be completed by the manufacturer's factory authorized representative at the equipment shop test prior to delivering the drive to the site:

   a. Program motor parameters such as motor horsepower, voltage, current, code letter, full load amps, and similar items. Program and/or configure each drive to properly operate the actual motor to which it is connected..
   b. Coordinate with the operational requirements of the process equipment and program drive with equipment parameters such as acceleration/deceleration and maximum/minimum speed ramp times, span and range of analog inputs, and similar items.
   c. Program communications parameters such as precedence between local and bus communications, protocol settings, IP address, etc.
   d. Verify inputs to and outputs from drive and make appropriate settings or programs for motor overtemperature, seal leaks, motor safeties, switch statuses etc.
   e. Test and verify drive performance with dummy loads.

2. Test the operation of each drive at the site after fully programming/ configuring the drive. Verify all settings with actual motor installed, driven equipment with driven equipment supplier and communications settings with actual communications and control equipment installed. Reprogram and/or reconfigure and then retest as required to obtain proper operation of the driven equipment and control of the process. Document the final configuration and programming parameters after successful startup and provide in hard copy and electronic form the documentation to the Owner at the job site.
3. Provide a minimum of eight hours training to the Owner, at the Owner's facility, prior to start-up or placing into operation the first drives. Training shall cover installation, maintenance, operation, and problem troubleshooting for each type of drive provided, and shall delineate differences between individual drives where configuration, programming, or control functions are different for otherwise similar model drives. Demonstrate use of the drive programming software specified elsewhere in these specifications and train Owner's personnel in its use.

3.7 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test controllers and electrical circuits for proper connection, continuity, and absence of undesirable shorts and grounds. Test wire and cable installation, when complete and seventy-two hours prior to

energization of the system. Check for continuity, visual damage, marking, and proper phase sequence before performing insulation testing.

2. Make insulation-resistance tests of each component and connecting supply or feeder circuit. Megger bus work and circuits phase-to-phase and phase-to-ground disconnecting and reconnecting equipment which cannot be meggered as required. The minimum acceptable steady-state value is 50 megohms. Record ambient temperature and humidity during testing.

B. Acceptance Testing: After installing motor controllers, before electrical circuitry has been energized, and prior to startup, demonstrate product capability and compliance with requirements.

1. Provide services of a qualified independent testing agency as described in Section 26 05 01 to perform specified testing for motor controllers.
2. Procedures:
    a. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.16.1.1 for motor starters other than variable frequency drives. Certify compliance with test parameters.
    b. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.17 for variable frequency drives. Certify compliance with test parameters.
3. Remove and replace malfunctioning units with new units, and retest.

3.8 CLEANING

A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally, using methods and materials recommended by manufacturer.

END OF SECTION

SECTION 26 51 19

INTERIOR LIGHTING

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes interior lighting fixtures (including fixtures normally mounted on the building), lamps, ballasts, emergency lighting units, and accessory materials such as frames, lenses, diffusers, hangers, spacers, stems and canopies, auxiliary junction boxes and other miscellaneous hardware as required for complete installation of all lighting equipment.

1.3 DEFINITIONS

A. LED luminaire: A complete lighting unit consisting of LED-based light emitting elements and a matched driver together with parts to distribute light, to position and protect the light emitting elements, and to connect the unit to a branch circuit. The LED based light emitting elements may take the form of LED packages (components), LED arrays (modules), LED Light Engine, or LED lamps. The LED luminaire is intended to connect directly to a branch circuit.

B. Fixture: A complete lighting unit, exit sign, or emergency lighting unit. Fixtures include lamps and parts required to distribute light, position and protect lamps, and connect lamps to power supply. Internal battery-powered exit signs and emergency lighting units also include a battery and the means for controlling and recharging the battery. Emergency lighting units include ones with and without integral lamp heads.

C. Average Life: The time after which 50 percent fails and 50 percent survives under normal conditions.

D. CRI: Color Rendering Index.

E. CCT: Correlated Color Temperature.

F. SSL: Solid State Lighting (or LED)

1.4 SUBMITTALS

A. General: Submit each item in this Article as described in Section 16010 and Division 1 Specification Sections.

B. Product Data describing fixtures, lamps, drivers, and emergency lighting units. Arrange Product Data for fixtures in order of fixture designation. Include data on features and accessories and the following:

1. Outline drawings indicating dimensions and principal features of fixtures.
2. Electrical Ratings and Photometric Data: Certified results of laboratory tests for fixtures and lamps.
3. Battery and charger data for emergency lighting units.

C. Provide one of the following sets of data regarding the output of the Luminaire over time:

1. LM-79-08 report at T=0 and at T=6000 hours with a summary table showing the percentage lumen output change and percent input power change.
2. LM-80-08 test data for the LEDs at the three temperatures per LM-80-08. Provide extrapolation data using an exponential decay function to show the output at 50,000 hours. Provide the Ts value from the LM-79-08 ad where the point falls in relation to the LM-80-08 extrapolated data. Interpolate between the LM-80-08 data for the Ts temperature.

D. Operation and Maintenance Manual: Shall include the following:

1. Maintenance Manuals for the lighting fixtures (specified in Division 1).
2. Field Acceptance Test Reports (see section 3.3 for further information)
3. Product Data

1.5 QUALITY ASSURANCE

A. Electrical Component Standard: Provide components that comply with NEC and that are listed and labeled by UL.

B. Refer to Section 26 05 01 paragraph 1.7.

C. Listing and Labeling: Provide fixtures, emergency lighting units, and accessory components specified in this Section that are listed and labeled for their indicated use and installation conditions on Project.

1. Special Listing and Labeling: Provide fixtures for use in damp or wet locations, and recessed in combustible construction that are specifically listed and labeled for such use. Provide fixtures for use in hazardous (classified) locations that are listed and labeled for the specific hazard.

D. Coordinate fixtures, mounting hardware, and trim with ductwork, insulation, sprinkler system, ceiling system and other items, including work of other trades, required to be mounted on ceiling or in ceiling space.

1.6 EXTRA MATERIALS

A. Furnish extra materials including spare parts as described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Two spare LED luminaires of each type being provided on the project as described on the lighting fixture schedule.

2. LED Lamps: 10% of each type and rating installed. Furnish at least one of each type.
3. Plastic Diffusers and Lenses: 1% of each type and rating installed. Furnish at least one of each type.
4. LED Drivers: 2% of each type and rating installed. Furnish at least one of each type.
5. Globes and Guards: 5% of each type and rating installed. Furnish at least one of each type.

B. Extra materials including spare parts shall be provided with the equipment or like materials at the time the equipment or materials arrive on site. It is not acceptable to provide extra materials after the equipment or materials are delivered to the site.

PART 2 — PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products specified in the Lighting Fixture Schedule.

2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. No visible labels, trademarks or monograms on the exterior of the lighting fixtures or on lens or diffusers

B. Metal Parts: Free from burrs, sharp corners, and edges.

C. Sheet Metal Components: Steel, except as indicated. Form and support to prevent warping and sagging.

D. Doors, Frames, and Other Internal Access: Smooth operating without the use of tools, intended for finger operation; free from light leakage at seams, joints or junctions visible in the installed condition under operating conditions. Spring loaded latches for frames.

E. Reflecting Surfaces: Minimum reflectance as follows, except as otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

F. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or water white, annealed crystal glass, except as otherwise indicated.

1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Lens Thickness: 0.125 inch minimum; except where greater thickness is indicated.

3. Pattern for plastic lenses: K12 prismatic refractors. Pattern No. 12 is not acceptable.
4. Approved manufacturers:
    a. Holophane
    b. KSH Plastics
    c. Carolite Plastics
    d. Plaskolite, Inc.

G. Provide gaskets on all trims and housings of "wet" location fixtures. Provide non-corrosive type plaster rings, hangers, trim and hardware in wet locations.

H. Fixture Supports

1. Provide hook hangers for fixtures where indicated or specified consisting of an integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking type plug.

I. LED Drivers: Electronic integrated circuit, solid-state, full-light-output, energy-efficient type compatible with lamps and lamp combinations to which connected.

1. Certification by Electrical Testing Laboratory (ETL). Can be UL recognized, but Listed when part of a fixture assembly.
2. Drivers shall have a minimum efficiency of 85%.
3. Sound Rating: "A" rating.
4. Voltage: Match connected circuits.
5. Starting Temperature: -30 deg. C to 50 deg C.
6. Minimum Power Factor: 90 percent.
7. Total Harmonic Distortion (THD) of Ballast Current: Less than 10 percent.
8. Conform to FCC Regulations Part 15, Subpart J for electromagnetic interference.
9. Lamp-Driver connection method does not reduce normal rated life of lamps.

2.3 LAMPS AS PART OF FIXTURE

A. Provide lamps for each fixture which comply with ANSI C78 series that is applicable to each type of lamp.

B. Color Temperature and Minimum Color-Rendering Index (CRI): 4000-4100 K and minimum CRI listed on fixture schedule.

C. LED Lamp Life: Rated average is a minimum of 50,000 operating hours before reaching L70 lumen output degradation point with no catastrophic failures.

2.4 FUSES

A. Provide fuses in fixtures mounted more than ten feet above floor or operated at 277 volts.

B. Fast acting, current limiting fuses, coordinated with the ballast and lamp operating characteristics, so as to avoid false tripping, yet provide fault clearing before damage occurs to the fixture. Bussman Type HFL in-line fuse holder and Bussman Type GLR fuse, sized at two-hundred percent of the driver current rating.

2.5 FINISHES

A. Manufacturer's standard, except as otherwise indicated, applied over corrosion-resistant treatment or primer, free of streaks, runs, holidays, stains, blisters, and similar defects.

PART 3 — EXECUTION

3.1 INSTALLATION

A. Coordination with other work.

1. Coordinate lighting fixture size and design, frame requirements, and hanging or mounting devices for project ceiling conditions before ordering lighting fixtures. Refer to the Plans for details of ceiling and wall construction; provide lighting fixtures suitable for the particular type of ceiling or wall at each location.
2. Adjust light fixtures as required - near piping, equipment, etc., to protect from physical damage and provide sufficient clearance to install lamps and to maintain lens, reflectors, ballasts, etc. Where pendant mounted fixtures are in conflict with ducts and piping, coordinate the location and mounting heights of the fixtures to the available space left between the various ducts and piping.
3. Locate fixtures so that doors and other equipment will not damage them at any time.
4. Adjust stem or chain lengths to suit actual field conditions where indicated mounting heights to bottom of fixtures are not possible or conflict with other trades' work. Brace pendants and rods over 48 inches long to limit swinging.
5. Prepare irregular surfaces for mounting.

B. Fixture support

1. Install fixtures with supports, brackets and trim as recommended by the fixture manufacturer to suit the particular building construction and use. Align each fixture to ceiling structure.
2. Provide clips on fixtures installed in grid type ceiling with exposed T-bar construction to hold fixture to T bars which prevent any relative lateral movement between fixture and the suspension system at any point on the fixture.
3. Install surface mounted fixtures tight to the ceiling construction. Provide shims or spacers as required to keep surface mounted fixture

from warping or twisting due to uneven surfaces. For suspended fixtures, use stems and chain attachments that cannot be displaced from hangers by an upward force.

4. Provide fixture hangers and attachments on pendant or bracket mounted fixtures in addition to raceway connections. Provide a minimum of two per fixture at the quarter points for fixtures of eight feet or less. Provide a minimum of four per fixture, equally spaced at the ends and on third points for fixtures over eight feet in length. Provide a minimum of one stem or chain per eight feet plus one for fixtures in a continuous row. Maximum spacing of stems not to exceed nominal length of each fixture. Install additional stems or hangers where recommended by the fixture manufacturer.
5. Secure surface and pendant fixtures to ceiling system, roof structure or slabs with a fastener such as lag screw, lag bolt, toggle bolt, cinch anchor or stud to support the fixture plus one-hundred pounds at each support. Nails or similar fasteners are not approved for lighting fixture support.
6. Do not support fixtures from ceiling material other than structural or framing material. Provide supports, spacers, channels, etc., necessary to support lighting fixtures where fixtures are located so that they cannot be connected directly to structure members. Provide additional framing to directly support fixtures where construction is such that mounting channels, strongbacks or bridging is required to support fixtures. Provide additional support material which matches the structure material.
7. Provide outlet boxes or other supports for lighting fixtures which are of sufficient strength to support at least four times the weight of fixture or one-hundred pounds, whichever is greater. Support all fixtures weighing more than fifty pounds independently of outlet box.
8. Do not support LED fixtures with forty-eight inches or longer lamps from outlet box ears. Provide suitable fixture stud in box for each fixture.
9. Support all surface mounted fixtures more than eighteen inches wide at or near each corner, in addition to support from outlet box.
10. For heavy pendant mounted fixtures, where support independent of box is required and where conduit and outlet boxes are installed on surface, use safety swivel hanger with fixture stud. For fixtures suspended indoors from sloping surfaces, provide suitable aligners.

C. Install fixtures in rows or grids true to line. Install fixtures in a common area at the same level or grade. Install continuous runs of fixtures straight and true with joining straps, couplings, and nipples. Maintain spacing for fixtures as dimensioned or shown on the reflected ceiling plan and do not arbitrarily change because of ceiling pattern, etc. Symbols on the Plans which are undimensioned show approximate locations and care shall be used to locate

fixtures on centers of spaces, at the quarter points, or as indicated. Any changes in fixture layout must be approved in writing by the Owner.

3.2 CONNECTIONS

A. Ground the lighting units. 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.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Tests: Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation.

C. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

D. Report results of tests in writing.

E. Replace fixtures that show evidence of corrosion during Project warranty period.

F. Provide replacement LEDs for all LEDs which fail prior to completion of the work.

3.4 ADJUSTING AND CLEANING

A. Clean fixture lens, diffusers and enclosures on fixtures. Dirty enclosures, lens or diffusers shall be removed, washed and rinsed as recommended by fixture manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

3.5 INTERIOR LIGHTING FIXTURE SCHEDULE

A. Lighting Fixture Schedule is shown on the Contract Plans.

END OF SECTION

DIVISION 31 – EARTHWORK

SECTION 31 10 00 – SITE CLEARING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Work included in this section consists of all work necessary to prepare the site for further site Work activities such as installation of the rammed aggregate pier foundation system.

B. This section includes removal of surface debris; removal of plant life; removal of surface rock; and excavation and stockpiling of topsoil.

C. Dust control shall be provided for the full duration of the project. The Contractor shall be responsible for obtaining and paying for any required permits.

1.02 RELATED SECTIONS

A. Section 31 14 11 – Soil Materials

1.03 REGULATORY REQUIREMENTS

A. Conform to applicable Local, State, and Federal codes for environmental requirements, disposal of debris, burning debris on site, and use of herbicides.

B. Coordinate clearing Work with utility companies.

C. Conform to clean air regulations of the Washington Department of Ecology. A copy of the regulations is available at the Central Regional Office of the Washington Department of Ecology located in Yakima, Washington.

D. Comply with the State of Washington regulation regarding disposal of waste material as outlined in WAC 173-304, Subchapter 461.

1.04 SUBMITTALS

A. No submittals required for this section.

1.05 QUALITY ASSURANCE

A. Work shall be performed in accordance with the requirements of Section 2-01, Clearing, Grubbing, and Roadside Cleanup, and Section 2-02, Removal of Structures and Obstructions, of the WSDOT Standard Specifications.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Materials not used.

PART 3 – EXECUTION

3.01 PREPARATION

A. Identify a salvage or stockpile area for placing removed materials.

B. A waste site has not been provided by the Contracting Agency for disposal of unsuitable material, asphalt concrete, debris, waste material, or any other objectionable material that is directed to waste by the Engineer.

3.02 PROTECTION

A. Locate, identify, and protect from damage any utilities which remain.

B. Protect bench marks, survey control points, and existing structures from damage or displacement.

3.03 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove brush, shrubs and surface rock.

C. Remove any unsuitable soil materials not meeting the requirements of Section 31 14 11 – Soil Materials.

3.04 REMOVAL

A. Remove debris, pipes, rock, extracted plant life, and any other objectionable or unsuitable material from the site.

B. Remove existing fencing where in conflict with new construction. Existing fence materials may be salvaged by the Contractor for use in replacement of existing fence where called out on the Plans. Damaged materials shall be disposed of as described above.

3.05 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated or re-graded, without mixing with foreign materials.

B. Do not excavate wet topsoil.

C. Stockpile in area on site to depth not exceeding 8 feet and protect from erosion.

D. Topsoil shall be saved for use as backfill adjacent to the new improvements and to achieve subgrade elevations. Refer to Section 31 14 11 – Soil Materials for material use requirements.

E. Excess topsoil not required for construction of improvements shall be removed from the project site.

3.06 DUST CONTROL

A. The Contractor shall be solely responsible for dust control on this project and shall protect motoring public, adjacent businesses, homes, orchards, and crops from damage due to dust, by whatever means necessary. The Contractor shall be responsible for any claims for damages and shall protect the Contracting Agency, Yakima County, and the Consultant from any and all such claims.

B. When directed by the Engineer, the Contractor shall provide water for dust control within two hours of such order and have equipment and manpower available at all times including weekends and holidays to respond to order for dust control measures.

END OF SECTION 31 10 00

SECTION 31 14 11 – SOIL MATERIALS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This section includes the requirements for subgrade materials and topsoil materials, whether obtained from project excavations, or imported from off-site sources.

B. Suitable soil materials obtained from project excavations shall be separated and stockpiled for later incorporation into the Work.

C. Placement of soil materials is covered in related sections.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 45 11 – Testing, Inspections, Supervision

C. Section 31 10 00 – Site Clearing

D. Section 31 22 13 – Rough Grading

E. Section 31 23 11 – Excavation, Backfill and Compaction for Structures

F. Section 31 23 15 – Trench Excavation and Backfill

G. Section 32 11 11 – Aggregate Materials

1.03 REFERENCE STANDARDS

A. The Standard Specifications for Road, Bridge, and Municipal Construction prepared by the Washington State Department of Transportation.

B. ASTM D 2487 – Classification of Soils for Engineering Purposes.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit name, address and phone number of imported materials source. Submit material data for verification that soil materials are in conformance with the specifications.

C. Submit results of tests specified in this Section and/or required by Section 01 45 11 – Testing, Inspections, Supervision.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with WSDOT Standard Specifications.

PART 2 – PRODUCTS

2.01 SUBGRADE MATERIALS

A. Subgrade materials are those materials used to accomplish rough grading and to bring ground surfaces to top of subgrade elevation, including the following:

1. Common Fill:

a. Suitable material obtained from project excavations.

b. Rock embankment material - common fill material which contains 25 percent or more, by volume, gravel or stone 4 inches or more in diameter.

c. Earth embankment material - common fill material other than rock embankment material.

d. Free of debris.

e. Imported common fill (if required) shall conform to the requirements of Section 9-03.14(3) of the Standard Specifications for “Common Borrow”

2. Structural Fill:

a. Imported, well-graded, crushed aggregate material conforming to the requirements of Section 9-03.9(3) of the Standard Specifications for “Crushed Surfacing Base Course.”

2.02 TOPSOIL MATERIALS

A. Topsoil shall be Type B or Type C per Section 9-14.1 of the Standard Specifications with the following properties:

1. Friable silt loam.

2. Reasonably free of roots, rocks larger than 2-inches, subsoil, debris, large weeds, and foreign matter.

3. Acidity range (pH) between 5.5 and 7.5.

4. Containing a minimum of 4 percent and a maximum of 20 percent inorganic matter.

2.03 SOURCE QUALITY CONTROL

A. Perform testing and analysis of topsoil materials in accordance with ASTM D1557.

B. If material tests indicate materials do not meet specified requirements, change material and retest.

C. For each type of materials provided to the project, use the same source throughout the Work.

PART 3 – EXECUTION

3.01 MATERIAL REMOVAL

A. Excavate rock, subsoil and topsoil from areas designated.

B. Remove lumped soil, boulders, and rock from topsoil.

C. Separate removed materials for later use as topsoil and common fill.

D. The Contractor may provide a screen for separation of the excavated materials into the gradations required for use as common fill or structural fill.

3.02 STOCKPILING

A. Stockpile materials on site at locations shown on the Plans for Contractor's Work area.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Prevent intermixing of soil types or contamination.

E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.03 STOCKPILE CLEANUP

A. Stockpile soil materials and leave area in a clean and neat condition. Grade site surface to prevent free-standing surface water.

B. Excess material shall be wasted to a location secured by the Contractor.

END OF SECTION 31 14 11

SECTION 31 22 13 – ROUGH GRADING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This section includes all Work necessary to achieve the top of subgrade elevations shown on the Plans or otherwise required to achieve suitable foundations for structures, roadways, parking areas, and landscaped areas.

B. Work required in this section may include, but not necessarily be limited to, unclassified excavation, backfilling, embankment construction, placement of structural fill, and backfilling of over-excavated areas.

C. Additional Work required to accomplish the requirements of this section is specified in the related sections.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 45 11 – Testing, Inspections, Supervision

C. Section 31 10 00 – Site Clearing

D. Section 31 14 11 – Soil Materials

E. Section 31 23 11 – Excavation, Backfill and Compaction for Structures

F. Section 31 23 15 – Trench Excavation and Backfill

G. Section 32 11 11 – Aggregate Materials

1.03 REFERENCE STANDARDS

A. The Standard Specifications for Road, Bridge, and Municipal Construction prepared by the Washington State Department of Transportation.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit test results as required by Section 01 45 11 – Testing, Inspections, Supervision.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with WSDOT Standard Specifications.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Topsoil: As specified in Section 31 14 11 – Soil Materials.

B. Subgrade Common Fill: As specified in Section 31 14 11 – Soil Materials.

C. Structural Fill and Structural Backfill: As specified in Section 31 23 11 – Excavation, Backfill and Compaction for Structures.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify site conditions prior to beginning Work.

B. Verify that survey bench mark and intended elevations for the Work are as indicated.

C. Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect from damage utilities which remain.

D. Notify utility company to remove and relocate utilities.

E. Protect above- and below-grade utilities which remain.

F. Protect plant life, lawns, rock outcropping, and other features remaining as a portion of final landscaping.

G. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

H. Comply with WSDOT Standard Specifications, Section 2-03.

3.03 SUBGRADE EXCAVATION

A. Excavate subgrade materials from areas to be further excavated, re-landscaped, or regraded.

B. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.

C. When excavating through roots, perform Work by hand and cut roots with sharp axe.

D. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion.

E. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.04 FILLING

A. Fill areas to contours and elevations with unfrozen materials.

B. Place fill material on continuous layers and compact in accordance with WSDOT Standard Specifications.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

D. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise.

E. Make grade changes gradual. Blend slope into level areas.

F. Remove surplus fill materials from site.

G. Comply with WSDOT Standard Specifications, Section 2-03.

3.05 TOLERANCES

A. Top surface of subgrade in roadway areas: To line and grade shown on Plans.

B. Top surface of subgrade beneath structures: Plus 0.00 feet above the line and grade shown on the Plans to minus 0.30 feet below the line and grade shown on the Plans.

C. Unless otherwise approved by the Engineer, manufactured or imported aggregate materials shall not be used to achieve subgrade elevations.

3.06 FIELD QUALITY CONTROL

A. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

END OF SECTION 31 22 13

SECTION 31 23 11 – EXCAVATION, BACKFILL AND COMPACTION FOR STRUCTURES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered within this section includes structural excavation, structural fill, and structural backfill necessary to construct this project as shown on the Plans and as specified herein.

B. Rock excavation is also included in this section. No blasting will be allowed.

C. Quantities and work required for excavation, backfill, and compaction for structures shall be included in the Bid Items related to site work. No separate distinction shall be made for excavation, backfill, and compaction for structures.

D. The limits of structural excavation, structural fill, and structural backfill are defined as follows:

1. Structural Excavation: That excavation required to establish subgrade below the structure with a horizontal limit extending to no more than 1 foot outside the limits of the footing or slab, or as otherwise indicated on the Plans.

2. Structural Fill: That fill placed on prepared subgrade up to the base of the footing or slab, with a horizontal limit beginning 1 foot outside the limits of the footing or slab, and extending down and out to the base of the fill at a slope of 1 horizontal to 1 vertical. Material placed outside these limits shall be considered common fill.

   Structural fill also includes fill paced inside structure walls up to the base of interior footings/slabs.

3. Structural backfill: That structural fill placed against the outside of the structure within a distance equal to the height of the backfill above the top of the footing, or 4 feet, whichever is less. Material placed outside these limits shall be considered common fill.

E. Additional requirements for backfilling and final subgrade preparation outside of structure areas shall be as specified in Section 31 22 13 – Rough Grading.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 45 11 – Testing, Inspections, Supervision

C. Section 03 10 00 – Concrete Forming and Accessories

D. Section 31 00 00 – Site Clearing

E. Section 31 14 11 – Soil Materials

F. Section 31 22 13 – Rough Grading

G. Section 31 23 15 – Trench Excavation and Backfill

H. Section 31 23 19 – Dewatering

I. Section 32 11 11 – Aggregate Materials

1.03 REFERENCE STANDARDS

A. American Society for Testing and Material (ASTM):

1. D 422 – Particle-Size Analysis of Soils.

2. D 1557 – Moisture-Unit Weight Relations of Soils and Soil-Aggregate Mixtures Using 10-pound Rammer and 18-inch Drop.

3. D 2487 – Classification of Soils for Engineering Purposes.

4. D 2922 – Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

5. D 3017 – Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

B. Washington State Department of Transportation Standard Specifications for Road, Bridge, and Municipal Construction.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit test results as required by Section 01 45 11 – Testing, Inspections, Supervision.

C. Submit an excavation plan, in accordance with governing state and federal requirements, showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during excavations 4 feet or more in depth.

D. The excavation plan submittal is for record purposes only, and shall not be construed as a detailed analysis for adequacy of the support system, nor shall any provisions of the above requirements be construed as relieving the Contractor of his overall responsibility and liability for the work. The Contractor shall be solely responsible for any and all liabilities which may arise from failure to provide adequate shoring, bracing, or sheeting as necessary to support the excavation under any and all conditions of loading which may exist, or which may arise during construction.

E. In addition, the Contractor shall obtain, pay for, and comply with all provisions or the Accident Prevention Division of the Washington State Workman's Compensation Department.

1.05 PROTECTION

A. Protection of adjacent work must be accomplished. Properly slope cuts to provide stability. Temporary cuts should be no steeper than 1 vertical to 1 horizontal, except temporary cuts in rock may be as steep as 1 vertical to 0.5 horizontal. Permanent slopes should be no steeper than 1 vertical to 2 horizontal, or as shown on the Plans.

PART 2 – PRODUCTS

2.01 EXCAVATION MATERIAL

A. The Contractor shall make his own deductions and conclusions as to the nature of the materials to be excavated and the difficulties which may arise from subsurface conditions.

B. Material produced from rock excavation shall be suitable for use as common fill. No more than 10 percent of the excavated material by volume shall have rocks larger than 12 inches.

C. The material shall be capable of being compacted to 95 percent (or the percentage otherwise indicated), of maximum dry density without undue weaving and heaving as determined by ASTM D 1557.

D. Payment for excavation will be made as described in 1-09.3(1) of Section 01 11 50 – Special Provisions. Payment will include all costs to dewater, excavate, load, and haul the material.

E. Stockpile excavated material in area designated on-site in accordance with Section 31 14 11 – Soil Materials and Section 32 11 11 – Aggregate Materials. Remove excess or unsuitable material from site. Suitable material shall be used for fill, backfill, and embankment construction.

2.02 STRUCTURAL FILL AND BACKFILL MATERIALS

A. Structural fill and structural backfill shall consist of the following materials:

1. Crushed Surfacing Base Course: As specified in Section 32 11 11 – Aggregate Materials.

2.03 FILTER FABRIC AND GEOGRID (IF USED)

A. Filter fabric shall be a sheet structure of non-woven construction fabric and consist of rot-proof polymeric continuous filaments. The fabric shall conform to the physical property requirements listed below:

Physical Property	Minimum Requirements
Weight	4 oz./sy
Thickness	30 mils
Grab Strength	120 lbs.
Elongation	60%
Trapezoidal Tear	65 lbs.
Specific Gravity Flux	100 gal/min/sf

B. Filter fabric shall be Mirafi 140N, or Engineer approved equal.

C. Geogrid shall be TriAx TX140, as manufactured by Tensar International Corporation, or Engineer approved equal.

2.04 PIPE ENCASEMENTS UNDER STRUCTURES

A. Pipes 6 inches or larger in diameter, where placed under structures, shall be encased in Class 3000 concrete as specified in Section 03 30 00 – Cast-In-Place Concrete. Details for such encasement shall be as shown on the Plans. Encasement shall provide bearing for overlying structures.

B. Pipes less than 6 inches in diameter, where placed under structures, shall be bedded in imported pipe bedding (crushed surfacing top course), unless otherwise specified or noted on the Plans.

PART 3 – EXECUTION

3.01 PREPARATION

A. Notify Utility Notification Center at least 48 hours prior to start of excavation. Notify utility company to remove and/or relocate utilities, if applicable.

B. Verify that survey bench mark and intended elevations for the work are as indicated.

C. Identify required lines, levels, contours, and datum locations.

D. Locate, identify, and protect from damage utilities which remain.

E. Protect plants and other features remaining as part of the final landscaping.

F. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving and curbs from excavating equipment and vehicular traffic.

G. Review safety requirements. Comply with OSHA/WISHA regulations.

H. Prior to backfilling:

1. Verify sub-drainage, damp proofing, and waterproofing installation has been inspected.

2. Verify structural stability of unsupported walls to support imposed loads by the fill.

3.02 CONTROL OF WATER

A. Dewatering: Excavations are to be kept free of standing water. Dewater excavations as required for subsequent construction.

B. Grade top perimeter of excavations to prevent surface water and/or runoff from draining into excavations.

3.03 GENERAL EXCAVATION

A. The method of excavation shall be the Contractor's option, but the Contractor shall exercise care when approaching the final grade to leave it in undisturbed condition. If the final grade is disturbed or becomes wet or dried out during the course of construction, the Contractor shall remove and replace the material as indicated in this section at no cost to the Owner. The Contractor is advised that footings should be placed as soon as possible to minimize these conditions.

B. Frost protection shall be provided for all structural excavation work. Foundation work shall not be placed on frozen ground.

C. Where shoring, sheet piling, sheeting, bracing, lagging or other supports are necessary to prevent cave-ins or damage to existing structures, it shall be the responsibility of the Contractor to design, furnish, place, maintain and remove such supports in accordance with applicable ordinances and safety requirements. The design, planning, installation, and removal of all sheeting, shoring, sheet piling, lagging, and bracing shall be accomplished in such a manner as to maintain the undisturbed state of the soil below and adjacent to the excavation.

D. Notify the Engineer of unexpected subsurface conditions and discontinue affected work in the area until notified to resume work. Unsuitable foundation materials, as determined by the Engineer, shall be removed and disposed of off-site.

E. Suitable excavated material shall be used in fills and in backfills, and as embankment fill. Stockpile excavated material in an area designated on-site in accordance with Section 31 14 11 – Soil Materials and Section 32 11 11 – Aggregate Materials. Excess suitable material shall be hauled to a location secured by the Contractor as specified in Section 31 14 11 – Soil Materials.

3.04 EXCAVATION FOR STRUCTURES

A. In general, all structures shall bear on suitable foundation material and shall be excavated to the depth required to construct the slabs and substructure elements. All footings and slabs shall bear on a minimum of 6 inches of crushed surfacing base course. Where existing grade is below finished grade, the Contractor shall remove the layer of unsuitable material and replace it with structural backfill material to the proper elevation.

B. Over-excavation for structures due to unsuitable subgrade material shall be as directed by the Engineer. Where over-excavation extents are not identified, over-excavation shall be provided to meet minimum bearing requirements for footings or slabs of 6 inches of crushed surfacing base course. Placement of structural fill following any over-excavation shall be completed according to the requirements of paragraph 3.06 – Placement of Structural Fill.

C. When fill is placed adjacent to walls, footings, and the like, heavy equipment for spreading and compacting shall not be operated closer to any wall than a distance equal to the height of the backfill above the top of the footing, or 4 feet, whichever is less. Fill adjacent to walls shall be all-weather material compacted to 92 percent of the maximum dry density as determined by ASTM D 1557, with small vibratory or hand compactors.

3.05 PREPARATION OF EARTH SUBGRADE FOR CONCRETE

A. When excavating for bottom mat slabs, final excavation to grade shall be done in a manner so as not to disturb the existing soil. If the soil is disturbed, the Contractor will be required to remove the disturbed material and replace it with structural fill material. Concrete shall not be placed on surfaces that are muddy, frozen, or dried out. If, during the course of construction, bottom surfaces become saturated with water, muddy, disturbed or dried out, the Contractor shall, at no cost to the Owner, remove the undesirable material and replace with compacted structural backfill as indicated above.

B. Fill under slabs on grade shall consist of a minimum of 6 inches of crushed surfacing base course, unless otherwise specified or noted on the Plans.

3.06 PLACEMENT OF STRUCTURAL FILL

A. Structural fill shall be placed in lifts not exceeding 8 inches for heavy-duty vibratory roller compactors, or 4 inches for hand operated compactors. Structural fill shall be compacted to 95 percent of maximum dry density as determined by ASTM D1557. The compaction effort will be field verified by a representative of the Engineer using a calibrated nuclear density gauge, in accordance with ASTM D6938.

B. Structural fill shall bear on rock or other firm base.

C. The structural fill shall be spread in lifts as indicated and each lift shall be compacted with a minimum of four passes with a heavy steel drum vibratory roller in a systematic pattern and as many additional passes as necessary to satisfy the Engineer. The vibratory roller will have the following characteristics, unless otherwise approved by the Engineer.

Static Weight:	18,900 lbs. minimum
Total Applied Weight:	58,900 lbs. minimum
Vibrating Shaft Speed:	1000 to 1500 RPM
Speed:	2 MPH maximum

D. In freezing weather, the following additional requirements will apply:

1. Prior to terminating work for the day, the final layer of compacted subbase material, after compaction, shall be rolled with a smooth-wheel roller, if necessary to eliminate ridges of soil left by tractors or trucks used for compaction.

2. A layer of loose protective material shall be left on top at the end of each day's operation. This material shall be removed and wasted at start of the next day's operations.

3. The Contractor shall not place a layer of compacted fill on snow, ice, or soil that was permitted to freeze prior to compaction. Removal of these unsatisfactory materials will be required prior to fill placement as directed by the Engineer at no additional cost to the Owner.

4. No frozen material shall be used in structural fill.

E. The Contractor shall bring the structural fill to the top of subgrade elevation, using materials described above, to within the following tolerances of the elevations indicated on the Plans: Plus 0.00 feet above subgrade elevation and minus 0.30 feet below subgrade elevation.

F. No payment will be made for excess structural fill used to correct subgrade elevations that are outside of the tolerances listed above.

3.07 PLACEMENT OF FILTER FABRIC AND GEOGRID

A. Filter fabric and geogrid shall be placed as specified herein, in those areas shown on the Plans, and as directed by the Engineer. Tears or blowouts of the fabric shall be exposed and repaired by a minimum of a 3-foot overlap on all sides and shall be incidental to the unit price. Filter fabric shall overlap a minimum of 3 feet.

3.08 FINAL TRIMMING AND CLEAN-UP

A. Final trimming and clean-up shall consist of all work as follows:

1. All irregularities shall be made smooth, washouts shall be filled, slopes made uniform, slightly rounded at top and bottom, and the entire area of the fill compacted and completed to the required lines, grades, and cross sections with 1/10 foot above or below the established grade.

2. Where additional material is required for filling, it shall be similar to that used in fill and may be obtained from a source approved by the Engineer.

3. When work is completed, the Contractor shall remove and dispose of all surplus material including stumps, trees, and brush, and leave premises in condition acceptable to the Engineer.

3.09 TESTING

A. Compaction tests will be performed by a certified independent testing laboratory, employed by the Owner. In the event the first compaction test of an area does not comply with the requirements of the Specifications, additional compaction shall be performed by the Contractor to obtain the required density, or the compacted material shall be replaced in accordance with the Specifications. Additional compaction tests for the repaired areas shall be performed by the certified testing laboratory and all costs associated with these additional compaction tests shall be paid for by the Contractor. This process shall be repeated until the soil compaction complies with the requirements of these Specifications.

END OF SECTION 31 23 11

SECTION 31 23 15 – TRENCH EXCAVATION AND BACKFILL

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This section includes requirements for excavation and backfill of trenches for utilities outside of buildings and structures, including all site piping.

B. Work includes, but is not necessarily limited to, the following:

1. Placement and compaction of pipe bedding material within the pipe zone for utilities outside of buildings and structures.

2. Placement and compaction of pipe bedding material within the pipe zone for utilities located beneath buildings and structures, when the trench is not filled with concrete.

3. Placement and compaction of trench backfill within the trench zone, from top of utility bedding (pipe zone) to subgrade elevations.

4. Dewatering required for trench excavation and backfill.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 45 11 – Testing, Inspections, Supervision

C. Section 03 30 00 – Cast-In-Place Concrete

D. Section 31 14 11 – Soil Materials

E. Section 31 22 13 – Rough Grading

F. Section 31 23 19 – Dewatering

G. Section 32 11 11 – Aggregate Materials

1.03 REFERENCES

A. The Standard Specifications for Road, Bridge, and Municipal Construction prepared by the Washington State Department of Transportation.

B. ASTM C 136 – Method for Sieve Analysis of Fine and Coarse Aggregates.

C. ASTM D 1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.

D. ASTM D 2922 – Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

E. ASTM D 3017 – Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.04 SUBMITTALS

A. Submit test results as required by Section 01 45 11 – Testing, Inspections, Supervision.

1.05 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

B. Pipe zone: That portion of the trench from 4 inches below the pipe to 6 inches above the pipe as shown on the Plans. The pipe zone shall be backfilled with bedding material per the Specifications.

C. Trench zone: That portion of the trench above the pipe zone. Backfill with native material unless otherwise directed by the Engineer.

1.06 FIELD MEASUREMENTS

A. Verify that survey bench mark, control point, and intended elevations for the work are as shown on the Plans.

B. Submit Construction Staking Request Form as required by 1-05.4(2) of Section 01 11 50 – Special Provisions.

1.07 COORDINATION

A. Coordinate work with other site construction activities.

B. Verify work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 – PRODUCTS

2.01 FILL MATERIALS

A. As specified by WSDOT Standard Specifications, Sections 7-08 and 7-09.

B. Imported pipe bedding (pipe zone): Crushed surfacing top course per Section 9-03.9(3) of the Standard Specifications.

C. Imported select trench backfill (trench zone): Crushed surfacing base course per Section 9-03.9(3) of the Standard Specifications.

D. Trench backfill material (trench zone): Unless otherwise directed by the Engineer, trench backfill material shall be obtained from project excavations.

E. See typical trench section on the Plans.

2.02 EXCAVATED MATERIAL

A. Includes removal of all natural or man-made objects of whatever nature encountered which must be removed for installation of the utility.

B. Includes dewatering.

PART 3 – EXECUTION

3.01 PREPARATION

A. Notify Utility Notification Center at least 48 hours prior to start of excavation.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns, and other features remaining as a portion of final landscaping.

D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above- and below-grade utilities which are to remain.

F. Cut out soft areas of subgrade not capable of compaction in place. Backfill with fill material and compact to density equal to or greater than requirements for subsequent backfill material.

G. Review safety requirements. Comply with OSHA/WISHA regulations. Provide shoring, cribbing, or extra excavation as required.

3.02 EXCAVATING

A. Excavate trenches required for utilities.

B. Cut trenches sufficiently wide to enable installation and allow inspection per Sections 7-08 and 7-09 of the WSDOT Standard Specifications. Remove water or materials which interfere with work.

C. Stockpile excavated material in an area designated on-site and remove from site excess material not being used.

3.03 BACKFILLING

A. Employ a placement method which does not disturb or damage utilities in trench, and/or other physical features in place at the time of construction.

B. Mechanical compaction shall be required for all trenches. The Contractor is hereby cautioned that time extensions shall not be granted due to unstable trench backfill conditions caused by excessive watering. The Contractor shall be responsible for correcting such conditions caused by his own construction activities.

C. Maintain optimum moisture content of fill materials to attain required compaction density. All trench backfill shall be compacted to at least 95 percent of maximum density as determined by ASTM D 1557.

D. Detectable marker tape shall be installed over non-metallic pipe lines. The tape shall be placed approximately three feet above the top of the pipe and shall extend its full length. The horizontal location of the tape shall vary no more than 2 feet from the centerline alignment of the pipe. Detectable marker tape shall meet the requirements of Section 9-15.18 of the Standard Specifications.

E. Street crossing trenches and other locations as directed by the Engineer shall be backfilled for the full depth of the trench with select backfill meeting the requirements for crushed surfacing base course, in Section 9-03.9(3) of the Standard Specifications.

F. Remove surplus fill materials from site.

3.04 TOLERANCES

A. Excavation methods shall be controlled to prevent over-excavation. All over-excavated areas which result from inadequate control of excavation methods shall be backfilled to the correct bottom of trench elevation at no cost to the Owner.

B. Bottom of trench excavation: Plus 0.00 feet above the line and grade shown on the Plans to minus 0.30 feet below the line and grade shown on the Plans.

C. Top Surface of Backfilling Under Paved Areas: Shall be to required subgrade elevations.

D. Top Surface of General Backfilling: Plus or minus 1-inch from required elevations.

3.05 FIELD QUALITY CONTROL

A. See Section 01 45 11 – Testing, Inspections, Supervision.

B. Compaction testing will be performed in accordance with ASTM D 1557.

C. If tests indicate work does not meet specified requirements, remove work, replace, compact, and retest.

D. Frequency of Tests: Shall be at various depths in the trench section.

E. The first 200 feet of trench backfill operations shall be considered a test section for the Contractor to demonstrate his backfilling and compaction techniques. Notify the Engineer at least 3 working days prior to beginning trench excavation and backfill operations. Arrange for in-place density tests to be taken on the completed test section. No further trenching will be allowed until the specified density is achieved in the test section.

3.06 PROTECTION OF FINISHED WORK

A. Protect finished work throughout remainder of construction.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION 31 23 15

SECTION 31 23 19 – DEWATERING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This section includes construction dewatering. The costs for all dewatering operations required shall be included in the cost of other items of work. No separate measurement or payment will be made for construction dewatering.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 57 13 – Temporary Erosion and Sediment Control

C. Section 31 10 00 – Site Clearing

D. Section 31 22 13 – Rough Grading

E. Section 31 23 11 – Excavation, Backfill and Compaction for Structures

F. Section 31 23 15 – Trench Excavation and Backfill

1.03 SUBMITTALS

A. Shop Drawings for Information: For dewatering system. Show arrangement, locations, and details of wells and well points and/or trenches and sumps; locations of headers and discharge lines; and means of discharge and disposal of water.

1.04 REGULATORY REQUIREMENTS

A. Comply with all requirements of the Washington State Department of Ecology 2011 Construction Stormwater General Permit related to dewatering.

1.05 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control ground-water flow into excavations and permit construction to proceed on dry, stable subgrades.

1. Maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.

2. Prevent surface water from entering excavations by grading, dikes, or other means.

3. Accomplish dewatering without damaging existing buildings adjacent to excavation.

4. Dewatering water shall be managed separately from construction stormwater runoff.

1.06 PROJECT CONDITIONS

A. A geotechnical report was prepared for the project and is located in Appendix B.

B. The Contractor, at their own cost, may make test borings and conduct exploratory operations necessary to determine groundwater conditions, or for dewatering design. Coordinate with the Engineer at least one week prior to the bid date.

PART 2 – PRODUCTS

2.01 MATERIALS

A. All materials used for dewatering, including pumps, pipes, hoses, filters, gravel for trenches, temporary sumps, etc. shall be designed, provided, installed, operated, maintained and removed by the Contractor.

PART 3 – EXECUTION

3.01 PREPARATION

A. Coordinate the dewatering design and implementation with the Plans. Refer to Section 01 57 13 – Temporary Erosion and Sediment Control for additional information.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.

2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

C. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

3.02 DEWATERING IMPLEMENTATION

A. Install dewatering system utilizing wells, well points, trenches, sumps, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until utilities and structures have been constructed and fill materials have been placed, or until dewatering is no longer required.

C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, utilities, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.

D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, utilities, and other excavations.

1. Maintain piezometric water level a minimum of 24 inches below surface of excavation or as needed to meet specified compaction requirements, see Plans and Section 31 23 11 – Excavation, Backfill and Compaction for Structures.

E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner that meets the requirements of Section 01 57 13 – Temporary Erosion and Sediment Control and the Construction Stormwater General Permit. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

F. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

G. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.

3.03 CLEANUP

A. Remove dewatering system from Project site upon completion of dewatering.

B. Restore disturbed areas in accordance with the Plans and Section 01 57 13 – Temporary Erosion and Sediment Control.

END OF SECTION 31 23 19

SECTION 31 63 33 – DRILLED MICROPILES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish all labor, materials, equipment, supervision, testing, and incidentals required to design, fabricate, install, grout, and test micropiles as indicated on the Plans and specified herein.

B. Work includes:

1. Micropile design and installation.

2. Reinforcing steel and casing installation.

3. Grouting operations.

4. Verification and proof load testing.

5. Micropile pile top connections.

6. Construction submittals and quality control documentation.

C. Micropile system shall be contractor-designed and installed to support the design loads indicated on the Plans.

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):

1. ASTM A36 – Structural Steel.

2. ASTM A252 – Welded and Seamless Steel Pipe Piles.

3. ASTM A615 – Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

4. ASTM A722 – Uncoated High-Strength Steel Bar for Prestressing Concrete.

5. ASTM C109 – Compressive Strength of Hydraulic Cement Mortar.

6. ASTM C150 – Portland Cement.

7. ASTM C494 – Chemical Admixtures for Concrete.

8. ASTM D1143 – Method of Testing Piles Under Static Axial Compressive Load.

9. ASTM D3689 – Method of Testing Individual Piles Under Static Axial Tensile Load.

10. ASTM D3966 – Lateral Load Tests.

B. American Welding Society (AWS):

1. AWS D1.1 – Structural Welding Code – Steel.

2. AWS D1.2 – Structural Welding Code – Reinforcing Steel.

a. AASHTO Standard Specifications for Highway Bridges.

b. FHWA NHI-05-039 – Micropile Design and Construction.

1.02 DEFINITIONS

Admixture: Substance added to the grout to control bleed and/or shrinkage, improve flowability, reduce water content, or retard setting time.

Alignment Load (AL): A minimum initial load (no greater than 10 percent of the Design Load) applied to micropile during testing to keep the testing equipment correctly positioned.

Bond Length: The length of the micropile that is bonded to the ground and used to transfer the applied axial loads to the surrounding soil or rock.

Bond-breaker: A sleeve placed over the steel reinforcement to prevent load transfer.

Casing: Steel tube introduced during the drilling process in overburden soil to temporarily stabilize the drill hole. This is usually withdrawn as the pile is grouted, although in certain types of micropiles, some casing is permanently left in place to provide added pile reinforcement.

Centralizer: A device to support and position the reinforcing steel in the drill hole and/or casing so that a minimum grout cover is provided.

Coupler: The means by which load capacity can be transmitted from one partial length of reinforcement to another.

Creep Movement: The movement that occurs during the creep test of a micropile under a constant load.

Design Load (DL): Maximum service load anticipated during the micropile service life.

Encapsulation: A corrugated or deformed tube protecting the reinforcing steel against corrosion.

Free (unbonded) Length: The designed length of the micropile that is not bonded to the surrounding ground or grout.

Micropile: Small-diameter drilled and grouted composite pile consisting of steel reinforcement and cement grout transferring loads through grout-to-ground bond.

Maximum Test Load: The maximum load to which the micropile is subjected during testing.

Overburden: Material, natural or placed, that may require cased drilling methods to provide an open borehole to underlying strata.

Post-grouting: The injection of additional grout into the load transfer length of a micropile after the primary grout has set. Also known as regrouting or secondary grouting.

Primary Grout: Portland-cement-based grout injected into the micropile hole prior to or after the installation of the reinforcement to direct the load transfer to the surrounding ground along the micropile.

Proof Load Test: Incremental loading of a production micropile, recording the total movement at each increment.

Reinforcement: The steel component of the micropile that accepts and/or resists applied loadings.

Sheathing: Smooth or corrugated piping or tubing that protects the reinforcing steel against corrosion.

Spacer: A device to separate elements of a multiple-element reinforcement.

Ultimate Grout-to-Ground Bond Values: The estimated ultimate geotechnical unit grout-to-ground bond strength selected for use in design.

Verification Load Test: Pre-production load test performed to verify design assumptions and installation methods.

1.03 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure for general submittal requirements.

B. Micropile Design Submittal

1. At least 21 calendar days before the planned start of micropile construction, submit complete design calculations and working drawings to the Engineer for review and approval. Include all details, dimensions, quantities, ground profiles, and cross-sections necessary to construct the micropile structure. Verify the limits of the micropile structure and ground survey data before preparing the detailed working drawings.

2. The drawings and calculations shall be signed and sealed by the Contractor's Professional Engineer or by the Consultant designer's Professional Engineer (if applicable), previously approved by the Engineer. If the micropile subcontractor uses a consultant design engineer to prepare the design, the micropile subcontractor shall still have overall contract responsibility for both the design and construction.

3. Submittal shall include the following components, at a minimum:

a. Micropile quantity

b. Design loading

c. Type and size of reinforcing steel

d. Minimum bond length

e. Total micropile length

f. Micropile top footing attachment

g. Casing welding procedure, if applicable

h. Disposal plan for surface water, drill flush, and excess waste grout

C. Design Calculations

1. Design calculations shall include, but not be limited to, the following items:

a. A written summary report which describes the overall micropile design.

b. Applicable code requirements and design references.

c. Micropile structure critical design cross-section(s) geometry including soil/rock strata and piezometric levels and location, magnitude and direction of design applied loadings, including slope or external surcharge loads.

d. Design criteria including soi/rock shear strengths (friction angle and cohesion), unit weights, and ground-grout bond values and micropile drillhole diameter assumptions for each soil/rock strata.

e. Factors of safety and allowable stresses used in the design on the ground-grout bond values, surcharges, soil/rock and material unit weights, steel, grout, and concrete materials.

f. Seismic design earthquake acceleration coefficient.

g. Design calculation sheets (both static and seismic) with the project number, micropile structure location, designation, date of preparation, initials of designer and checker, and page number at the top of each page. Provide an index page with the design calculations.

h. Design notes including an explanation of any symbols and computer programs used in the design.

i. Pile to footing connection calculations.

D. Working Drawings

1. The working drawings shall include all information required for the construction and quality control of the piling. Working drawings shall include, but not be limited to, the following items unless provided in the Plans:

a. A plan view of the micropile structure identifying:

i. A reference baseline and elevation datum.

ii. The offset from the construction centerline or baseline to the face of the micropile structure at all changes in horizontal alignment.

iii. Beginning and end of micropile structure stations.

iv. Right-of-way and permanent or temporary construction easement limits, location of all known active and abandoned existing utilities, adjacent structures, or other potential interferences. The centerline of any drainage structure or drainage pipe behind, passing through, or passing under the micropile structure.

v. Subsurface exploration locations shown on a plan view of the proposed micropile structure alignment with appropriate reference base lines to fix the locations of the explorations relative to the micropile structure.

b. An elevation view of the micropile structure(s) identifying:

i. Elevation view showing micropile locations and elevations; vertical and horizontal spacing; batter and alignment and the location of drainage elements (if applicable).

ii. Existing and finish grade profiles both behind and in front of the micropile structure.

c. Design parameters and applicable codes.

d. General notes for constructing the micropile structure including construction sequencing or other special construction requirements.

e. Horizontal and vertical curve data affecting the micropile structure and micropile structure control points. Match lines or other details to relate micropile structure stationing to centerline stationing.

f. A listing of the summary of quantities on the elevation drawings of each micropile structure showing pay item estimated quantities.

g. Micropile typical sections including micropile spacing and inclination; minimum drillhole diameter; pipe casing and reinforcing bar sizes and details; splice types and locations; centralizers and spacers; grout bond zone and casing plunge lengths (if used); corrosion protection details; and connection details to the substructure footing, anchorage, plates, etc.

h. A typical detail of verification and production proof test micropiles defining the micropile length, minimum drillhole diameter, inclination, and load test bonded and unbonded test lengths.

i. Details, dimensions, and schedules for all micropiles, casing and reinforced steel, including reinforcing bar bending details.

j. Details for constructing micropile structures around drainage facilities (if applicable).

2. The Contractor shall submit updated drawings when plan dimensions are changed. Within 30 days after completion of the work, submit as-built drawings and revised design calculations signed by the approved Professional Engineer for all design changes made during construction.

1.05 QUALITY ASSURANCE

A. Micropile Contractor Qualifications:

1. Minimum five completed micropile projects within the last five years.

2. Minimum 100 micropiles installed of similar capacity.

3. Personnel shall possess documented experience on comparable projects.

B. Design Engineer Qualifications:

1. Registered Professional Engineer experienced in micropile design.

2. Minimum three completed micropile projects of similar scope.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store reinforcing steel and casing off the ground and protect from corrosion and contamination.

B. Protect grout materials from moisture intrusion.

C. Remove damaged or defective materials from the site.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Cement: Portland cement conforming to ASTM C150.

B. Water: Potable and free from deleterious substances.

C. Admixtures:

1. ASTM C494 compliant.

2. Chloride-containing admixtures are prohibited.

D. Reinforcing Steel:

1. ASTM A615 Grade 60 or ASTM A722 high-strength threaded bars.

2. Couplers shall develop full ultimate tensile strength.

E. Permanent Casing:

1. ASTM A252 Grade 3 steel pipe.

2. Minimum yield strength: 345 MPa

F. Grout:

1. Neat cement or sand-cement grout.

2. Minimum 3-day compressive strength: 2,000 psi.

3. Minimum 28-day compressive strength: 4,000 psi.

G. Centralizers and Spacers:

1. Fabricated from PVC or steel.

2. Wood spacers are prohibited.

H. Reinforcing Bars:

1. Reinforcing steel shall be deformed bars in accordance with ASTM A615/AASHTO M31, Grade 420 or Grade 520 or ASTM A 722/AASHTO M275, Grade 1035. When a bearing plate and nut are required to be threaded onto the top end of reinforcing bars for the pile top to footing anchorage, the threading may be continuous spiral deformed ribbing provided by the bar deformations (e.g. Dywidag or Williams continuous threadbars) or may be cut into a reinforcing bar, the next larger bar number designation from that shown on the Plans shall be provided, at no additional cost.

I. Corrosion Protection: Provide epoxy coating, encapsulation, galvanization, or grout protection as required.

2.02 FABRICATION

A. Fabricate micropile reinforcement and casing in accordance with approved shop drawings.

B. Threaded and welded joints shall develop required structural capacities.

C. Complete penetration welds shall conform to AWS D1.1.

2.03 DESIGN REQUIREMENTS

A. The micropiles shall be designed to meet the specified loading conditions, as shown on the contract plans and approved working drawings. Design the micropiles and pile top to footing connections using the procedures contained in the FHWA “Micropile Design and Constructoin”, Report No. FHWA NHI-05-039.

B. The required geotechnical factors of safety shall be in accord with the FHWA manual, unless specified otherwise. Estimated soil/rock design shear strength parameters, unit weights, applied foundation loadings, slope and external surcharge loads, corrosion protection requirements, known utility locations, easements, rights-of-way, and other applicable design criteria will be as shown on the plans or specified herein.

C. Structural design of any individual micropile structure elements not covered in the FHWA manual shall be by the service load design method in conformance with appropriate articles of the most current edition of the AASHTO Standard Specifications for Highway Bridges, including current interim specifications.

D. Where required as shown on the contract plans, corrosion protection of the internal steel reinforcing bars, consisting of either encapsulation, epoxy coating, or grout, shall be provided in accordance with Materials Section 2.01. Where permanent casing is used for a portion of the micropile, encapsulation shall extend at least 1.5m into the casing.

PART 3 – EXECUTION

3.01 EXAMINATION

A. The Contractor shall review the available subsurface information to assess the site geometry, equipment access conditions, and location of existing structures and above ground facilities.

B. The Contractor is responsible for field locating and verifying the location of all utilities shown on the plans prior to starting the Work. Maintain uninterrupted services for all utilities designated to remain in service throughout the Work. Notify the Engineer of any utility locations different from shown on the plans that may require micropile relocations or structure design modifications.

C. Prior to start of any micropile construction activity, the Contractor and Resident Engineer shall jointly inspect the site to observe and document the pre-construction condition of the site, existing structures, and facilities.

3.02 SITE PREPARATION

A. The Contractor shall control and properly dispose of drill flush and construction related waste, including excess grout, in accordance with the standard specifications and all applicable local codes and regulations. Provide positive control and discharge of all surface water that will affect construction of the micropile installation. Maintain all pipes or conduits used to control surface water during construction. Repair damage caused by surface water at no additional cost. Upon substantial completion of the Work, remove surface water control pipes or conduits from the site. Alternatively, with the approval of the Engineer, pipes or conduits that are left in place, may be fully grouted and abandoned or left in a way that protects the structure and all adjacent facilities from migration of fines through the pipe or conduit and potential ground loss.

B. Immediately contact the Engineer if unanticipated existing subsurface drainage structures are discovered during excavation or drilling. Suspend work in these areas until remedial measures meeting the Engineer’s approval are implemented.

C. Coordinate the work and the excavation so the micropile structures are safely constructed. Perform the micropile construction and related excavation in accordance with the Plans and approved submittals. No excavations steeper than those specified herein or shown on the Plans will be made above or below the micropile structure locations without written approval of the Engineer.

3.03 MICROPILE INSTALLATION

A. The micropile contractor shall select the drilling method, the grouting procedure, and the grouting pressure used for the installation of the micropiles. The micropile contractor shall also determine the micropile casing size, final drillhole diameter and bond length, and central reinforcement steel sizing necessary to develop the specified load capacities and load testing requirements. The micropile contractor is also responsible for estimating the grout take. There will be no extra payment for grout overruns.

B. Allowable Tolerances:

1. Centerline of piling shall not be more than 75 mm from indicated plan location.

2. Pile shall be plumb within 2 percent of total-length plan alignment.

3. Top elevation of pile shall be plus 25 mm or minus 50 mm maximum from vertical elevation indicated.

4. Centerline of reinforcing steel shall not be more than 19 mm from indicated location.

C. Drilling:

1. The drilling equipment and methods shall be suitable for drilling through the conditions to be encountered, without causing damage to any overlying or adjacent structures or services. The drillhole must be open along its full length to at least the design minimum drillhole diameter prior to placing grout and reinforcement.

2. Temporary casing or other approved method of pile drillhole support will be required in caving or unstable ground to permit the pile shaft to be formed to the minimum design drillhole diameter. The Contractor’s proposed method(s) to provide drillhole support and to prevent detrimental ground movements shall be reviewed by the Engineer. Detrimental ground movement is defined as movement which requires remedial repair measures. Use of drilling fluid containing bentonite is not allowed.

D. Ground Heave or Subsidence:

1. During construction, the Contractor shall observe the conditions in the vicinity of the micropile construction site on a daily basis for signs of ground heave or subsidence. Immediately notify the Engineer if signs of movements are observed. Contractor shall immediately susp4end or modify drilling or grouting operations if ground heave or subsidence is observed, if the micropile structure is adversely affected, or if adjacent structures are damaged from the drilling or grouting. If the Engineer determines that the movements require corrective action, the Contractor shall take corrective actions necessary to stop the movement or perform repairs. When due to the Contractor’s methods or operations or failure to follow the specified/approve construction sequence, as determined by the Engineer, the costs of providing corrective actions will be borne by the Contractor.

E. Pipe Casing and Reinforcing Bars Placement and Splicing

1. Reinforcement may be placed either prior to grouting or placed into the grout – filled drillhole before temporary casing (if used) is withdrawn. Reinforcement surface shall be free of deleterious substances such as soil, mud, grease, or oil that might contaminate the grout or coat the reinforcement and impair bond. Pile cages and reinforcement groups, if used, shall be sufficiently robust to withstand the installation and grouting process and the withdrawal of the drill casings without damage or disturbance.

2. The Contractor shall check pile top elevations and adjust all installed micropiles to the planned elevations.

3. Centralizers and spacers (if used) shall be provided at 3 m centers maximum spacing. The upper- and lower-most centralizer shall be located a maximum of 1.5 m from the top and bottom of the micropile. Centralizers and spacers shall permit the free flow of grout without mis-alignment of the reinforcing bar(s) and permanent casing. The central reinforcement bars with centralizers shall be lowered into the stabilized drillhole and set. The reinforcing steel shall be inserted into the drill hole to the desired depth without difficulty. Partially inserted reinforcing bars shall not be driven or forced into the hole. Contractor shall re-drill and re-insert reinforcing steel when necessary to facilitate insertion.

4. Lengths of casing and reinforcing bars shall be secured in proper alignment and in a manner to avoid eccentricity or angle between the axes of the two lengths to be spliced. Splicers and threaded joints shall meet the requirements of Materials Section 2.0. Threaded pipe casing joints shall be located at least two casing diameters (OD) from a splice in any reinforcing bar. When multiple bars are used, bar splices shall be staggered at least 0.3 meters.

F. Grouting:

1. Micropiles shall be primary grouted the same day the load transfer bond length is drilled. The Contractor shall use a stable neat cement grout or a sand cement grout with a minimum 28-day day unconfined compressive strength of 28 MPa. Admixtures, if used, shall be mixed in accordance with manufacturer's recommendations. The grouting equipment used shall produce a grout free of lumps and undispersed cement. The Contractor shall have means and methods of measuring the grout quantity and pumping pressure during the grouting operations. The grout pump shall be equipped with a pressure gauge to monitor grout pressures. A second pressure gauge shall be placed at the point of injection into the pile top. The pressure gauges shall be capable of measuring pressures of at least 1 MPa or twice the actual grout pressures used, whichever is greater. The grout shall be kept in agitation prior to mixing. Grout shall be placed within one hour of mixing. The grouting equipment shall be sized to enable each pile to be grouted in one continuous operation.

2. The grout shall be injected from the lowest point of the drill hole and injection shall continue until uncontaminated grout flows from the top of the pile. The grout may be pumped through grout tubes, casing, hollow-stem augers, or drill rods. Temporary casing, if used, shall be extracted in stages ensuring that, after each length of casing is removed the grout level is brought back up to the ground level before the next length is removed. The tremie pipe or casing shall always extend below the level of the existing grout in the drillhole. The grout pressures and grout takes shall be controlled to prevent excessive heave or fracturing of rock or soil formations. Upon completion of grouting, the grout tube may remain in the hole, but must be filled with grout.

3. Grout within the micropiles shall be allowed to attain the required design strength prior to being loaded.

4. If the Contractor elects to use a postgrouting system, working drawings and details shall be submitted to the Engineer.

G. Contractor shall prepare and submit to the Engineer full-length installation records for each micropile installed. The records shall be submitted within one work shift after that pile installation is completed. The data shall be recorded on the micropile installation log. A separate log shall be provided for each micropile.

3.04 TOLERANCES

A. Micropile location tolerance: 3 inches maximum

B. Alignment tolerance: 2 percent of pile length

C. Top elevation tolerance:

1. Plus 1 inch.

2. Minus 2 inches.

D. Reinforcing steel alignment tolerance: 3/4 inch.

3.05 GROUT TESTING

A. Test grout compressive strength in accordance with ASTM C109.

B. Obtain one set of three grout cubes per day or per 10 piles, whichever is more frequent.

C. Test grout density prior to pile grouting operations.

3.06 LOAD TESTING

A. Perform verification and proof load tests in accordance with ASTM D1143 and ASTM D3689.

B. Verification Tests:

1. Perform prior to production installation.

2. Maximum test load shall be 2.0 times design load.

C. Proof Tests:

1. Perform on production piles.

2. Maximum test load shall be 1.6 times design load.

D. Record pile movement and creep during testing.

E. Failed piles shall be rejected and replaced or modified at no additional cost to Owner.

3.07 FIELD QUALITY CONTROL

A. Maintain installation logs for each micropile.

B. Record:

1. Pile location.

2. Diameter and depth.

3. Reinforcement details.

4. Grout quantities and pressures.

5. Installation dates.

6. Drilling conditions.

7. Test results.

C. Submit completed installation records daily.

3.08 PROTECTION

A. Protect completed micropiles from damage due to construction activities.

B. Repair or replace damaged work at no additional cost to Owner.

END OF SECTION 31 63 33

DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 32 11 11 – AGGREGATE MATERIALS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This section includes the requirements for manufactured or naturally-occurring aggregate materials. Manufactured materials may be obtained from approved off-site sources, or manufactured on site by the Contractor.

B. No off-site materials source has been designated for this project.

C. Placement of aggregate materials is covered in related sections.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 45 11 – Testing, Inspections, Supervision

C. Section 31 14 11 – Soil Materials

D. Section 31 22 13 – Rough Grading

E. Section 31 23 11 – Excavation, Backfill and Compaction for Structures

F. Section 31 23 15 – Trench Excavation and Backfill

1.03 REFERENCE STANDARDS

A. The Standard Specifications for Road, Bridge, and Municipal Construction prepared by the Washington State Department of Transportation.

B. AASHTO M147 – Materials for Aggregate and Soil-Aggregate.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit name, address and phone number of imported materials source. Submit material data for verification that aggregate materials are in conformance with the specifications.

C. Submit results of tests required by Section 01 45 11 – Testing, Inspections, Supervision.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with WSDOT Standard Specifications.

PART 2 – PRODUCTS

2.01 AGGREGATES

A. Crushed Surfacing Base Course: Conforming to WSDOT Standard Specifications, Section 9-03.9(3), for “Crushed Surfacing Base Course.”

B. Crushed Surfacing Top Course: Conforming to WSDOT Standard Specifications, Section 9-03.9(3), for “Crushed Surfacing Top Course.”

C. Gravel Borrow: Conforming to WSDOT Standard Specifications, Section 9-03.14(1), for “Gravel Borrow.”

D. Gravel backfill for infiltration trenches and subsurface drains: Conforming to WSDOT Standard Specifications, Section 9-03.12(4) “Gravel Backfill for Drains,” or Section 9-03.12(5) “Gravel Backfill for Drywells.”

E. Gravel backfill for walls and footing drains: Conforming to WSDOT Standard Specifications, Section 9-03.12(2) “Gravel Backfill for Walls.”

2.02 SOURCE QUALITY CONTROL

A. Field inspection, source testing, and analysis of aggregate material will be performed under provisions of Section 01 45 11 – Testing, Inspections, Supervision.

B. If tests indicate materials do not meet specified requirements, change material or material source and retest.

C. For each type of materials provided to the project, use the same source throughout the Work.

PART 3 – EXECUTION

3.01 STOCKPILING

A. Stockpile materials on site at locations designated by Engineer.

B. Stockpile in sufficient quantities to meet project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

3.02 STOCKPILE CLEANUP

A. Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free-standing surface water. Excess aggregate materials purchased under the unit price provisions of the contract may be stockpiled on site at locations designated by the Engineer for later use by the Owner.

3.03 PLACEMENT OF AGGREGATE MATERIALS

A. Verify that subgrade has been inspected, gradients and elevations are correct and dry.

B. Place aggregate materials in a maximum of 6-inch layers and compact to 95 percent of maximum density as determined by ASTM D 1557 (modified proctor).

C. Refer to WSDOT Standard Specifications, Section 4-04.3(5).

END OF SECTION 32 11 11

SECTION 32 12 16 – ASPHALT PAVING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish and install hot mix asphalt paving (HMA), wearing binder, or base course.

B. Furnish and install aggregate materials under hot mix asphalt concrete pavement and as gravel surfacing.

C. Furnish materials and apply lane marking paint (striping) to pavement surfaces.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 45 11 – Testing, Inspections, Supervision

C. Section 03 30 00 – Cast-In-Place Concrete

D. Section 31 22 13 – Rough Grading

E. Section 31 23 15 – Trench Excavation and Backfill

F. Section 32 11 11 – Aggregate Materials

1.03 REFERENCES

A. The Standard Specifications for Road, Bridge, and Municipal Construction prepared by the Washington State Department of Transportation (WSDOT).

B. ASTM D 946 – Penetration-Graded Asphalt Cement for Use in Pavement Construction.

C. TAI (The Asphalt Institute) – MS-2 Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.

D. TAI (The Asphalt Institute) – MS-3 Asphalt Plant Manual.

E. TAI (The Asphalt Institute) – MS-8 Asphalt Paving Manual.

F. TAI (The Asphalt Institute) – MS-19 Basic Asphalt Emulsion Manual.

G. AASHTO-M-248.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit name, address and phone number of materials source.

C. Submit HMA Mix Design: The Owner will accept a mix design for HMA that has been approved by WSDOT within the past 12 months that uses the same aggregate source and asphalt cement source as is proposed for this project. Provide mix design, performed in accordance with WSDOT requirements, to the Engineer for review at least 10 working days prior to any paving operations.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with WSDOT Standard Specifications.

PART 2 – PRODUCTS

2.01 MATERIALS

A. All materials shall conform to the WSDOT Standard Specifications.

B. Lane Marking Paint: Chlorinated rubber-alkyd type, AASHTO-M-248, CFS-TT-P115), Type III, White or Yellow, 4 inches wide.

C. An asphalt prime coat will not be required on this project.

D. A soil sterilant will not be required to be applied to the subgrade.

2.02 ASPHALT PAVING MIX

A. Asphalt concrete paving shall be HMA Class 1/2-inch PG 64-28 and conform to WSDOT Standard Specifications, Section 5-04.

B. The use of more than 30 percent of recycled material in the asphalt concrete pavement will not be permitted.

C. Performance Grade (PG) asphalt binder will not be required to meet the additional requirements of Section 9-02.1(4) of the Standard Specifications.

D. Provide anti-stripping additive per the Contractor submitted, and Engineer approved WSDOT mix design.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify base conditions.

B. Verify that compacted granular base is dry and ready to support paving and imposed loads.

C. Verify gradients and elevations of base are correct.

D. Provide sufficient number of trucks to assure a continuous paving operation. Assure proper asphalt concrete mix temperatures are maintained.

E. Protect edges of existing pavement; if edges are damaged, re-trim to neat line.

F. Paving operations shall not proceed until base conditions are correct and sufficient hauling and placing equipment is available.

3.02 SUBBASE

A. Refer to WSDOT Standard Specifications, Section 4-04.

B. Place aggregate base materials to the compacted depths shown on Plans.

C. Place and compact gravel shouldering as required by Section 4-04.3(11) of the Standard Specifications.

3.03 PLACING ASPHALT PAVEMENT

A. Place asphalt concrete pavement in accordance with the requirements of WSDOT Standard Specifications, Section 5-04.3.

B. Compact to a minimum of 91% of theoretical maximum Rice density ASTM D 2041.

3.04 PAVEMENT MARKINGS

A. Apply pavement markings in accordance with the requirements of WSDOT Standard Specifications, Section 8-22.

B. Glass beads will not be required with pavement markings.

C. Two applications of paint will be required to complete all paint stripe markings.

3.05 TOLERANCES

A. Flatness: Maximum variation of 1/4-inch measured with 10-foot straightedge.

B. Variation from True Elevation: Paving surface to be at grade and elevations shown.

3.06 FIELD QUALITY CONTROL

A. Refer to Section 01 45 11 – Testing, Inspections, Supervision.

B. Take samples and perform tests in accordance with TAI MS-2.

3.07 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 7 days or until surface temperature is less than 140°F.

END OF SECTION 32 12 16

SECTION 32 13 13 – CONCRETE PAVING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This section includes all Portland Cement concrete work related to concrete sidewalks, concrete paving, stair steps, curbs and gutters, planter curbs, and integral curbs.

B. Furnish and install aggregate base materials beneath Portland Cement concrete work included in Item A.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 45 11 – Testing, Inspections, Supervision

C. Section 03 30 00 – Cast-In-Place Concrete

D. Section 31 22 13 – Rough Grading

E. Section 32 11 11 – Aggregate Materials

1.03 REFERENCE STANDARDS

A. The Standard Specifications for Road, Bridge, and Municipal Construction prepared by the Washington State Department of Transportation.

B. ACI 304 – Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete

C. ASTM A 615 – Deformed and Plain Billet-Steel for Concrete Reinforcement

D. ASTM C 33 – Concrete Aggregates

E. ASTM C 94 – Ready Mix Concrete

F. ASTM C 150 – Portland Cement

G. ASTM C 260 – Air-Entraining Admixtures for Concrete

H. ASTM C 309 – Liquid Membrane-Forming Compounds for Curing Concrete

I. ASTM C 494 – Chemical Admixtures for Concrete

J. ASTM D 1751 – Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Provide product data on joint filler, admixtures, and curing compounds.

C. If colored concrete is used, submit samples of the full range of color to Engineer. Color to be verified by Engineer.

D. Submit name, address and phone number of materials source.

E. Submit mix design per Section 03 30 00 – Cast-In-Place Concrete.

F. Submit test results as required by Section 01 45 11 – Testing, Inspections, Supervision.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with WSDOT Standard Specifications, Section 8-04 and 8-14.

B. Obtain cementitious materials from same source throughout the course of the project.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40°F, or surface is wet or frozen.

PART 2 – PRODUCTS

2.01 FORM MATERIALS

A. Form Materials: WSDOT Standard Specifications, Section 8-14.

B. Joint Filler: ASTM D 1751.

2.02 REINFORCEMENT

A. Reinforcing Steel and Wire Fabric: WSDOT Standard Specifications, Section 9-07.

2.03 CONCRETE MATERIALS

A. Refer to Section 03 30 00 – Cast-In-Place Concrete.

B. Fine and Coarse Mix Aggregates: ASTM C 33

C. Water: Potable, not detrimental to concrete.

D. Air Entrainment: ASTM C 260

2.04 ACCESSORIES

A. Curing Compound: Cur-to-Spec-MS colorless curing system or equal.

2.05 CONCRETE

A. Refer to Section 03 30 00 – Cast-In-Place Concrete, Class 4000A.

2.06 SOURCE QUALITY CONTROL AND TESTS

A. Submit proposed mix design of each class of concrete for review prior to commencement of work.

B. Tests on cement and aggregates will be performed to ensure conformance with specified requirements.

C. Test samples in accordance with WSDOT Standard Specifications and Section 03 30 00 – Cast-In-Place Concrete.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify base conditions.

B. Verify compacted subgrade, granular base, and stabilized soil is acceptable and ready to support paving and imposed loads.

C. Verify gradients and elevations of base are correct.

D. Concrete placement shall not proceed until base conditions are correct.

3.02 SUBBASE

A. Refer to WSDOT Standard Specifications.

B. Place aggregate base materials to depths shown on Plans.

3.03 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete pavement.

C. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

3.04 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.05 REINFORCEMENT

A. Place reinforcement as indicated.

B. Interrupt reinforcement at contraction and expansion joints.

C. See Plans for specified joint requirements in reinforced concrete slabs.

3.06 PLACING CONCRETE

A. Refer to WSDOT Standard Specifications and the following revisions to Section 8-14.3(3):

1. This section is supplemented with the following:

a. All sidewalks not located in driveway entrance areas shall be four inches in thickness. All concrete approaches located behind a depressed curb and gutter section shall be 6 inches in thickness.

b. Sidewalks shall be marked across the entire width every five feet and with preformed asphalt impregnated joint fillers 3/8-inch thick every 20 feet. Concrete sidewalk shall be cured in accordance with Section 5-05.3(13)A of the Standard Specifications. Application of the curing compound shall be in accordance with the manufacturer's recommendations. Failure to properly secure or seal the cement concrete sidewalk will require the Contractor to remove and replace the sidewalk section at his expense.

c. First-class workmanship and finish will be required on all portions of cement concrete sidewalk work. Quality of workmanship and finish will be evaluated continuously and will be based solely upon the judgment of the Engineer. If at any time it is found that quality is unacceptable, work shall be immediately stopped, and no additional sidewalk shall be placed. Cement concrete sidewalk which does not comply with the section details on the Plans, or in the Engineer's opinion does not demonstrate first-class workmanship and finish, shall be removed and replaced at the Contractor's expense. Should the Contractor's equipment or methods be unable to produce sidewalk meeting the requirements of the Details and Specifications, no further sidewalk construction will be allowed until corrections have been made to said equipment.

3.07 JOINTS

A. Place expansion joints at maximum 24-foot intervals, unless noted otherwise. Align curb, gutter, and sidewalk joints.

B. Place joint filler between paving components and building or other appurtenances. Recess top of filler 1/4-inch typical, unless noted otherwise.

C. Provide scored control joints at 6 feet maximum in all flatwork.

D. Provide keyed joints as indicated.

E. Provide keyed or expansion joints extending each direction from building or structure corners.

F. Coordinate joint patterns with adjoining doorways and geometry of the flatwork. Provide equal spacing of joints.

G. Provide additional joints as directed by Engineer.

3.08 FINISHING

A. Paving: Light broom.

B. Sidewalk Paving: Light broom, radius to 1/2-inch radius, and trowel joint edges.

C. Curbs: Light broom.

D. Direction of Texturing: Perpendicular to pavement direction. Verify with Engineer.

3.09 JOINT SEALING

A. Refer to WSDOT Standard Specifications.

3.10 TOLERANCES

A. Variation from True Elevation: Paving surface to be at grade and elevation shown.

B. Flatness: Maximum variation of 1/8-inch measured with 10-foot straightedge.

C. Straightness of Vertical Faces and Edges: Maximum variation of 1/4-inch measured with 10-foot straightedge.

D. Ponding: No ponding will be allowed. All surfaces shall drain.

3.11 FIELD QUALITY CONTROL

A. Refer to Section 01 45 11 – Testing, Inspections, Supervision.

B. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.

C. One additional test cylinder will be taken during cold weather and cured on-site under same conditions as concrete it represents.

D. One slump test will be taken for each set of test cylinders taken.

E. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.12 PROTECTION

A. Immediately after placement, protect cement concrete pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian or vehicular traffic over cement concrete pavement for 7 days minimum after finishing, until 75 percent design strength of concrete has been achieved.

C. See Section 03 30 00 – Cast-In-Place Concrete for additional requirements.

END OF SECTION 32 13 13

DIVISION 33 – UTILITIES

SECTION 33 14 16 – SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This section includes all work required to furnish and install water pipelines, bedding, fittings, and accessories.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 45 11 – Testing, Inspections, Supervision

C. Section 03 30 00 – Cast-In-Place Concrete

D. Section 31 23 15 – Trench Excavation and Backfill

E. Section 32 11 11 – Aggregate Materials

F. Section 33 14 50 – Disinfection of Water Utility Distribution

1.03 REFERENCE STANDARDS

A. The Standard Specifications for Road, Bridge, and Municipal Construction prepared by the Washington State Department of Transportation.

B. ASTM D 1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18-inch (457 mm) Drop.

C. ASTM D 3017 – Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

D. ASTM D 1784 – Polyvinyl Chloride (PVC) Pipe, Schedule 40.

E. ASTM D 2467 – Socket Type Plastic Fittings, Schedule 80.

F. ASTM F 876 – Standard Specification for Crosslinked Polyethylene (PEX) Tubing.

G. Approval and certification of the National Sanitation Foundation.

H. AWWA C104 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

I. AWWA C111 – Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.

J. AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit product data indicating pipe and pipe accessories.

C. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Submit test results in accordance with Section 01 45 11 – Testing, Inspections, Supervision.

F. Submit record drawings. Record location of pipe runs, connections, cleanouts, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 QUALITY ASSURANCE

A. Refer to WSDOT Standard Specifications.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Refer to WSDOT Standard Specifications.

1.07 DEFINITIONS

A. Bedding: Fill placed under, beside, and directly over pipe, prior to subsequent backfill operations.

1.08 REGULATORY REQUIREMENTS

A. Conform to all applicable Local and State codes for materials and installation of the work of this section.

1.09 FIELD MEASUREMENTS

A. Verify that field measurements and elevations are as indicated.

PART 2 – PRODUCTS

2.01 WATER PIPE

A. Ductile Iron Pipe: Ductile iron pipe shall conform to the requirements of Section 9-30.1(1) of the Standard Specifications. Pipe joints shall be rubber gasket push-on type, “Tyton Joint,” or approved equal. Fittings shall be mechanical joint in accordance with Section 9-30.2(1) of the Standard Specifications.

Connection couplings for ductile iron pipe, either transition or straight, shall be compression bolted-sleeve type flexible couplings conforming to Section 9-30.2(7) of the Standard Specifications.

B. Polyvinyl Chloride (PVC) Pipe: PVC pipe (4-inch and larger) shall conform to the requirements of Section 9-30.1(5) of the Standard Specifications. PVC Pipe (over 12-inch) shall conform to the requirements of AWWA C 905 DR 25. Joints shall be rubber gasket push-on type with thickened bell. Fittings shall be mechanical joint and/or flanged in accordance with the Plans and Section 9-30.2(1) of the Standard Specifications.

Polyvinyl Chloride (PVC) Pipe (smaller than 4-inch): PVC Pipe, Schedule 80, solvent weld with integral bell conforming to ASTM D 2672. PVC Fittings, Schedule 80, solvent weld.

C. Crosslinked Polyethylene (PEX) Pipe: PEX pipe shall be copper tube size (CTS), meeting the requirements of ASTM F876/F877 and AWWA C904, and shall be ANSI/NSF Standard 14/61 certified.

D. High Density Polyethylene Pipe (HDPE) shall be extra high molecular weight, high density ethylene/hexane copolymer, PE 3408 polyethylene resin. The Standard Dimension Ratio (SDR) shall be SDR 11 for all pipe sizes. Pipe material shall be provided in straight segments for pipe 4 inches and larger in diameter, or coiled for pipe smaller than 4 inches in diameter

The manufacturer's certification shall state that the pipe was manufactured from one specific resin in compliance with these Specifications. The certificate shall state the specific resin used, its source, and list its compliance with these Specifications. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.

The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other deleterious defects, and shall be identical in color, density, melt index, and other physical properties throughout.

During extrusion production, the HDPE pipe shall be continuously marked with durable printing including (but not limited to) nominal size, dimension ratio, pressure rating, type (trade name), material classification, certification base and date.

Polyethylene fittings shall comply with all appropriate requirements of AWWA C901, AWWA C906, or CSA B137.1. Socket type fittings shall comply with ASTM D2683. Butt fusion fittings shall comply with ASTM D3261. Electrofusion fittings shall comply with ASTM F1055. Fabricated fittings shall be designed and manufactured to be as strong, or stronger, than the pipe to which the fittings will be joined. Mechanical fittings shall be approved only after submission of appropriate test data and service histories indicating their acceptability for the intended service. In all cases, the Specifications and requirements for the fittings supplied shall comply with the appropriate sections of AWWA C901, AWWA C906, or CSA B137.1.

Pipe stiffeners shall be used in conjunction with mechanical restrained fittings. Pipe stiffeners shall be designed to support the interior wall of the HDPE and maintain pipe round. The stiffeners shall support the pipe's end and control the "necking down" reaction to the pressure applied during normal installation. The pipe stiffeners shall be formed for 304 or 316 stainless steel to the HDPE manufacturers published average inside diameter of the specific size and DR of the HDPE.

2.02 VALVES FOR WATER MAINS

A. Gate Valves: All gate valves size 3-inch through 10-inch shall be resilient seated gate valves conforming to the latest AWWA Standard C 509. Valves shall be Mueller, Dresser, Clow, or equal.

All gate valves 3-inch and larger shall have mechanical joint and/or flanged connections as shown on the Plans, non-rising stems, open counterclockwise, and shall be provided with a 2-inch square operating nut. Stuffing box shall be O-ring type.

Valves smaller than 3-inch shall have screw type end connections and be non-rising stem, screwed bonnet, solid wedge disc type having a minimum working pressure of 200 psi. Valves shall be Crane 438, Stockham 103, or equal.

B. Butterfly Valves: Butterfly valves shall be suitable for direct burial and shall conform to the latest AWWA Standard C 504. Valves shall have mechanical joint and/or flanged connections as shown on the Plans and shall be of the same size as the line on which they are located. Valve shafts shall be a one-piece unit extending full size through the valve disc and valve bearings, with minimum shaft diameter as specified in AWWA C 504 Class 250B. Valve operators shall be worm gear type, sealed, gasketed, and lubricated for underground service. All valves shall open counter-clockwise and shall be provided with a 2-inch operating nut, unless otherwise specified.

C. Valve Boxes: All buried valves shall be installed with valves boxes. The top section of the valve boxes shall be Olympic Foundry Model 940, or approved equal, 18 inches high. The bottom section shall be Olympic Foundry Model 940, or equal, 36 inches high; extension sections shall be Olympic Foundry Model 940, or equal, 12 inches high.

Where depth of bury to the centerline of the valve is more than five feet, provide operating nut extension stems to bring the operating nut to within 1-foot of finished grade, Olympic Foundry Part No. VSE, or equal.

Valve box covers for water mains shall have the word “WATER” cast into them, Olympic Foundry model 940, or approved equal. Valve box covers for sewer force mains shall be provided with specially marked with word “SEWER” cast into them.

2.03 BEDDING AND COVER MATERIALS

A. See typical trench section shown on the Plans.

B. Imported pipe zone bedding for flexible pipes shall be crushed surfacing top course meeting the requirements of Section 9-03.9(3) of the Standard Specifications and shall be placed and compacted in layers as designated by the Engineer.

C. Pipe zone bedding for rigid pipes shall be native or imported gravel bedding material meeting the requirements of Section 9-03.12(3) of the Standard Specifications, or as approved by the Engineer.

D. Imported select backfill, where directed by the Engineer, shall be crushed gravel, placed and compacted in layers. The crushed gravel backfill shall conform to crushed surfacing base course meeting the requirements of Section 9-03.9(3) of the Standard Specifications, or as approved by the Engineer.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that trench excavation base is ready to receive work and that all excavations, dimensions, and elevations are as indicated on the Plans.

3.02 PREPARATION

A. Hand trim excavations to required elevations.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

C. No existing valves shall be opened or closed without permission of the Contracting Agency.

3.03 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 15 – Trench Excavation and Backfill for work of this section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION – PIPE

A. Refer to WSDOT Standard Specifications, Section 7-08.

B. Backfill in accordance with Section 31 23 15 – Trench Excavation and Backfill.

C. Flush pipeline in accordance with Section 7-09.3(24)A of the WSDOT Standard Specifications.

D. Unless otherwise shown on the Plans, provide a minimum of 4 feet and maximum of 8 feet earth cover over exterior buried piping systems and appurtenances conveying water.

E. All utility water pipe installed above ground shall be insulated. Utility water pipe insulation shall be 1" minimum thickness preformed water-repellent mineral wool with protective aluminum jacketing. Jacketing material shall be 0.024-inch thick smooth or embossed aluminum with integral interior moisture barrier. Seal all joints and secure jacketing with 1/2-inch aluminum bands at 8 inches on center. Install factory-formed fittings around all elbows, joints, valves, etc. Pipe insulation and protective aluminum jacketing shall be as manufactured by Johns Manville, or engineer approved equal. Heat trace shall be self-regulating cable, 3.4 w/ft output, NVENT (Raychem) XLE series or approved equal, suitable for use on a 120VAC power source. Provide all power connection, splice kit, tee, and end seal accessories required for a complete installation.

3.05 INSTALLATION – HDPE PIPE

A. Handling of HDPE Pipe: The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact, and without physical damage. The transportation carrier shall use appropriate methods and intermittent checks to ensure the pipe is properly supported, stacked, and restrained during transport such that the pipe is not nicked, gouged, or physically damaged.

Pipe shall be stored on clean, level ground to prevent undue scratching or gouging of the pipe. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations. The handling of pipe shall be done in such a manner that it is not damaged by dragging over sharp objects or cut by chokers or lifting equipment.

Sections of pipe having been discovered with cuts or gouges in excess of 10% of the wall thickness of the pipe shall be cut out and removed or the section of pipe rejected.

B. Joining HDPE Pipe: Sections of polyethylene pipe shall be joined into continuous lengths on the job site, above ground. The joining method shall be butt fusion and shall be performed in strict conformance with the pipe manufacturer's recommendations and ASTM-F-585. The butt fusion equipment used in the joining process shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400 ºF and interface fusion pressure of 75 psi. Socket fusion, hot gas fusion, threading, or solvent-cement joints and epoxies are not permitted.

The Contractor shall be responsible to verify the fusion equipment is in good working order and the operator has been trained within the past twelve months. The fusion equipment shall be equipped with a Datalogger for recording heater temperature and fusion pressure.

All fused joints shall be watertight and shall have a tensile strength equal to that of the pipe. All joints are subject to acceptance by the Owner prior to insertion. All defective joints shall be cut out and replaced at no additional cost to the Town.

The Contractor shall remove all HDPE trimmings or other miscellaneous material from the inside of the pipe being butt fused prior to installation. All HDPE pipe, both new and existing, shall be adequately covered at the end of each working day to prevent entry by animals (i.e. rodents, cats, etc.). If pipe is left open and unattended by the Contractor, he shall be responsible for verifying no animals have entered the pipe and provide suitable evidence to the Engineer. The Contractor shall not continue work until such evidence is provided and accepted by the Engineer.

C. Backfill in accordance with Section 31 23 15 – Trench Excavation and Backfill.

3.06 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 11 – Testing, Inspections, Supervision.

B. Request inspections prior to and immediately after placing bedding.

C. Pressure test water mains in accordance with WSDOT Standard Specifications, Section 7-09.3(23).

D. Pressure Testing HDPE Pipe:

1. Pressure testing shall be conducted in accordance with ASTM F2164, Field Leak Testing of Polyethylene Pressure Piping Systems Using Hydrostatic Pressure. The HDPE pipe shall be filled with water raised to test pressure and allowed to stabilize. The test pressure shall be 60 psi. The pipe shall pass if the final pressure is within 5% of the test pressure for 1 hour. For safety reasons, hydrostatic testing only will be used. The Contractor shall maintain a log of all pipe testing on the project. At a minimum, the testing log shall indicate the following parameters: Name of technician, time, test pressure, test duration, and whether the test passed or failed.

E. No leakage will be allowed.

F. If tests indicate work does not meet specified requirements, remove work, replace, and retest at no cost to Owner.

3.07 PROTECTION

A. Protect finished installation.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 14 16

SECTION 33 14 50 – DISINFECTION OF WATER UTILITY DISTRIBUTION

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This section includes all work required for disinfection of potable water distribution and transmission system.

B. Flushing of water lines.

C. Testing and reporting results.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 45 11 – Testing, Inspections, Supervision

C. Section 33 14 16 – Site Water Utility Distribution Piping

1.03 REFERENCE STANDARDS

A. The Standard Specifications for Road, Bridge, and Municipal Construction prepared by the Washington State Department of Transportation (WSDOT).

B. AWWA B300 – Standard for Hypochlorites.

C. AWWA B301 – Standard for Liquid Chlorine.

D. AWWA B302 – Standard for Ammonium Sulfate.

E. AWWA B303 – Standard for Sodium Chlorite.

F. AWWA C651 – Standards for Disinfecting Water Mains.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Test Reports: Indicate results comparative to specified requirements.

C. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.

1.05 PROJECT RECORD DOCUMENTS

A. Documents and procedures shall be in accordance with WSDOT Standard Specifications, Section 7-09.3(24).

1.06 QUALITY ASSURANCE

A. Perform work in accordance with AWWA C651.

B. Testing Firm: Company specializing in the testing and examining of potable water systems approved by the State Washington.

C. Submit bacteriologist's signature and authority associated with testing.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable Local codes or regulation for performing the work of this Section.

PART 2 – PRODUCTS

2.01 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Hypochlorite; AWWA B301, Liquid Chlorine; AWWA B302, Ammonium Sulfate; and AWWA B303, Sodium Chlorite.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that piping system and water well have been cleaned, inspected, and pressure tested.

B. Perform scheduling and disinfecting activity with start-up, testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.02 EXECUTION

A. Provide and attach required equipment to perform the work of this Section.

B. Flush system to remove debris and contaminants.

C. Pressure test water distribution pipelines in accordance with Section 33 11 16 – Site Water Utility Distribution Piping. Repair leaks and re-test if necessary.

D. Inject treatment disinfectant. Introduce treatment into piping system.

E. Maintain disinfectant in system for 24 hours.

F. Flush, circulate, and clean until required cleanliness is achieved; use domestic water.

G. Replace permanent system devices removed for disinfection.

3.03 FIELD QUALITY CONTROL

A. Refer to Section 01 45 11 – Testing, Inspections, Supervision.

B. Test samples in accordance with AWWA C651.

END OF SECTION 33 14 50

SECTION 33 31 13 – SITE SANITARY SEWERAGE GRAVITY PIPING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This section includes all work required to furnish and install gravity flow sanitary sewer piping, bedding, fittings, and accessories.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 45 11 – Testing, Inspections, Supervision

C. Section 03 30 00 – Cast-In-Place Concrete

D. Section 31 23 15 – Trench Excavation and Backfill

1.03 REFERENCE STANDARDS

A. The Standard Specifications for Road, Bridge, and Municipal Construction prepared by the Washington State Department of Transportation.

B. ANSI/ASTM D 1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregates Using 10 lb (4.54 Kg) Rammer and 18-inch (457 mm) Drop.

C. ANSI/ASTM D 3034 – Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.

D. ASTM D 2922 – Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

E. ASTM D 3017 – Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

F. ASTM D 1784 – Rigid CPVC Vinyl Compounds

G. ASTM D 2321 – Underground Installation of Thermoplastic Pipe (non-pressure applications)

H. ASTM F 493 – Solvent Cements for CPVC Pipe and Fitting

I. ASTM F 1668 – Procedures for Buried Plastic Pipe

J. ASTM F 2618 – Standard for Chlorinated Poly (Vinyl Chloride) Chemical Waste Drainage Systems

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Product Data: Submit product data indicating pipe and pipe accessories.

C. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Submit test results in accordance with Section 01 45 11 – Testing, Inspections, Supervision.

F. Submit record drawings. Record location of pipe runs, connections, cleanouts, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 DEFINITIONS

A. Bedding: Fill placed under, beside, and directly over pipe, prior to subsequent backfill operations.

1.06 REGULATORY REQUIREMENTS

A. Conform to all applicable Local and State codes for materials and installation of the work of this section.

1.07 FIELD MEASUREMENTS

A. Verify that field measurements and elevations are as indicated.

1.08 COORDINATION

A. Coordinate the work with termination of sanitary sewer connections outside building, connection to structures, and trenching.

PART 2 – PRODUCTS

2.01 SEWER PIPE MATERIALS

A. PVC Sewer Pipe

1. Conform to the requirements of Section 9-05.12(1) of the Standard Specifications.

2. PVC Fittings for PVC sewer pipe, such as tees, wyes, elbows, plugs, etc., shall be flexible gasket joint fittings acceptable for use and connection to PVC sewer pipe.

B. Detectable Marker Tape: Marker tape shall be a detectable type and shall be marked “SEWER,” and shall conform to Section 9-15.18 of the Standard Specifications.

2.02 BEDDING AND COVER MATERIALS

A. See Typical Trench Section shown on Plans and Section 31 23 15 – Trench Excavation and Backfill.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that trench excavation base is ready to receive work and that excavations, dimensions, and elevations are as indicated on Drawings.

3.02 PREPARATION

A. Hand trim excavations to required elevations.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.03 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 15 – Trench Excavation and Backfill for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION – PIPE

A. Refer to WSDOT Standard Specifications, Section 7-08.

B. Clean and test pipe in accordance with the Standard Specifications. Section 7-17.3(2)A of the Standard Specifications shall be supplemented with the following:

All sewers and appurtenances shall be cleaned and tested after backfilling. Both infiltration and exfiltration testing of the gravity sewer pipeline will be required. Deflection testing of the pipeline will also be required, 15 days after completion of backfill and compaction. Deflection testing shall be done by pulling a steel mandrel through the pipe. All testing shall be witnessed by the Owner and the Engineer.

3.05 INSTALLATION – SIDE SEWERS

A. Refer to WSDOT Standard Specifications, Section 7-08, for general pipe installation requirements.

B. Side sewers shall be constructed in accordance with Section 7-18 of the Standard Specifications. Section 7-18.3(1) shall be supplemented with the following:

1. Side sewers shall be the same diameter from the building to the main sanitary sewer unless an increase in size is necessary as a result of connecting additional structures to the side sewer. The minimum pipe diameter shall be 6 inches. Larger sizes, if required, will be as shown on the Plans.

2. Pipelines shall be installed at a minimum slope of 1/4-inch per foot whenever practicable. Flatter slopes will be allowed where it is impractical, due to the depth of the main sanitary sewer or structure features, to maintain the minimum slope of 1/4-inch per foot. Allowable minimum flatter slopes are 1/8-inch per foot for 4-inch through 6-inch diameter pipes, and 1/16-inch per foot for 8-inch diameter and larger pipe.

3. Cleanouts shall be of the same size and type of material as the side sewer in which they are installed. Provide side sewer cleanouts at the following minimum locations:

a. At the outside of the structure.

b. At intervals not to exceed 100 feet in straight pipe runs.

c. At the end of aggregate changes in direction exceeding 90 degrees.

d. At other locations deemed necessary by the Engineer.

4. Manholes may be used in lieu of cleanouts and shall be placed at intervals not to exceed 300 feet. If manholes are used, the minimum location requirements for cleanouts will apply except for spacing in straight runs. Manholes are required in side sewers 8-inches in diameter and larger and shall be placed at all changes in horizontal alignment or vertical grade.

5. Grade bottom of the trench to the line and grade to which the pipe is to be laid, with allowance for pipe thickness and imported pipe bedding. Remove hard spots which would prevent a uniform thickness of bedding. Before laying each section of pipe, check the grade and correct any irregularities found. The trench bottom shall form a continuous and uniform bearing and support for the pipe. Carefully place imported pipe bedding material around the pipe so the pipe barrel is completely supported and no voids or uncompacted areas are left beneath the pipe. Place remaining backfill material in uniform layers and compact each layer, taking care not to damage the side sewer.

6. Imported pipe bedding will be required. The trench shall be backfilled with imported pipe bedding from 3 inches below the bottom of the pipe to 3 inches above the top of the pipe.

7. Side sewers shall not be backfilled prior to inspection by the Engineer. The completed sewer shall provide a continuous connection from the structure to the main sanitary sewer and shall show no signs of possible leakage. All deficiencies shall be corrected as directed by the Engineer prior to the backfilling and acceptance of the side sewer.

C. Side sewers shall be tested up to the property line, or nearest joint thereto, simultaneously with the sanitary sewer main, for both the required infiltration and exfiltration tests. The Contractor shall provide all fittings necessary to test the side sewers as outlined in Section 7-17.3(4) of the Standard Specifications. That segment of the side sewer between the property line and the building structure may be tested with the main line, or separately, and the Contractor may install a tee fitting at the property line to facilitate testing. All necessary test fittings shall be removed and all openings plugged at the completion of the test.

3.06 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under the provisions of Section 01 45 11 – Testing, Inspections, Supervision.

B. Request inspections prior to and immediately after placing bedding.

C. Refer to WSDOT Standard Specifications.

D. Perform leakage tests in accordance with Section 7-17.3(2) of the WSDOT Standard Specifications.

E. If tests indicate work does not meet specified requirements, remove work, replace, and retest at no cost to Owner.

3.07 PROTECTION

A. Protect finished installation.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 31 13

DIVISION 40 – PROCESS INTERCONNECTIONS

SECTION 40 01 11 – PROCESS SYSTEM TESTING

PART 1 – GENERAL

1.01 GENERAL

A. Refer to Section 01 45 11 – Testing, Inspections, Supervision for general requirements.

B. It is the intent of the Owner to have a complete and operable facility. All facilities shall be tested during construction and/or during the Contractor's operational period to insure the facility is complete, is operable to the satisfaction of the Engineer, and meets the design performance requirements.

C. General test requirements are specified in this section. Additional test requirements may be specified in other divisions of these Specifications and in other sections of this division. In submitting a proposal for this work the Contractor agrees that any specified performance requirements, testing procedures, leakage allowances, or other requirements are fair and practicable and that he guarantees to secure the results specified.

D. All costs for power, gas, water, labor and material (including chemicals) required for testing shall be borne by the Contractor.

E. Defective items revealed by the testing shall be removed and replaced or otherwise corrected as directed by the Engineer, and the system again subjected to the same test. All cost for power, gas, water, labor and material (including chemicals) required for re-testing shall be borne by the Contractor.

1.02 TESTING

A. Equipment and Systems: All equipment and systems shall be tested by the Contractor under the review of the Engineer, to verify the proper operation thereof in accordance with these Specifications.

B. Pipe and Fittings: After completion of the installation, the Contractor shall test all piping and pipe work as specified herein. The Contractor shall furnish all material, equipment and labor for testing and re-testing the piping systems.

Each system may be tested as a unit or in sections, but each complete system shall successfully meet the requirements specified herein before acceptance by the Engineer. Should any defects appear in the pipe or fittings, the necessary repairs shall be made and the line re-tested until it shall meet the requirements.

The Contractor shall take all necessary precautions to prevent any joints from withdrawing while the pipelines and their appurtenances are being tested, and he shall, at his own expense, repair any damage to the pipes and their appurtenances or to any other structures resulting from or caused by these tests.

C. Water Main Piping: All pressure water main piping shall be hydrostatically pressure tested in accordance with Section 7-09.3(23) of the WSDOT Standard Specifications supplemented with the following:

Replace the first sentence with:

All water mains and appurtenances shall be tested under a hydrostatic pressure of 150 psi.

D. Refer to Section 33 11 16 – Site Water Utility Distribution Piping, for additional pipe testing requirements.

E. Connections to the existing water mains shall be tested following the testing of all new piping per the above test requirements. The Engineer shall be notified immediately if any leaks are detected in existing piping outside of the project limits. The Contractor shall be responsible for repairing and retesting leaks at the connection points.

F. Process Piping: All pressure process piping shall be hydrostatically tested in accordance with the requirements for water main piping, unless otherwise specified.

G. Gravity Pipe Lines (PVC, DI, cast iron, and concrete drain and sewer): All gravity pipe lines shall be tested in accordance with Section 33 31 11 – Site Sanitary Utility Sewerage Piping.

H. Building Plumbing: All plumbing shall be tested in accordance with applicable state and local codes and as specified.

1. Before final connections are made to main sewers and prior to backfilling of trenches or connecting of fixtures, all drainage piping shall be hydrostatically tested. All openings shall be capped or plugged and the system filled with water to the top of a vertical section of pipe ten feet high, temporarily connected to the highest point of the underground system. The water shall be allowed to stand in the system for at least 30 minutes prior to inspection. If the water level remains constant and no leaks are found during the period of inspection, the water shall be drained from the system. Final connections shall then be made to the main sewers and the trenches backfilled.

2. Before any fixtures are connected, all water piping shall be hydrostatically tested and proven tight at a pressure of not less than 150 psig at the lowest point in the system. The pressure shall be maintained for at least one hour for inspection. If the pressure remains constant and no leaks are found during the period of inspection, the water shall be drained from the systems and final connections shall then be made to the fixtures.

3. Should any leaks, flaws or defective materials or equipment be found during the testing operations, such leaks or flaws shall be corrected and effective materials and equipment replaced. After corrections have been made, tests shall be repeated until all systems are proven tight. All corrections and re-tests shall be made without additional cost to the Owner.

I. Water Containing Structures: Water retaining structures shall be tested for water-tightness and repaired in accordance with Section 03 30 00 – Cast-In-Place Concrete.

END OF SECTION 40 01 11

SECTION 40 02 11 – PROCESS SYSTEM BASIC MATERIALS AND METHODS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this section describes the materials and methods common to all sections of Division 26 – Electrical and Division 40 – Process Interconnections. Mechanical materials specified under other sections of Division 40 – Process Interconnections shall meet the requirements of this section, unless part of larger factory assembled equipment.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 78 00 – Operation and Maintenance Manuals

C. Section 05 50 11 – Miscellaneous Metals

D. Division 26 – Electrical

E. Division 40 – Process Interconnections

1.03 REFERENCE STANDARDS

A. American National Standards Institute (ANSI).

B. American Society of Mechanical Engineers (ASME):

1. ANSI/ASME B1.20.1 – Pipe Threads, General Purpose (Inch).

2. ANSI/ASME B16.1 – Gray Iron Pipe Flanges and Flanged Fittings.

C. Anti-Friction Bearing Manufacturers Association (AFBMA).

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Contractor shall investigate the capacity and space requirements of the proposed equipment before submitting shop drawings.

C. Submit product data for all materials and equipment used on the project, including drawings, catalog-cuts, etc. Indicate model numbers and specified options and accessories that are proposed for use.

D. Fees and permits: Obtain required permits necessary to execute the work under this division. See Section 01 11 50 – Special Provisions and Section 01 45 11 – Testing, Inspections, Supervision for additional information related to permits.

E. The Contractor shall verify all actual conditions and shall refer to architectural, structural, piping and electrical Plans. Rerouting of pipe from that shown on construction Plans due to interferences, types of material and equipment submitted that are different from those originally shown on Plans and/or specified, Contractor's convenience for construction that does not compromise functional intent, etc., will be permitted only after review by the Engineer. In this case, shop drawings shall be submitted consisting of plan and section views clearly showing all pipe, fittings, valves, pipe hangers, supports, and mechanical and electrical equipment. Shop drawings shall be completely dimensioned and labeled, and reviewed and approved by the Engineer prior to beginning construction.

1.05 QUALITY ASSURANCE

A. All pressure vessels, safety devices, and appurtenances shall comply with standards of and bear stamp of ASME.

B. All electrical devices and wiring shall comply with standards of NEC. All devices shall be UL listed and so identified.

1.06 PRODUCT HANDLING

A. Contractor is responsible for protection of all material, equipment and apparatus provided under this section from all damage both in storage and when installed, until final acceptance.

B. Provide temporary storage facilities for material and equipment. Provide heat for equipment storage as recommended by manufacturer.

C. Any material, equipment or apparatus damaged because of improper storage or protection will be rejected and any repair or replacement will be at no cost to the Owner.

1.07 JOB CONDITIONS

A. Electrical requirements

1. Starters: Except for starters specifically included in Division 26 – Electrical, furnish all starters for motors in this division.

2. Disconnects. Except for disconnects factory mounted on mechanical equipment, or in combination with starters, motor disconnects are specified in Division 26 – Electrical.

3. Power wiring: Except for factory wiring on mechanical equipment, power wiring is specified in Division 26 – Electrical. Equipment devices and wiring shall comply with NEC.

4. Provide controls, controllers, transformers, and switches required by the work of this section.

5. Factory wired assemblies and panels shall be prewired to numbered terminal strips for connection to field wiring.

6. Provide disconnect switch for each control circuit connection to prewired assemblies and control panels.

7. Provide approved wiring diagrams for work as specified in Division 26 – Electrical and Division 40 – Process Interconnections.

8. Provide weatherproof devices and installations for outdoor applications or as specified in Division 26 – Electrical.

9. Install wiring as specified in Division 26 – Electrical.

PART 2 – PRODUCTS

2.01 FLANGES AND PIPE THREADS

A. Unless otherwise noted, all flanges on equipment and appurtenances provided under this section shall conform in dimensions and drilling to ANSI/ASME B16.1, Class 125. All pipe threads shall conform in dimension and limits of size to ANSI/ASME B1.20.1, Class 2 NPT, Taper Pipe Thread.

B. Grooved pipe connections shall be Victaulic or equal.

2.02 GUARDS

A. All exposed moving parts shall be provided with guards in accordance with the requirements of the Occupational Safety and Health Act. Guards shall be fabricated of 12-gauge steel and expanded metal screen to provide visual inspection of moving parts without removal of the guard. Guards shall be galvanized after fabrication and shall be designed to be readily removable.

2.03 BEARINGS

A. Unless otherwise specified, all equipment bearings shall be oil or grease lubricated, ball or roller anti-friction type of standard manufacture. Bearings shall be conservatively designed to withstand all stresses of the service specified. Each bearing, except when otherwise noted, shall be rated in accordance with the latest revisions of AFBMA Methods of Evaluating Load Ratings of Ball and Roller Bearings for one of the following classes of B-10 rating life: Class M1, 8,000 hours of operation; Class M2, 20,000 hours of operation; Class M3, 50,000 hours of operation; of Class M4, 100,000 hours of operation. Bearings shall be not less than Class M3 unless otherwise noted.

B. All grease lubricated bearings, except those specified to be factory lubricated for life, shall be fitted with easily accessible grease supply, flush, drain and relief fittings. Extension tubes shall be used when necessary. Grease supply fittings shall be the standard hydraulic type.

C. Oil lubricated bearings shall be equipped with either a pressure lubricating system or a separate oil reservoir type system. Each oil lubrication system shall be of sufficient size to safely absorb the heat energy normally generated in the bearing under a maximum ambient temperature of 60˚C and shall be equipped with a filler pipe and an external level gauge.

2.04 V-BELT DRIVES

A. Unless otherwise noted, V-belt drives shall be Dodge Dyna-V belts with matching Dyna-V sheaves and Dodge Tapper-lock bushes, Woods' Super-V belts with matching Sure-Grip sheaves and Woods' Sure-Grip bushes, or Eaton Hy-T wedge with Eaton High Torque QD sheaves, or equal.

B. Pulleys and bushes shall be dynamically and statically balanced. Pulleys shall be separately mounted on their bushes by means of three pull-up grub or cap tightening screws. Bushes shall be key-seated to the driver shaft.

C. Belts shall be selected for not less than 150 percent of rated driver horsepower and, where 2 pulley sizes are specified, shall be capable of operating with either set of pulleys. Belts shall be of the anti-static type where flame-proof equipment is specified.

D. Each belt-driven unit shall be furnished with a complete set of spare belts. Spare belts shall be properly identified as to design, horsepower speed, length, pulley size and use and shall be packaged and stored as specified for spare parts storage and marking. Where 2 or more belts are involved, matched sets of belts shall be provided.

2.05 SHAFT COUPLINGS

A. General: Shaft couplings for direct connected electric motor-driven equipment 1/2 HP or larger shall be Type I or Type II as specified herein. Type I couplings shall be utilized for all reversing drives, positive displacement pumps or high torque loads. Type II couplings shall be employed on all other drives. Where requirements of the equipment dictate specialized features, the manufacturer may substitute the coupling normally supplied for the service. All couplings shall be non-lubricated type, designed for not less than 50,000 hours operating life.

Coupling sizes shall be as recommended by the manufacturer for the specific application, considering horsepower, speed of rotation and type of service. The use of couplings as specified herein shall not relieve the Contractor of his responsibility for precision alignment of all driver-driven units.

B. Type I couplings: Positive displacement pumps and reversing equipment or equipment where sudden torque reversals may be expected shall be connected to their drivers by flexible couplings which can accommodate angular misalignment, and end float, and which cushion shock loads and dampen torsional vibrations. The flexible member shall consist of a built-up elastic member comprised of synthetic rubber, duck and wire reinforcement with synthetic tension members bonded together in rubber. The flexible member shall be attached to flanges by means of clamping rings and cap screws and the flanges shall be attached to the stub fit. There shall be no metal-to-metal contact between the driver and driven unit.

C. Type II couplings shall be employed on normal torque, non-reversing applications. Type II couplings shall be of the pin and preloaded neoprene cylinder type, designed to accommodate shock loading, vibration and shaft misalignment or offset. Stub shafts shall be connected through collar or round flanges, firmly keyed to their shafts, to neoprene cylinders held to individual flanges by through pins. Couplings with cylinders pinned to both coupling flanges will not be acceptable.

2.06 ELECTRICAL DEVICES

A. All electrical motors, starters, controls and other devices furnished with mechanical systems shall be UL labeled or furnished with other certification satisfactory to the administrative authority. In addition, electrical components shall comply with Division 26 – Electrical of these specifications. See diagrams on electrical plans.

2.07 EQUIPMENT PADS

A. All mechanical equipment shall be installed on a concrete pad with a minimum height above the floor of 4 inches. Details for a typical concrete pad are included in the Plans.

2.08 PIPE SUPPORTS

A. Pipe supports shall conform to the Manufacturers Standardization Society (MSS) Standard Practice Manual SP-69 (Selection and Application); SP-58 (Materials, Design and Manufacture); SP-89 (Fabrication and Installation Practices). MSS Standard Practice Manual SP-90 contains Guidelines on Terminology for Pipe Hangers and Supports.

B. Pipe supports shall be manufactured by competent and reputable companies experienced in the application of pipe hanger and support systems. Pipe supports shall be constructed of hot-dip galvanized steel or stainless steel, as called out on the Plans. Fasteners and/or anchor bolts shall be stainless steel.

C. Pipe stands shall be supported by Schedule 40 pipe of the diameter required for adequate support, or as shown on the Plans, whichever is more conservative. Pipe stands shall include either pre-manufactured or shop formed pipe cradles and base plates. Pipe supported on stands that are greater than 4 feet 0 inches above the floor level (CL) shall have hold-down straps or clamps.

D. All piping shall be properly supported by anchors, brackets or hangers. Supports shall be placed at a maximum spacing of 10 feet, unless otherwise specified and at all other locations needed to facilitate take-down of pipe and equipment removal. Maximum horizontal pipe hanger and support spacing shall not exceed distances as herein specified, as shown on the Plans, or as shown on Table 3 of MSS SP-69.

E. Overhead piping shall be supported with acceptable hangers as shown on the Plans, of the standard manufacture of a reputable manufacturer. Fastening of supports to structural components shall be in accordance with methods approved by the structural component manufacturer and the Engineer. Provisions shall be made to distribute pipe loads over the proper, structural components of the building with approved fastening devices.

F. The following pipe support equipment and practices will not be acceptable:

1. Use of wire or perforated straps.

2. Hanging from unreinforced roof decks or any portion of structure not approved by the engineer.

3. Hanging from grating or other removable walkways or structural components.

PART 3 – EXECUTION

3.01 GENERAL

A. All equipment shall be installed in accordance with manufacturer's recommendations unless specifically directed by the Engineer otherwise.

3.02 PLANS

A. Plans are diagrammatic and show the general design, arrangement and extent of the systems. Do not scale Plans for roughing in measurements, nor use as shop drawings. Make field measurements and prepare shop drawings as required. Coordinate work with shop drawings of other specification divisions.

3.03 SLEEVES AND INSERTS

A. Contractor shall be responsible for locating and installing sleeves, inserts and supports, including pipe supports, as required during the construction.

3.04 REVISIONS DURING INSTALLATION

A. Contractor shall be responsible for making minor changes in the piping, ductwork and equipment locations due to structural obstructions or conflicts with work specified in other divisions.

3.05 EQUIPMENT INSTALLATION

A. Belt driven equipment: Mount with motors on common steel base with adjustable motor mount.

B. Locate and install sleeves, inserts and supports as required at proper stage of construction.

C. Install equipment so nameplates are visible.

D. Basis for equipment and material installation is the published recommendations of manufacturer. Submit such recommendations for review.

3.06 TESTING BUILDING SYSTEMS

A. Contractor shall notify Engineer at least one week prior to testing. Provide tests specified. Provide all test equipment including test pumps, gauges, instruments, and other equipment required. Pressure gauges used shall be graduated in increments suitable for magnitude of test pressures specified and shall have range of approximately twice test pressure. Use only gauges and instruments recently calibrated.

B. Where testing is specified, completed installation shall comply with designated requirements. Provide replacement materials as may be required to accomplish this compliance.

C. Piping:

1. Remove from systems, during testing, all equipment which would be damaged by test pressure. Replace removed equipment after testing. Systems may be tested in sections as work progresses; however, any previously tested portion shall become a part of any later test of composite system. Correct leaks by remaking joints with new material; makeshift remedies will not be permitted. Test time will be accrued only while full test pressure is applied to system.

2. Do all testing before backfilling, concealing, insulating, or painting.

3. Tolerance shall be no pressure drop, except that due to temperature change or as specified in test procedure. Perform tests in accordance with requirements in Section 40 01 11 – Process System Testing and Section 40 20 11 – Process Piping.

D. Valves

1. Test valve bonnets for tightness. Test operate valves from closed-to-open-to-closed position while valve is under piping test pressure.

2. Test automatic valves by actuating from fully open to fully closed.

E. Piping Specialties

1. Test pressure gauges for accurate indication.

2. Test all other piping specialties for proper operation.

F. Hangers and supports: With systems in normal operation, test hangers, supports and rods to ensure they are plumb and supporting proper share of load. Additionally, support, as required, systems and equipment that sway, crawl, or vibrate.

G. Other materials and equipment: Test other materials and equipment as specified, as recommended by equipment manufacturer, or directed to assure they are complete, operable and ready for use.

3.07 CLEANING

A. During progress of work, keep premises reasonably free of debris, cuttings and waste material. Upon completion of work, and at other times as directed, remove all such debris from premises.

B. Clean equipment and materials. Remove foreign materials including dirt, grease, splashed paint and plaster. Restore to original condition any damaged finish.

C. Clean, by flushing, interior of water piping after pressure testing. Upon completion of flushing, completely drain systems at all low points; remove, clean and replace all strainer baskets and refill systems.

3.08 STARTUP PROCEDURES

A. General: Provide material and labor required to perform startup of each respective item of equipment and system prior to beginning of test, adjust and balance procedures. Provide information and assistance required, cooperate with test, adjust and balance services.

1. Comply strictly with manufacturer's specified procedures in starting up mechanical equipment.

B. Bearings:

1. Inspect for cleanliness, clean and remove foreign materials.

2. Verify alignment.

3. Replace defective bearings and those which run rough or noisy.

4. Lubricate as necessary and in accord with manufacturer's recommendations.

C. Drives:

1. Adjust tension in V-belt drives and adjust varipitch sheaves and drives for proper equipment speed.

2. Adjust drives for alignment of sheaves and V-belts.

3. Clean, remove foreign materials before starting operation.

D. Motors:

1. Check each motor for amperage comparison to nameplate value at full equipment load.

2. Correct conditions which produce excessive current flow and which exist due to equipment malfunction.

3. Check for proper rotation before running equipment.

E. Pumps:

1. Check mechanical seals for cleanliness and adjustment before running pump.

2. Inspect shaft sleeves for scoring.

3. Inspect mechanical faces, chambers and seal rings, replace if defective.

4. Verify that piping system is free of dirt and scale before circulating liquid through the pump.

F. Control Valves:

1. Inspect both hand-operated and automatic control valves, clean bonnets and stems.

2. Tighten packing glands to assure no leakage, but permit valve stems to operate without galling.

3. Replace packing in valves to retain maximum adjustment after system is judged complete.

4. Replace packing on any valve which continues to leak.

5. Remove and repair bonnets which leak.

6. Coat packing gland threads and valve stems with a surface preparation of “Moly-Cote” or “Fel-Pro” after cleaning.

G. Verify that control valve seats are free from foreign material and are properly positioned for intended service.

H. Tighten flanges and couplings after system has been placed in operation.

1. Replace all gaskets which show any sign of leakage after tightening.

I. Inspect screwed and welded joints for leakage.

1. Promptly remake each joint which appears to be faulty, do not wait for rust to form.

2. Clean threads on both parts, apply compound and remake joints.

3. Cut out welded joint and replace with new section of pipe and new couplings.

J. After system has been placed in operation, clean strainers, dirt pockets, orifices, valve seats and headers in fluid systems to assure system is free of foreign materials.

K. Remove rust, scale and foreign materials from equipment and renew any defaced surfaces.

L. Inspect fan wheels for clearance and balance.

1. Provide factory-authorized personnel for adjustment when needed.

M. Check each electrical control circuit to assure that operation complies with specifications and requirements to provide desired performance.

N. Inspect each pressure gauge, thermometer, meter, and process instrument for calibration.

1. Replace items which are defaced, broken, or which read incorrectly.

O. Repair damaged insulation.

P. Vent gases trapped in any part of systems.

1. Verify that liquids are drained from all parts of gas or air systems.

Q. Check piping for leaks at every joint, and at every connection, using “Leak-Tek” or other approved compound.

3.09 CONTINUING ADJUSTMENTS

A. Provide such periodic continuing adjustment services as necessary to ensure proper functioning of mechanical systems after occupancy of the project and for warranty period stated in Section 1-05.10(1) of Section 01 11 50 – Special Provisions.

END OF SECTION 40 02 11

SECTION 40 03 11 – PROCESS SYSTEM CODING AND IDENTIFICATION

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered by this section consists of furnishing all labor, materials, and equipment required for the color coding and identification of mechanical and electrical systems as shown on the Plans and as specified in Division 26 – Electrical and Division 40 – Process Interconnections, including but not limited to the following:

1. Identification of all exposed piping, panels, equipment cabinets, and mechanical equipment.

2. Locating devices for concealed controls and equipment and buried piping and utilities.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 09 90 00 – Painting and Coating

C. Division 26 – Electrical

D. Division 40 – Process Interconnections

1.03 REFERENCE STANDARDS

A. American National Standards Institute (ANSI).

B. American Society of Mechanical Engineers (ASME).

C. National Electric Code (NEC).

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. The Contractor shall submit product data and samples of legend markers, valve tags, and plastic plates, indicating all materials and colors prior to painting and installation.

PART 2 – PRODUCTS

2.01 COLOR CODING OF PIPELINES

A. Piping shall be painted in colors as selected by the Owner to match existing piping color coding system where applicable, or colors as specified herein for the pipe service.

B. Piping shall be painted and color coded in accordance with Section 09 90 00 – Painting and Coating, and the Washington State Department of Ecology (WSDOE) recommended piping color code scheme. A portion of the WSDOE color code scheme, along with corresponding Sherwin Williams 4000 series industrial color numbers, is provided in the following schedule:

Service	Color	Sherwin Williams No.
Potable Water	Dark Blue	4086 Safety Blue
Non-Potable Water	Jade Green	4070 Generator Green
Sludge	Brown	4001 Bolt Brown
Polymer Solution	Tan	4003 Pallet Tan

2.02 PIPING IDENTIFICATION SYSTEMS

A. General: All exposed piping, and appurtenances shall conform to an identification system. Items shall be considered exposed unless buried or concealed in the construction. Insulated pipe shall be identified as required for the carrier pipe. The Contractor shall obtain the Engineer's approval of all color coding and identification prior to application.

B. Standards: Identification markers for piping shall have background and legend colors as specified herein. All identification shall be in accordance with the following standards unless otherwise specified or directed by the Engineer:

1. Background: White
2. Legend: Black

C. Manufacturers:

1. Subject to compliance with the specifications, equivalent products by the following manufacturers are acceptable:

a. Brady Worldwide, Inc., 6555 W. Good Hope Rd, Milwaukee, WI 53223; Phone: (800) 250-3082; Fax: (800) 292-2289; www.bradyid.com.

b. Seton Identification Products, 20 Thompson Rd., Branford, CT 06405; Phone: (800) 571-2596; Fax: (800) 345-7819; www.seton.com.

D. Identification Materials:

1. Legend markers: Provide self-sticking vinyl labels or Snap-On type markers with legends and/or symbols with borders as approved by the Engineer. Arrows indicating direction of flow shall point away from legend. If flow may be both ways, use double-headed arrows.

2. Self-sticking labels shall be equal to Brady material number B-946, suitable for temperature ranges of -40 ºF to 180 ºF (-4 ºC to 82 ºC). Snap-on type markers shall be equal to Brady material number B-915. Pipe markers for stainless steel air piping shall be equal to Brady material/number B-689 with maximum service temperature of 248˚F or higher.

3. Self-sticking markers for piping 3 inches in diameter to 6 inches in diameter shall be Brady Style 1, piping less than 3 inches in diameter shall be Brady Style 4 and piping 8 inches in diameter and larger shall be Brady Style 1HV. Snap-on or strap-on markers shall be in a style appropriate for the size of piping.

2.03 EQUIPMENT IDENTIFICATION SYSTEMS

A. Plastic-laminated plates for equipment identification shall be made of engraving stock, melamine plastic laminate punched for mechanical fasteners. Thickness shall be 1/16 inch for signs up to 20 square inches and 1/8 inch for larger signs. Engraved legend shall be white letters on black face. Use self-tapping stainless-steel screws or no. 10 stainless steel machine screws with nuts, flat washers, and lock washers.

B. Refer to Division 26 – Electrical for additional electrical equipment and cabinet identification material requirements.

2.04 VALVE, GATE AND INSTRUMENT TAGS

A. Provide Type 304 stainless steel, 1-1/2-inch diameter steel tags with eyelet holes for all valves, gates and instruments identified in the applicable schedules on the Plans. Tag lettering shall be engraved or stamped with the applicable valve, gate or instrument number per the Plan schedules. Printed or written lettering shall not be acceptable. Provide Brady B-919 tags, Seton Item 08212 tags, or equivalent products manufactured by others.

B. Provide stainless steel chains and fasteners to securely mount tag to valve, gate, or instrument.

PART 3 – EXECUTION

3.01 PIPING SYSTEMS

A. All exposed piping in rooms, vaults, and outdoors shall be painted in accordance with paragraph 2.01 of this section.

B. Identify piping by legend markers and arrows to show pipe contents and direction of flow. Legend markers and arrows shall be provided at the following locations:

1. Behind every access door or panel.

2. At each valve.

3. At each “T” joint.

4. At each point of entry or exit where pipe passes through walls, floors or ceilings.

5. At intervals not exceeding 50 feet apart on long runs.

6. On overhead piping, provide legends on the lower portion of the pipe where view from the floor is unobstructed.

C. The number and location of the markers shall be sufficient to readily identify each pipe along its entire exposed length. In general, legend markers and directional arrow markers shall be placed at the inlets and outlets of equipment, both sides of valves, into and out of walls, at each riser and tee joint, and at 10-foot intervals of long runs, or as determined by the Engineer.

D. Where two or more pipes run parallel, markings shall be applied in the same relative location on each side so as to be in vertical or horizontal linearity as the case may be, and present a workmanlike appearance.

E. Where numerous fittings occur close together, as in manifolds and around equipment, the above Specifications as to location of markers shall be modified as indicated by good judgment to prevent a cluttered appearance.

3.02 EQUIPMENT

A. All equipment, including apparatus cabinets, switchgear, panels, dampers, fans, pumps, etc., shall have identification consisting of plastic-laminated plates as approved by the Engineer showing equipment number, nature, and function of each piece of equipment, and a designation corresponding to control diagrams and directions. Voltages shall be indicated where applicable.

1. Plates shall be on outside of boxes, cases, motor control centers, control panels, etc.; except panel cabinets, which shall be identified on the inside of the doors unless otherwise indicated.

2. Fans and air supply units shall be identified with the following information after the fan systems have been adjusted:

Unit Number	Running Current
Fan RPM	Starting Current
Static Pressure	CFM
Motor HP	Direction of Fan Rotation

B. Refer to Division 26 - Electrical for additional electrical equipment and cabinet identification requirements.

3.03 VALVE, GATE AND INSTRUMENT TAGS AND DIRECTORY

A. All interior and exterior valves, gates and instruments identified on the applicable Plan schedules shall be provided with identification tags as specified above.

1. Provide a printed directory of valves, gates and instruments giving tag symbol, location, use, type, size, pressure rating and manufacturer's name. Five copies shall be delivered to the Engineer for transmittal to the Owner.

2. Tag lettering shall correspond to the label indicated on the Plan schedules, or as coordinated by the Engineer.

3. Tags shall be securely mounted to the specified item with stainless steel chain, and fasteners.

4. The location and type of mounting or attachment shall not affect the operation of the valve, gate or instrument in any way.

END OF SECTION 40 03 11

SECTION 40 20 11 – PROCESS PIPING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The work included in this section consists of furnishing and installing pipe, fittings and related items, complete as specified herein and as indicated on the Plans. Special pipe, fittings or installation requirements may be specified with the particular equipment involved.

B. Any pipe and fitting materials in substantial contact with drinking water shall be NSF 61 approved.

C. Not all the pipe and fittings listed in this section are used in this project.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 09 90 00 – Painting and Coating

C. Section 33 14 16 – Site Water Utility Distribution Piping

D. Division 40 – Process Interconnections

1.03 REFERENCE STANDARDS

A. American Water Works Association (AWWA).

B. American National Standards Institute (ANSI).

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Product data in the form of drawings, catalog cuts, etc. shall be submitted for all items proposed for use on the project.

C. Submit shop drawings of all exposed interior piping. Detailed shop drawings showing plan and field-verified dimensional information; connection types, sizes and locations; valves and fittings; and all required appurtenances, including piping support types, sizes and locations, shall be submitted for review and approval for all fabricated DI, PVC, and stainless steel piping systems specified and shown on the plans.

PART 2 – PRODUCTS

2.01 PIPE MATERIALS

A. General:

1. All pipe and fittings shall be of the type and size indicated on the Plans. All pipe of each type shall be of the same manufacturer.

2. Pipe shall be grooved piping system, flanged, mechanical joint or push-on joint as required or as specified. Unless otherwise shown on the Plans or specified herein, the following shall apply:

a. Mechanical joint with mechanical restraints shall be used for all buried ductile iron fittings.

b. Fused connections shall be used on all buried HDPE pipe.

c. Regarding joint restraint, it is the intent of the Plans and Specifications to use “Grip Ring” or “Meg-a-Lug” type mechanical restraints in lieu of thrust blocking.

d. All exposed piping shall be flanged or Victaulic type grooved pipe connections.

3. Ductile iron and cast iron pipe and fittings in submerged applications shall be fusion-bonded epoxy coated inside and out per AWWA C116 and AWWA C213. Field welded or cut materials shall be field coated with two coats of epoxy per AWWA C210.

4. Exposed pipe and fittings shall be coated as specified in Section 09 90 00 – Painting and Coating.

5. Glass lining, where required, shall be vitreous inorganic material applied to internal pipe surfaces that have been prepared by blasting. The lining shall be applied in a minimum of two coats, separately applied and fired at a maturing temperature of approximately 1,400 °F to fuse the vitreous and inorganic materials to the metal surface. The entire finish coating shall be a minimum of 10 mils dry film thickness. Glass lining shall be as manufactured by US Pipe Fabrication, or approved equal.

B. Ductile Iron Pipe and Fittings: Ductile iron pipe shall conform to the provisions of ANSI A21.51/AWWA C151. Ductile iron pipe thickness shall conform to provisions of ANSI M1.50. All pipe and fittings shall be cement-mortar lined and seal coated in accordance with ANSI 21.4. Thickness class for all pipe and fittings shall be as follows:

Use	Required Class
General Use, 12-inch Diameter and Smaller	52
General Use, Over 12-inch Diameter	50 or 51
Threaded Taps	52
Threading, for Threaded Flanges	53

Ductile iron pipe shall be furnished with mechanical joints, flanged joints or push-on joints as specified and shall conform to ANSI A21.11/AWWA C111 and ANSI A21.15/AWWA C115. Flanges shall conform to ANSI B16.1, Class 125 drilling.

Fittings shall be ductile or cast iron unless otherwise shown on the Plans, and shall conform to ANSI 21.53/AWWA C153 or ANSI A21.10/AWWA C110 and ANSI A21.11/AWWA C111. Where taps are shown on fittings, tapping bosses shall be provided.

Where restrained joints are required, provide locked-type mechanical retainer glands with mechanical joint fittings, “Grip Ring,” “Meg-a-Lug” or approved equal. Push-on joints shall be supplied with “Field-Lok” gaskets or approved equal.

Grooved pipe shall conform to AWWA Standard C606, or the coupling manufacturer's recommendations for rigid grooving dimensions. Flexible grooves shall be provided as necessary for settlement or expansion only where shown on the Plans or as approved by the Engineer.

C. Cast Iron Pipe and Fittings: Cast iron pipe shall conform to the current provisions of the ANSI A21.1, A21.7, and A21.10. Cast iron pipe shall be Thickness Class 22.

Flanged pipe shall be flanged in accordance with ANSI B-16.1, with Class 125 drilling and full face gaskets. Rubber gasket joints shall conform to ANSI 21.11.

All cast iron pipe shall be cement lined and seal coated in accordance with ANSI 21.4, unless specified otherwise.

D. High Density Polyethylene (HDPE) Pipe and Fittings: See Section 33 11 16 – Site Water Utility Distribution Piping for HDPE material specifications.

E. Cross-Linked Polyethylene (PEX) Pipe and Fittings: PEX pipe shall conform to ASTM F876/F877 and AWWA C904. PEX pipe fittings/adapters shall be brass crimp type fittings, compatible with the piping used.

F. PVC Pipe and Fittings: Unless otherwise shown, PVC pipe shall conform to the requirements of the “Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch for Water,” (AWWA C900) or “Standard for Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 inches through 36 inches,” (AWWA C905) and shall be furnished in cast iron equivalent outside diameters. Pipe shall be Pressure Class 150. Pipe fittings shall be Class 150 cast iron, mortar lined, and meet the requirements of the “American National Standard for Gray Iron and Ductile Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids,” (ANSI 21.10/AWWA C110) and the “American National Standard for Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings for Water,” (ANSI A21.4/AWWA C104), respectively.

Unless otherwise shown or specified, PVC pressure pipe 3 inches and smaller shall be Schedule 80, Type 1 and shall conform to ASTM D 1785. Buried pressure fittings 3 inches and smaller may be rubber gasket or solvent weld joints. Fittings shall conform to ASTM D 2467, Schedule 80 for solvent weld joints. Threaded joints shall be provided where connecting to unions, valves and where future disassembly may be required.

PVC gravity sewer pipe shall be as specified in Section 33 31 11 – Site Sanitary Utility Sewerage Piping.

G. Fabricated PVC pipe and fittings, where called for on the plans, shall be constructed of schedule 80 material conforming to ASTM D1785 and ASTM D2467. Solvent cements shall conform to ASTM D2564. Pipe and fittings shall be fabricated and assembled by the manufacturer in lengths and configurations as shown on the plans to allow for easy installation in the field and future disconnection. Field assembly of fabricated PVC pipe and fittings will not be allowed. Provide flanged or socket weld joints where shown on the plans and approved by the Engineer. Fabricated PVC pipe and fittings shall be as manufactured by Spears® Manufacturing Company, or Engineer approved equal, and meet the following minimum performance criteria:

1. Dimensional Conformance

    a. All sockets shall have an interference fit with applicable pipe.

    b. All change-of-direction fittings shall not exceed ± 1° variance in the specified angle.

    c. All standard stock fittings shall have specified cut lengths for all components in order to maintain dimensional consistence. Maximum overall deviations shall not exceed ±1/2-inch for fittings to 12 inches, ±1-inch for sizes 14 inches and larger and all wyes.

2. Structural Conformance

a. Burst Pressure - representative sample of fittings shall be tested to a minimum of two times the applicable maximum internal pressure rating in accordance with ASTM D1599.

b. Fabricated fittings shall meet the applicable requirements of the following Quality Assurance testing in accordance with the designated Standard Test Method:

TEST STANDARD	TEST METHOD
Burst Test	ASTM D1599
Lap Shear Test	CAN/CSA B181.2
Joint Delamination	Spears® Test
Air-Gap Spark Test	Spears® Test
Fusion Bond Tensile Test	CAN/CSA B181.2
Fusion Bond Deflection	CAN/CSA B181.2
Branch Deflection Test (Bending)	CAN/CSA B181.2/ ASTM F1866

c. All DWV and Low Pressure fittings shall additionally meet the requirements of ASTM F1866 and the applicable portions of CAN/CSA B181.2.

d. Fittings designed for use at pressures in excess of 130 psi may be reinforced where reinforcement has been deemed necessary for proper fitting performance.

e. Fiberglass reinforced fittings shall be free of visible chips, cracks, foreign inclusions, air bubbles, lack of fill-out, delamination and sharp obtrusive surfaces as defined in ASTM D2563.

3. All fittings or product packaging shall be labeled with the manufacturer's name, part number, size, description, product code and ASTM Specification Number, if applicable.

4. All pipe, fittings and complete fabricated assemblies shall be meet the pressure ratings and flow conditions as shown on the plans or specified herein.

H. Copper Pipe and Fittings: Copper pipe shall conform to ASTM B-88, Type K. Fittings shall be wrought copper solder joint fittings conforming to ASA-B16.22.

Copper piping shall be silver-soldered with minimum 45 percent silver content; Handy Harman, Easy-Flow, or equal with flux as recommended by manufacturer. In making screwed joints, tin male threads with soft solder. Epco or equal dielectric unions shall be used for all connections between copper and ferrous piping.

I. Brass Pipe and Fittings: Brass pipe and fittings shall conform to ASTM B43 and AWWA C800.

J. Galvanized Steel Pipe and Fittings: Galvanized steel pipe and fittings shall be provided in accordance with ASTM A120, ASTM A197, or ASTM A47. The minimum wall thickness shall be Schedule 40. 2-1/2 inch or smaller pipe shall have screwed couplings. 3-inch and larger pipe shall have grooved mechanical joint couplings or flanged couplings. Galvanized steel pipe and fittings shall not be used for potable water applications.

K. Welded Steel Pipe and Fittings: Welded steel pipe and fittings shall be manufactured of steel plate of thickness not less than 3/16-inch for pipes 12 inches in diameter and smaller, and not less than 1/4-inch for larger sizes. Pipe materials, fabrication, and shop testing of straight pipe shall conform to the requirements of the AWWA C200. All outlets, 4-inch diameter and larger, shall be provided with reinforcing designed for the water working pressure specified or shown. Shop drawings of all welded steel pipe and fittings 8 inches in diameter and larger shall be furnished in accordance with Section 01 33 00 – Submittals Procedure. Steel pipe and fittings shall be lined with cement mortar in accordance with AWWA C205

L. Stainless Steel Pipe and Fittings:

1. Stainless steel pipe for water or sewer applications shall be Type 304/304L, Sch. 40S, conforming to the requirements of AWWA C220. Stainless steel fittings shall be Type 304/304L, conforming to the requirements of AWWA C226, with flanged connections meeting the requirements of AWWA C228, Class SD minimum thickness, or grooved pipe connections conforming to AWWA C606.

2. Stainless steel pipe for process air applications shall be Type 304/304L, Schedule 10S per ASTM A312 or ASTM A778 with flange connections where shown on the Plans. Fittings shall be per ASTM A403 or A774 and flange connections shall be provided with stainless steel plate flanges welded to the pipe with 150 lb class drilling holes.

3. Stainless steel pipe and/or fittings passing through concrete structures shall be Type 316/316L and the exterior surfaces shall receive two coats of epoxy after fabrication, in accordance with AWWA C210. Fittings located within sewage wet wells shall also be Type 316/316L. Flange bolt isolation kits shall be provided in all locations where stainless steel piping is connected to dissimilar piping materials.

M. Miscellaneous Pipe and Fittings: Where indicated on the Plans, the Contractor shall furnish and install miscellaneous piping and fittings as required for the service indicated. All material shall be first class and suitable for the indicated service.

1.	Wrought Steel Pipe, Black and Galvanized	ASTM A120
2.	Wrought Iron Pipe, Black	ASTM A72
3.	Cast Iron Screwed Fittings	ASTM A126
4.	Malleable Iron Screwed Fittings	ASTM A197
5.	Welding Fittings, Black	ASTM A234

2.02 GASKETS

A. Gaskets for mechanical or push-on joints shall be rubber, conforming to ANSI A21.11/AWWA C111. Gaskets for mechanical joints used in air service piping shall be EPDM for temperatures up to 300˚F.

B. Gaskets for flanged fittings shall be full-face neoprene rubber. Flanged gaskets for air service piping shall be EPDM for temperatures up to 300˚F.

C. Gasket material shall be suitable for use in sewage, irrigation, or potable water lines.

D. Bolt-through mechanical joint restraint gaskets (foster adapters) shall be used for connection of mechanical joint fittings and valves where indicated on the Plans or where approved by the Engineer. Foster adapters shall be as manufactured by Infact Corporation, constructed of epoxy coated ASTM A536, Grade 65-45-12 ductile iron with gasket material as specified in paragraph A above. Bolts and nuts shall be as specified in paragraph 2.03.

2.03 BOLTS AND NUTS

A. Flange bolts and nuts connecting pipe and fittings shall be of a similar material to the pipe and fittings being connected, unless otherwise specified. At a minimum, carbon steel bolts shall be in accordance with ASTM A307 grade B, and stainless steel bolts shall be in accordance with ASTM F593. Stainless steel or “blue-coated” bolts and nuts, Romac R-blue, Tripac 2000, or Engineer approved equal shall be used for all underground connections. Stainless steel bolts and nuts shall be used for all submerged connections. Flange bolt isolation kits shall be provided where dissimilar materials are being connected. Length, size, and strength of bolts and nuts shall be in accordance with applicable AWWA standards.

2.04 COUPLINGS

A. Grooved Mechanical Joint Couplings: Grooved-end couplings shall conform to the requirements of AWWA C606 and shall be suitable for the pipe being joined. Depending on the piping requirements, the coupling shall either provide a rigid joint or controlled pipe movement (for deflection and/or thermal expansion). Pipe grooving shall be in accordance with the coupling manufacturer's specifications. Couplings shall be Victaulic System by Victaulic Company or approved equal.

B. Flexible Pipe Couplings: Flexible couplings are required on all pipes less than 36-inch diameter, wherever a pipeline penetrates a structure or, where shown on the Plans. Couplings shall be of the gasketed bolted sleeve type with diameter to properly fit the pipe, as manufactured by Romac, Smith-Blair, Dresser, or approved equal. Couplings shall be assembled on the job in a manner to insure permanently tight joints under all reasonable conditions of expansion and contraction. Gasket and O-ring material shall be as recommended by manufacturer for intended service. Buried or submerged couplings shall be provided with Type 316 stainless steel bolts and nuts. Couplings shall have an epoxy coating finish. Couplings for stainless steel piping shall be fabricated of Type 316 stainless steel and be provided with stainless steel bolts.

C. Threaded Joints: Threaded joints shall be made of clean-cut threads to standard lengths, so made up that joint leaves not more than three threads exposed. Apply approved pipe compound to male threads only.

2.05 BURIED PIPE RESTRAINT

A. “Grip Ring” or “Meg-a-Lug” type mechanical restraints shall be used for buried pipe restraint in lieu of thrust blocking, unless otherwise specified.

2.06 AIR PIPING EXPANSION JOINTS

A. Provide molded EPDM spherical expansion joint fittings with optional Type 304 stainless steel flanges and hardware suitable for use in high temperature blower applications up to 300^{o}F, 20 PSI or less, General Rubber Style 1101, Proco Style 240 or Engineer approved equal at all locations shown on the Plans. Size as called out on Plans. For outdoor installations expansion joints shall be provided with manufacturers optional UV and weather resistant protective coating.

2.07 MODULAR/MECHANICAL SEAL AND SLEEVE

A. Penetration Seals: Use a modular, mechanical seal, consisting of rubber links shaped to continuously fill the annular space between the pipe and the wall opening. Link-Seal® or Engineer approved equal, pressure plates shall be molded of glass reinforced nylon. Hardware shall be 316 Stainless Steel. Elastomer shall be identified with coloration of permanent marking for positive field identification. Each link shall have permanent identification of the size and manufacturer's name molded into the pressure plate and sealing element. PSI-Thunderline / Link-Seal® Modular Seal as manufactured by Pipeline Seal & Insulator, Inc., Houston, TX, or Engineer approved equal. Required seal elastomer materials shall be as follows and suitable for the application:

1. Typical application: Model “C” EPDM seal

2. High temperature application (air piping): Model “T” Silicone seal

B. Sleeves and Wall Openings:

1. For pipe diameters, up to 18-inch:

a. Install molded non-metallic high density polyethylene (HDPE) or PVC sleeves with integral hollow, molded water-stop ring larger than the outside diameter of the sleeve itself. Century-Line® Sleeve as manufactured by Pipeline Seal& Insulator, Inc, Houston, TX., or Engineer approved equal. See Plans for installation details.

2. For pipe diameters, greater than 18-inch:

a. Sleeve is not allowed. Provide spool with continuously welded wall collar as shown on Plans.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION

A. Pipe shall be installed in accordance with good trade practice and in strict accordance with the manufacturer's instructions. The methods employed in handling and placing of pipe, fittings and equipment shall be such as to ensure that after installation and testing they are in good condition.

B. Refer to Section 33 13 00 – Disinfecting of Water Utility Distribution, for installation of piping outside of building limits.

3.02 INTERIOR AND EXTERIOR PIPING INSTALLATION

A. Enter and exit through structure walls, floors, and ceilings by using penetrations and seals as shown on the Plans.

B. When entering or leaving structures with buried piping less than 36-inch diameter, install a flexible pipe coupling when shown on the Plans.

C. When entering or leaving structures with pipe 36 inches or larger, install a joint within 2 feet of point where pipe enters or leaves structure and install second joint not more than 6 feet nor less than 4 feet from first joint.

D. Install expansion devices as necessary to allow expansion and contraction movement.

E. Underground Pipe Anchorage:

1. Provide restrained joints unless shown or specified otherwise to prevent movement of piping caused by forces in or on buried piping tees, wye branches, plugs, valves or bends as shown and/or specified.

2. Place concrete blocking when shown or specified so that it extends from fitting into solid undisturbed earth wall. Concrete blocks shall not cover pipe joints.

3. Provide bearing area of concrete in accordance with drawing detail.

4. Restrain pipe joints within minimum distance from restrained fitting joints as shown below.

Pipe Size (inches)	Length of Restrained Pipe (feet) Each Side of Bend or Valve*		
	Fitting Angle		Plug or Valve
	0° to 45°	46° to 90°	
6	5	12	46
8	7	16	60
10	8	20	71
12	9	22	78
16	11	27	98
18	12	30	110
20	14	34	121
24	16	38	138
Listed lengths are based on a test pressure of 100 psi. To compute the length for a different test pressure, use the following equation: Length = (Test Pressure/100) x (Table Value)			

F. Install insulating components where dissimilar metals are joined together.

G. Underground Pipe Locating System:

1. Install over all underground piping and utility systems installed per this contract.

2. For pipes greater than 6-inch diameter install magnetic tape or tracing wire 6 inches above the top of the pipe center.

3. For pipes less than 6-inch diameter, install warning tape 24 inches above the top of pipe.

H. All above ground pipe shall be secured in place by use of pipe restraints or other approved methods as shown on the Plans.

Provide floor stands, wall bracing, concrete piers, hangers, brackets, clamps, etc., for all pipes running near the floors or near walls and which can be properly supported or suspended by the walls or floors. The weight of above ground piping shall be carried independently of equipment. Pipelines near concrete or masonry walls may also be hung by hangers carried from wall brackets at a higher level than pipe. Hanging of any pipe from another is prohibited. Special hangers and supports shall be as shown on Standard Details or on the Plans. See Section 40 02 11 – Process System Basic Materials and Methods for additional pipe support requirements.

I. Equipment shall be so positioned and aligned that no strain shall be induced within the equipment during or subsequent to the installation of pipe work.

J. In erecting the pipe, a sufficient number of screwed unions or flanged joints shall be used to allow any sections or run of pipe to be disconnected without taking down adjacent runs.

K. Flexible couplings shall be installed where shown on the Plans and at such other points as may be required for ease of installation or removal of the pipe, subject to approval of the Engineer. Flexible couplings shall be of the positive lock type where necessary to prevent separation of pipe due to internal pressures.

3.03 INSTALLATION AT CONCRETE WALLS AND FITTINGS

A. Whenever a pipeline of any material terminates at, or extends through, a structural wall or sump, the Contractor shall install, in advance of pouring of concrete, the fittings or special casting required for the particular installation.

B. Ductile iron or steel pipe to be cast in water bearing walls, or more than two feet below grade, shall have seep rings.

END OF SECTION 40 20 11

SECTION 40 20 12 – PROCESS VALVES AND GATES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The Contractor shall furnish and install all valves, gates, and accessories as shown and specified. In addition, valve-operating units, stem extensions and other accessories shall be furnished and installed by the Contractor where shown, or where required in the opinion of the Engineer, to provide for convenience in operation. Where buried valves are indicated, the Contractor shall furnish and install valve boxes to grade. All valves and gates shall be new and of current manufacture. All exposed shut-off valves, 6 inch and larger, shall have operators with position indicators. Where buried valves call for position indicators, they shall be provided with valve boxes and covers containing position indicators.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 09 90 00 – Painting and Coating

C. Division 22 – Plumbing

D. Division 26 – Electrical

E. Section 33 14 16 – Site Water Utility Distribution Piping

F. Section 40 20 11 – Process Piping

1.03 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit product data for all valves, operators, and controls (if applicable), including wiring diagrams and electrical data.

1.04 APPLICABILITY

A. Inclusion of products in this Specification section does not necessarily indicate that the particular product is installed for this project. If the product is used, it shall be furnished in accordance with this specification section unless otherwise approved by the Engineer.

B. Costs for all valves, gates, operators and appurtenances shall be included in the cost of applicable bid items as described in 1-09.3 of Section 01 11 50 – Special Provisions, complete and operable, and painted in accordance with Section 09 90 00 – Painting and Coating.

C. Valves and gates in piping systems shall be adequately supported to prevent their load from being imposed on any operating equipment, and in accordance with best practices to resist dislocation when adjacent piping or support is removed for maintenance, and to prevent injury to operation or maintenance personnel.

PART 2 – PRODUCTS

2.01 GENERAL REQUIREMENTS

A. The flanges of valves may be raised or plain faced. Flanges of valves for water working pressures of 175 psi or less shall be faced and drilled to 125-pound American Standard template. Flanges of valves for water working pressures greater than 175 psi shall be faced and drilled to 250-pound American Standard template. Valves installed in grooved (Victaulic™) piping system shall be groove joint, or may be flanged with adapter flanges.

B. Unless otherwise specified, each valve body shall be tested under a test pressure equal to twice its design water working pressure.

C. Unless otherwise specified, all interior bronze parts of valves except gate valve stems shall conform to the requirements of the “Specification for Composition Bronze or Ounce Metal Castings,” (ASTM B62). Gate valve stems shall be of bronze containing not more than 5 percent zinc nor more than 2 percent aluminum, and shall have a minimum tensile strength of 60,000 psi, a yield strength of 40,000 psi, and an elongation of at least 10 percent in 2 inches, as determined by a test coupon poured from the same ladle from which the valve stems to be furnished are poured.

D. Except where otherwise provided, the exterior surfaces of all submerged valves shall be epoxy coated with 8 mils of “Scotchcoat” or Miccrow 650 or approved equal.

E. Where designated, certain valves and gates shall be furnished with electric operators provided by the valve or gate manufacturer. All operators of a given type shall be furnished by the same manufacturer. Where these operators are supplied by different valve manufacturers, the Contractor shall coordinate their operator selections to provide uniformity of each type of electric operator. Electric operators shall be of the same manufacturer to the extent possible, and shall conform to the applicable section of these Specifications. Care must be taken to assure that electric operators and controls for valves located in Classified Areas conform to restrictions to be explosion proof if required.

F. Valves and operators in particular locations may require a combination of units, sensors, limit switches and controls specified in this or in other divisions of these Specifications. It shall be the responsibility of the Contractor to properly assemble and install these various items so that all systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on shop drawing submittals. Care must be taken to assure that electric operators and controls for valves located in Classified Areas conform to restrictions to be explosion proof if required.

G. Unless specifically required to be equipped with other types of operators, all valves with centerline more than 6 feet above the operating floor shall be equipped with chain wheels and operating chains. Each chain wheel operated valve shall be equipped with a chain guide which will permit rapid handling of the operating chain without “gagging” of the wheel. A hanging bracket or hook shall be provided on an adjacent wall or structure to provide for securing the chain out of the walking area.

2.02 PVC VALVES

A. PVC Ball Valves: PVC ball valves shall be rated for 200 psi service with lever handle, EPDM seals and threaded double union body (True Union) that can be removed from the line without disengaging the end connections. PVC ball valves shall be Chemtrol® (NIBCO), Spears®, Asahi® or approved equal.

B. PVC Ball Check Valves: PVC ball check valves shall be rated for 200 psi service with PVC body, union-type end connections. PVC ball check valves shall be Chemtrol® (NIBCO), Spears®, Asahi® or approved equal.

C. All ball valves and ball check valves used for sodium hypochlorite solution and chemical solution piping shall be PVC.

D. Valve seal materials shall be suitable for use with specified chemicals. Viton® seals shall be used at all sodium hypochlorite and CIP valves.

E. Provide vented style ball valves for sodium hypochlorite service.

F. Socket weld PVC valves may be used in lieu of true union valves if unions are installed on either side of the valve for easy removal.

2.03 GATE VALVES

A. Gate valves 2-1/2 inches and under with screwed ends shall be 200 pound. WOG with bronze body and trim, union bonnet, rising stem and solid wedge disc. NIBCO, Crane, or equal.

B. Gate valves 3 inches and over with flanged ends shall be 200 pound WOG with iron body, bronze trim, resilient seal or resilient wedge gate valves, non-rising stem, by Clow, or equal. Valves located below the operating surface shall have Engineer approved extension stems with operating nut located at approximately the walking level, and stem mounted in suitable stem guides.

C. Gate valves for buried service shall be installed per Section 2.07 below.

2.04 BUTTERFLY VALVES

A. Butterfly valves shall be rubber-seated, conforming to the requirements of the latest version of AWWA C504, Class 250B, as specified herein. Valves shall be short-bodied with either flanged, mechanical joint, or grooved ends as called out on the plans. Flanged end connections shall have ANSI/ASME B16.1 Class 125 drilling. Mechanical joint ends shall be in accordance with ANSI/AWWA C111. Valve manufacturer shall have a minimum of five years of experience producing AWWA butterfly valves. Valves shall be as manufactured by Henry Pratt (Mueller Co.), DeZURIK®, Val-Matic, or Engineer approved equal.

B. Valve bodies and discs shall be constructed of ASTM A536, Grade 65-45-12 ductile iron. The valve disc shall be solid lens-shaped or profiled design to minimize pressure drop and line turbulence. Valve seat material shall be Buna-N or EPDM, bonded to valve body or disc. Seat retaining materials shall be constructed of stainless steel. Valve shafts shall be one-piece design extending completely through the valve disc and bearings, and shall be constructed of Type 316 stainless steel. Shaft seals shall be designed for use of standard v-type packing. All interior and exterior valve surfaces, except rubber seat and stainless steel materials, shall be epoxy coated.

C. Manual actuators for butterfly valves shall be of the worm gear of traveling-nut type with position indicator and hand wheel, chain wheel, or 2-inch operating nut, as shown on the plans. Actuators shall be of the self-locking type, designed to hold the valve in any intermediate position between fully open and fully closed without creeping or fluttering. Actuators shall be equipped with mechanical stop-limiting devices to prevent over-travel of the disc in the open and closed positions. Actuators shall be fully enclosed and designed to produce the specified torque with a maximum pull of 80 lb. on the operator.

Manual actuators shall be tested and capable of withstanding the torques specified in AWWA C504. The contractor shall submit certified copies of reports describing the procedures and test results for each actuator model provided. Refer to Section 33 11 16 – Site Water Utility Distribution Piping, for actuator requirements for buried service valves. Actuator housings and operators shall be epoxy coated.

2.05 WAFER/LUG BUTTERFLY VALVES

A. Wafer/lug butterfly valves shall be resilient-seated, conforming to the requirements of MSS SP-67 and MSS SP-25, and meeting the intent of AWWA C504, Class 250B, as specified herein, and suitable for both on/off and throttling service. Valves shall be compatible with ANSI/ASME B16.1 Class 125 drilling and supplied with a minimum of four alignment holes. Lug style valves shall be used where indicated on the Plans. Valve manufacturer shall have a minimum of five (5) years of experience producing wafer/lug butterfly valves. Valves shall be as manufactured by Centerline (Crane®), Henry Pratt, DeZURIK®, or Engineer approved equal.

B. Valve bodies shall be constructed of ASTM A536, Grade 65-45-12 ductile iron, and shall be epoxy coated. The valve seat design shall be full-body, isolating the valve body and stem from the flow. Valve seat material shall be EPDM, suitable for operating temperatures up to 275^0F. The valve disk shall be constructed of Type 316 stainless steel. Valve shafts and taper pins shall be constructed of Type 416 stainless steel. Shaft bushings shall be PTFE and shaft seal shall be o-ring type.

C. Manual actuators for wafer/lug butterfly valves shall be lever or gear type as called out on the Plans. Lever operators shall allow for the valve to be held in any intermediate position and locked in 10 positions. Geared actuators shall be worm gear type with position indicator and hand wheel or chain wheel operator as indicated on the Plans. Actuator housings and operators shall be epoxy coated.

D. Valves shall be supplied with electric and pneumatic actuators where specified or indicated on the Plans.

2.06 PLUG VALVES (STANDARD, 3-WAY, V-PORT)

A. General: All plug valves of the same type and size shall be furnished by single manufacturer. Valves shall be of the non-lubricated, eccentric-type with screwed, flanged or mechanical joint ends as shown on the Plans or as required for the application. Plug valves shall conform to the requirements of the latest edition of AWWA C517, as specified herein. Valves shall be as manufactured by Henry Pratt, DeZURIK®, Val-Matic, or Engineer approved equal.

B. Construction: Bodies shall be constructed of ASTM A536, Grade 65-45-12 ductile iron. Seats in 3 inch and larger valves shall have a welded-in overlay of high nickel content on all surfaces contacting the plug face. Valves shall have permanently lubricated stainless steel bearings in the upper and lower plug stem journals. All valves shall be of the bolted bonnet design. All 4 inch and larger valves shall be designed so that they can be repacked without removing the bonnet, and the packing shall be adjustable. All exposed nuts, bolts, springs and washers shall be zinc plated. Flanged valves shall be faced and drilled to ANSI 125/150-pound standard. Valves in piping runs using grooved pipe couplers may have grooved ends, or may utilize adapters for coupling to adjacent piping.

C. Plugs: Standard and 3-way plug valves shall have resilient faced plugs. Resilient plug facings shall be of neoprene suitable for use with sewage, sludge or scum. Plugs shall be constructed of ATSM A536, Grade 65-45-12 ductile iron. Port areas of valves shall be at least 80 percent of full pipe area. Valves installed in sludge lines shall be installed with the seat on the upstream side. Three-way plug valves shall have separate screw-type operators for unseating and seating the plug, and for turning the plug while unseated.

D. Operators: Plug Valves shall have lever or gear actuators and tee wrenches, extension stems, floor stands, chain-wheels, etc., as required or indicated on the Plans. Valves 4 inches or less may have lever or t-wrench operators. Valves greater than 4 inches shall have gear operators. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft and the quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position, and an adjustable stop shall be provided to set closing torque. All exposed nuts, bolts and washers shall be zinc plated. Type and position of operators shall be approved by the Engineer for each valve. Chain hangers shall be mounted near all valves with chain wheel operators to allow hanging the chains out of operating areas.

E. Valves and gear actuators for buried or submerged service shall have seals on all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, springs and washers shall be stainless steel.

F. Valves installed in grooved (Victaulic™) piping systems shall preferably be grooved joint, but may be flanged with adapter flanges to piping with approval of Engineer.

G. Valves shall be supplied with actuators where specified or indicated on the Plans.

2.07 VALVE BOXES FOR BURIED SERVICE

A. All buried valves shall be installed within valve boxes. The top section of the valve boxes shall be Olympic Foundry Model 940, or approved equal, 18 inches high. The bottom section shall be Olympic Foundry Model 940, or equal, 36 inches high; extension sections shall be Olympic Foundry Model 940, or equal, 12 inches high.

B. Where depth of bury to the centerline of the valve is more than five feet, provide operating nut extension stems to bring the operating nut to within 1-foot of finished grade, Olympic Foundry Part No. VSE, or equal.

C. Valve box covers for water mains shall have the word "WATER" cast into them, Olympic Foundry model 940, or approved equal. Valve box covers for sewer force mains shall be provided with specially marked with word "SEWER" cast into them.

2.08 SWING CHECK VALVES

A. Swing check valves shall be swing-type, external lever check valves. The valve shall have a cast iron body and disc, bronze seat, rubber seat ring and 303 stainless steel shaft. The external lever shall have an adjustable weight. Swing check valves shall be Mueller, Kennedy, Victaulic or equal.

B. Where called for on the Plans, including electrical or instrumentation Plans, valves shall be equipped with position sensor switches. Switches shall be mounted on approved stainless steel brackets located to not interfere with valve or adjacent equipment operation. Switches shall be micro-limit switches DPST or proximity switches. Switch actuation shall be for “non-closed” position indication.

2.09 SILENT CHECK VALVES

A. Silent check valves shall be globe style with 125 pound flanges, consisting of a heavy cast iron body, bronze seat, bronze disc and stainless steel spring. APCO Series 600, Cla-Val Series 581, or approved equal. The valve disc must be center divided at both ends with an integral shaft and shall be spring loaded for guaranteed silent shut-off operation. Valves springs shall be helical or conical and the seat and disc shall be field replaceable for ease of maintenance.

B. Silent check valves shall be capable of silent operation when installed in vertical or horizontal positions with flow either up or down. The flow area through the valve body shall be equal to or greater than the cross-sectional area of the equivalent pipe size.

2.10 PRESSURE REGULATING VALVES

A. Pressure-regulating valves shall be full line size indicated with adjustable range to suit the installation. Valves shall have a stainless-steel seat ring and cast bronze body.

2.11 BACKFLOW PREVENTER VALVES

A. Backflow preventer valves 2 inches and larger shall be reduced pressure type approved by the State of Washington Department of Health. Units shall be complete with inlet and outlet valves. Maximum pressure loss through the valve shall be 10 psi. Valve must be equipped with resilient seated shutoff valves and test cocks. Drain lines with air gaps shall be provided with piping to a floor sump. Backflow preventer valves shall be Clayton Model RP or equal.

B. Backflow preventer valves smaller than 2 inches shall be a reduced pressure-principle device meeting State of Washington Department of Health requirements. Backflow preventer valves shall have bronze bodies and bronze trim, 175 psi working pressure, 300 psi hydrostatic test pressure, and screwed ends. Backflow preventer valves shall be supplied with isolation gate valves of the same size as the RPBP valve, test cocks and threaded drain connection. Size shall be as shown on the Plans.

2.12 SOLENOID VALVES

A. Solenoid valves shall be the same size as the lines in which they are installed and shall be suitable for the intended service. All solenoid valves shall have explosion-proof, watertight enclosures. Provide manual operator where indicated on the Plans. Provide strainer ahead of all solenoid valves as specified and recommended by the manufacturer. Valves shall be suitable for operation on a 120V, 60 Hz, AC, single-phase power supply. Valves shall be as manufactured by Magnatrol Valve Corporation, or Engineer approved equal.

2.13 DUCKBILL CHECK VALVES

A. Duckbill check valve shall be as manufactured by Red Valve Co., ProCo, or equal. Valve shall be one-piece elastomer and shall utilize Type 316 stainless steel components, where applicable.

2.14 CORPORATION STOPS

A. Unless otherwise shown, corporation stops shall be Ford Meter Box Company, James Jones, Mueller or equal.

2.15 NON-FREEZE HYDRANTS

A. Yard hydrants shall have built in drain port and stop-and-waste capability to prevent freezing. Hydrants shall be installed in a 1.5 cubic foot gravel sump with drain valve 3foot minimum bury depth. Hydrants shall have 3/4-inch or 1-inch inlet as called out on the Plans and 3/4-inch hose connection unless otherwise called out. Operation shall be by lockable lift handle. Installation shall be according to the manufacturer’s recommendations. Hydrants shall be Zurn model Z-1395 or approved equal

B. Wall hydrants shall be anti-siphon, automatic draining type with integral backflow preventer, bronze casing and interior parts, 3/4-inch or 1-inch inlet as shown on the Plans and hose connection, stainless steel face and operating key, Zurn model Z-1310 or approved equal.

2.16 HOSE BIBBS

A. Interior wash down hose bibbs shall be cast bronze with 3/4-inch inlet and outlet, Zurn/Wilkins model 195, or equal. Exterior wash down hose bibbs shall be cast bronze with 3/4-inch inlet and outlet, Zurn/Wilkins model 1315 or equal. Where called out on the Plans, a hose rack shall be installed next to each hose bibb.

B. Hose bibbs for process connections shall be 1/2-inch inlet by 3/4-inch outlet, Zurn/Wilkins model 195, or equal.

2.17 WATER PRESSURE RELIEF VALVES

A. Small pressure relief valves shall be bronze body with cadmium plated steel springs. Valves shall be sized for the pressure and discharge services for the areas in which they are required. Pressure setting shall be adjustable over a 1 to 250 psi range. Valves shall be as manufactured by Lunkenheimer, Watts or approved equal.

B. PVC Pressure Relief Valves for sodium hypochlorite service:

1. Pressure relief valves shall protect as system from excessive pressure by opening at a set point to allow venting/by-pass of piping system. The valves shall be designed for a working service pressure of 150 psi. Valves shall be Plast-OMatic Valves, Inc. Series RVD, or approved equal, with the following Features.

a. Compact, PVC fabricated body with 1/2-inch threaded connections.

b. Viton ® / FKM elastomers with no wetted metal parts.

2. Valve shall be installed per manufacturer’s recommendations with necessary piping, tees, and fittings to connect to system piping and discharge/by-pass location.

2.18 STRAINERS

A. Metal Strainers shall be provided ahead of any control valves, regulators and where shown. They shall have cast iron or bronze body, stainless steel screens, and screwed ends for size 3 inch and smaller, and flanged ends for size greater than 3-inch. They shall be designed for 250 psi working pressure in sizes 3-inch and smaller, and 125 psi working pressure in sizes over 3 inches. Strainers shall be Y-pattern, Armstrong Figs. 6 and 7, a similar item manufactured by Crane, or equal.

B. PVC Strainers shall be provided ahead of any control valves, regulators and where shown on the Plans. They shall have PVC body, Viton®/FKM gaskets, PVC screens and socket ends with true union connections for size 3 inch and smaller, and flanged ends for size greater than 3-inch. They shall be designed for 150 psi working pressure. Strainers shall be Y-pattern, Hayward® YS Series or approved equal.

C. PVC Basket Strainer shall be provided where shown on the Plans. They shall have PVC body, Viton®/FKM gaskets, PVC or Titanium strainer baskets and socket ends with true union connections for size 3-inch and smaller, and flanged ends for size greater than 3inch. They shall be designed for 150 psi working pressure. Basket strainers shall be inline basket strainers, Hayward® SB Series Simplex Basket Strainers or approved equal.

2.19 AIR RELEASE AND AIR/VACUUM RELIEF VALVES

A. Sewage Combination Air Release Valves:

1. Sewage combination air release valves shall allow escape of small quantities of air while under pressure, and shall allow large quantities of air to enter or escape when draining or filling the pipeline. The valves shall be designed for a working service pressure of 150 psi. Valves shall be Vent-O-Mat Series RGX, or Engineer approved equal, with the following features:

a. Compact, tubular all stainless steel fabricated body, stainless steel top flange, stainless steel top cover and swivel flange outlet connection, and stainless-steel bolts.

b. HDPE hollow, direct-acting float and HDPE solid orifice float.

c. Nitrile rubber seals and natural rubber seat.

d. Integral “anti-surge” orifice mechanism.

e. Standard factory tests, including hydrostatic test at 1.5 times the rated working presser, low head leak test (7 psi) and small orifice function test at maximum rated working pressure.

2. Air and water from the outlet of the combination air release valve shall be plumbed through stainless steel piping to the floor drain system, as shown on the plans. Unions shall be placed in the drain line to allow disassembly of the valve and plumbing for maintenance.

3. 2-inch and smaller air valves shall be equipped with NPT inlet and outlet connections. 3-inch and larger valves shall be equipped with flanged inlet and outlet connections. Valves shall also be equipped with inlet shutoff valves in a size and type as called out on the plans.

B. Water Combination Air and Vacuum Valve:

1. Combination air release valves shall allow escape of small quantities of air while under pressure. Air/Vacuum valves shall allow large quantities of air to enter or escape. The valves shall be for service of 150 psi. The body and cover shall be cast iron, float and stem shall be stainless steel and the seat shall be Buna-N.

2. Air and water from the outlet of the combination air release valve shall be plumbed through galvanized iron piping to drain at the floor or to the floor drain system as shown on the Plans. Unions shall be placed in the drain line to allow disassembly of the valve and plumbing for valve maintenance.

3. Combination air release valves shall be APCO Series 140C or Val-Matic 200C Series, in size called out on the Plans.

4. All internals shall be easily removed through the top cover of the valve without removing the valve from the line.

5. Air valves shall be equipped with NPT inlet and outlet in the size called out on the Plans. Valves shall be equipped with inlet shutoff valve.

2.20 MICELLANEOUS VALVES

A. Where indicated on the Plans, Contractor shall furnish and install miscellaneous valves. Valves shall be first class and suitable for the indicated service.

B. All valves not designated on the Plans as to type, shall be subject to approval of the Engineer

2.21 METALLIC GATES

A. Slide gates and weir gates shall be provided as shown on the Plans. Gates shall be supplied by a single manufacturer with a minimum of five years of experience in the production of similar equipment. Gates shall be as manufactured by Golden Harvest Inc., Rodney Hunt, Fontaine, or Engineer-approved equal.

B. Gates and operators shall conform to the requirements of AWWA C561. Submit complete engineering design calculations in compliance with AWWA standards.

C. Slide gates and weir gates shall be constructed of stainless steel. All gate components shall have a minimum material thickness of 1/4-inch.

D. Frame: Gate frames shall be rigid, welded unit, composed of the guide rails, and cross bars, with a clear opening as specified on the Plans. Frames shall be flatback, spigotback, or embedded type as shown on the Plans.

E. Guides: Guide frames shall be fabricated of stainless steel and incorporate a dual slot design. The primary slot will accept the plate of the slide (disc) and the second slot will be sufficiently wide to accept the reinforcing ribs of the disc. Guides shall be provided with ultra high molecular weight (UHMW) seats on both sides of the slide. The guides shall be designed for maximum rigidity, having a weight of not less than 13 pounds, per foot. The guides will be of sufficient length to support at least two-thirds (2/3) the height of the slide, when the gate is fully open.

F. Slide: The slide shall be plate reinforced with structural stainless steel shapes welded to the plate. The slide shall not deflect more than 1/360 of the span of the gate under maximum head. Reinforcing ribs shall extend to the guides so that the seating surface of the guide is reinforced. The stem connection shall be either the clevis type, with structural members welded to the slide and a bolt to act as pivot pin, or a threaded and bolted (or keyed) thrust nut supported in welded nut pocket. The pocket and yoke of the gate shall be capable of taking at least twice the rated thrust output of the operator at 70 pounds pull.

G. Seal: Gates shall be furnished with a flush bottom seal arrangement. A resilient neoprene seal with a minimum width of exposed face of 3/4 inch shall be securely attached to the frame along the invert and shall extend to the depth of the primary slot.

Gates shall be provided with "J" bulb seals along the sides, and across the invert (weir gates) or top (standard upward opening) of the gate. When seals are required completely around opening, a flush bottom closure shall be used on the invert. Seals shall be frame mounted and shall not protrude into the specified opening of the gate.

The seating face of the frame for tapered-wedge sluice gates shall be oriented at an angle to the plane of the mounting flange to effect a wedging action upon closure.

H. Stem: Stems shall be type 303 or 304 stainless steel of suitable length and ample strength for the intended service. The stem diameter shall be capable of withstanding twice the rated output of the operator at 70 pounds pull, and shall be supported such that L/R ratio for the unsupported stem length shall not exceed 200.

Stem guides shall be fabricated of stainless steel. Stem guides shall be equipped with a UHMW bushing. Guides shall be adjustable and spaced in accordance with the manufacturer's recommendation. The L/R ratio shall not exceed 200.

I. Yoke and Pedestal: Self-contained gates shall be provided with a yoke to support the operating bench stand. The yoke shall be formed by two structural members welded at the top of the guides to provide a one piece rigid frame. Non-self-contained gates shall be provided with pedestal mounted lifts. The pedestal shall be fabricated of stainless steel. A fabricated stainless steel pedestal support wall bracket shall be provided, and shall have a horizontal plate to allow the top of wall anchorage in addition to wall anchorage.

2.22 GATE OPERATORS

A. Except where motorized operators are specified, all slide, weir, and sluice gates shall be equipped with geared operators as shown on the drawings or in the gate schedule and as detailed. Geared operators shall be the crank operated type and shall have either a single or double gear reduction, depending upon the lifting capacity required. Operators shall be furnished with a threaded bronze lift nut to engage the threaded portion of the stem. The lift unit shall be flanged and supported on non-metallic thrust washers, ball or roller bearings to take the thrust developed during opening and closing of the gate. Pedestals, where used, shall be of stainless steel with ample base area. The gear and driving unit case shall be stainless steel. Pedestal and gear unit driving case shall be water and dust tight.

B. Gears shall be provided with machine cut teeth designed for smooth operation. The gearing and lift nut shall be mounted in a housing which shall be separately supported on another structure or pedestal. Lubrication fittings shall be provided to permit lubrication of all gears and bearings.

C. Gates which have a width exceeding twice the slide height shall be furnished with tandem interconnected operators with a single input crank.

D. All operators shall be finished with a graduated, clear plastic stem cover with a counter type position indicated to show the position of the gate in tenths of an inch unless otherwise called out.

E. Gates where the operator is not mounted at a walking surface shall have extended crank stems and supports at the walkway where operation is intended, as shown on the Plans.

F. Gates where the operating level is outside of the tank wall from the gate shall have geared bench-stand type operators at the top of the wall on top of wall mounting brackets, with the operating shaft extended to outside of the wall. There the extended shaft shall be operated by either.

1. Two right angle gear boxes to a hand crank shaft lower on the wall; or by.

2. An enclosed chain drive with sprockets on the upper and lower shafts, with the lower chain sprocket driven by a horizontal crank shaft.

   Crank shafts shall be located a minimum of three feet above the walking surface at the lower outside wall location, or as shown on the Plans. The shaft shall be suitable for operation by portable electric operator. Grease fittings for each of the operators shall have extended grease tubes and zirks extended to an operator accessible location outside of the basin wall.

G. Extended shafts for special lift variations shall have universal joints, as appropriate, to accommodate slight misalignment between geared operators and/or right angle gear boxes.

2.23 DISC FILTER ASSEMBLY

A. Utility Water Filter Assembly shall be a 3-inch, 3-filter, Disc-Kleen Filter, as manufactured by Netafim USA, or approved equal. Filter assembly shall be supplied with manufacturer's optional 120VAC backflush controller with differential pressure sensor.

B. The utility water filter assembly shall be a factory assembled and tested self-cleaning filter with an 80-mesh filtration size. Filtration shall be accomplished by disks stacked inside a housing. The filter shall automatically backwash based on pressure differential across the filter.

C. Filtration Process: As water travels through the filter, debris shall be captured along the filter and in the grooves of the channel in the filter elements. As pressure loss through the filter increases the backwash cycle shall begin, the backwash valve shall change position, and the outlet pressure loosens the disks. A nozzle inside the filter stack then sprays water against the loosened disks to clean them and flush away debris. When the backwash cycle is complete, the backwash valve shall return to its original position, and the inlet pressure shall recompress the discs to resume filtration.

D. Materials of Construction: Manifold – polypropylene; Filter body – glass reinforced polyamide; Spine – polypropylene; O-Rings and Seals – EPDM.

E. Inlet and outlet connections – 6-inch grooved; backflush valve port – 2-inch NPT; maximum operating pressure – 140 psi; minimum backflush pressure required – 40 psi.

PART 3 – EXECUTION

3.01 INSTALLATION

A. All valve, gate, and control installations shall comply with the manufacturer's recommendations.

END OF SECTION 40 20 12

SECTION 40 63 43

PROGRAMMABLE LOGIC CONTROLLERS

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Programmable logic controller (PLC) control system(s), including:

a. Hardware, installation, field testing, and training.

B. Related Sections include the following:

1. Section 40 67 16 for control panels housing PLC equipment.

C. PLC Programming will be provided by others.

1.3 REFERENCES

A. Referenced Standards:

1. National Electrical Manufacturers Association (NEMA):

a. ICS 1, General Standards for Industrial Control and Systems.
b. ICS 1.1, Safety Guidelines for the Application, Installation and Maintenance of Solid State Control.
c. ICS 4, Terminal Blocks for Industrial Use.
d. ICS 6, Enclosures for Industrial Controls and Systems.
e. Publication No.250, Enclosures for Electrical Equipment (1000 V maximum).

2. National Fire Protection Association (NFPA):

a. National Electric Code (NEC).

1.4 SYSTEM DESCRIPTION

A. Design Requirements

1. The system includes central processing units (CPUs), input/output (I/O) modules, communication modules, power supplies, and associated accessory items to provide a complete and functional control system.

B. The PLCs will function to monitor and control site operation and communicate with other locations via Ethernet spread spectrum radio link.

C. Performance Requirements

1. The installed system performs the functional and operational algorithms required for control of the process.

1.5 SUBMITTALS

A. General: Submit each item in this Article as described in Section 16010 and Division 1 Specification Sections.

B. Product Data

1. Manufacturer's data sheets for each hardware component including specific model numbers for each device, and size of memory provided in each CPU.
2. Manufacturer's installation manual, operation and maintenance manual(s) for each component and/or device.

C. Shop Drawings:

1. Drawings

a. See Section 40 67 16 for requirements.

2. Schedule of system I/O including the following data:

a. I/O point, with name, tag number, and indication of type and the characteristics of the I/O signal.

3. Listing of spare parts provided with the system.

D. Operation and Maintenance Manuals:

1. See Section 01 33 00.
2. Provide specific information including:

a. Manufacturer's published operation and maintenance manual, and troubleshooting guide.
b. Information for obtaining assistance and troubleshooting, parts ordering information, and field service personnel requests.

3. Include final system drawings, and final I/O lists.
4. Include testing reports. (see Section 3.1 for further information)

1.6 QUALITY ASSURANCE

A. Refer to Section 26 05 01 paragraph 1.7.

PART 2 — PRODUCTS

2.1 MANUFACTURERS

A. For compliance with the existing telemetry system, the PLC equipment is limited to:

1. Allen–Bradley

2.2 MATERIALS

A. Conform to NEMA ICS 1.1 for installation and application of the PLC system.

B. The equipment consists of fully integrated microprocessor units specifically designed for operation in unconditioned audible noise and high vibration areas.

1. Includes analog, digital, and communications interfaces for interface directly with ISA or other industry standard transducers, actuators, and communications equipment without the need for intervening conditioning devices.

C. Equipment operates in 32 to 140 Degrees F temperature and 0 to 95 percent relative humidity. Equipment does not require cooling fans or other heating or conditioning equipment to operate within this environmental range.

D. Include the following minimum safety measures:

1. Watchdog function to monitor:

a. Internal processor clock failure.
b. Processor memory failure.
c. Loss of communication between processor and I/O modules.
d. Failure to execute logic program.

2. Safe wiring:

a. Equipment failure mode is such that the loss of power or control signal to the equipment results in the equipment either shutting down or operating safely.
b. Stopping of equipment results from the de-energization of control circuits, rather than the energization of control circuits.

3. Monitoring of internal faults and display:

a. Internal PLC system status and faults shall be monitored and displayed on the processor module or rack. Monitored items shall include:

1) Processor ok/processor fault.
2) Battery ok/battery low.
3) Power supply ok/power supply fault.
4) Module failure.

E. Monitoring of Internal Processor Faults:

1. An internal watchdog shall time out and shut down the processor upon detection of a problem. Problems include:

a. Processor fails to correctly address input modules.
b. Processor ceases to execute the logic program.
c. Input modules fail to read current status values of inputs.

d. Processor memory failure.

F. Firmware

1. All programmable components (PLCs, Switches, Operator Interfaces, etc.) shall use the latest, stable firmware and software versions.

2.3 COMPONENTS

A. Provide components as indicated.

B. Provide all incidental materials and equipment required for a complete, functional, and successfully operating PLC system. These items include, but are not limited to:

1. field potential distributors
2. interconnecting cables
3. terminating resistors (where necessary)
4. other items ordinarily furnished as part of a complete system

C. PLC System Central Processor Unit (CPU):

1. PLC in Telemetry Control Panel

a. Rockwell Automation CompactLogix per drawing call outs.

D. Input/output (I/O) Modules.

1. Modules as called out on the contract drawings.

E. Field Potential Distributors:

1. Provided as necessary to implement the interconnections depicted on the elementary wiring diagrams on the Drawings.

F. Communications Modules:

1. CPU built-in USB port for programming
2. CPU built-in Ethernet port using one of the following protocols:

a. Ethernet/IP (CIP)
b. Ethernet/IP (PCCC)

3. Communications Modules as noted on Drawings

2.4 ACCESSORIES

A. Provide all accessories required, whether indicated or not, for a complete PLC control system to accomplish the requirements of the Plans and Specifications.

2.5 SOFTWARE

A. Provide to the Owner the most recent versions of software required to program the PLC and Operator Interface. Turn over to the Owner all licenses, software keys, activation codes, and any other digital usage rights identifier (including dongles, USB keys, etc.). The Owner shall retain these rights to the

software in perpetuity. Arrange for the Owner to receive the software and any required licenses, software keys, activation codes, and any other digital usages rights identifiers within 60 days of notice to proceed.

2.6 EXTRA MATERIALS

A. Provide the following extra materials:

1. Provide one spare processor module for each type of processor module furnished.
2. Provide one spare I/O card for every 10 cards, or fraction thereof, of each type of card installed.
3. Provide one spare power supply for each type of power supply furnished.
4. Provide one spare communications module for each type of module furnished.
5. Provide one spare network adapter or specialty card.
6. Provide one spare communication card.
7. Provide two spare cables for each type of cable furnished.
8. Provide a list of the manufacturer's recommended spares for maintenance purposes. Include in the list any special tools and test equipment necessary or recommended by the manufacturer for the maintenance of the complete system. Provide any recommended spares not supplied above along with the recommended special tools and test equipment.
9. Provide one spare chassis for each type of chassis furnished.

PART 3 — EXECUTION

3.1 TESTING

A. Shop test PLCs and Remote I/O units in the presence of the Owner prior to shipment to project site. Notify the Owner at least ten working days before testing. Testing shall be performed at the panel manufacturer's facility. The panel manufacturer shall conduct a rehearsal of the shop test prior the arrival of the Owner and shall verbally certify that they believe there are no readily apparent obstacles to performance of the test. (In this case, some examples of readily apparent obstacles would be panel mounted equipment lacking power wiring or panel mounted equipment inadvertently wired to work under either primary or backup power, but not both.)

1. Provide a test plan at time of notification of testing. Coordinate the time of testing of the panels with the Construction Schedule.
2. Each assembled panel shall be meggered and tested to be free from grounds and shorts before the shop test.
3. Controllers, circuits and interlocks shall be rung out and tested to assure that they function correctly before the panel is shipped. Each device

and control loop shall be tested and demonstrated to function properly in each mode (such as “hand”, “local”, “automatic”). Discrete input signals shall be tested in both the “on” and “off” state. Analog signals (4-20 milliamp, or similar type) shall each be tested at not less than three values (4.08 mA or 0.5%, 12 mA or 50%, and 19.92 mA or 99.5%). Test results shall be documented. Test discrete outputs by forcing the output on and off via the programming software. Measure the resistance (for relay outputs) or voltage (for active outputs) between the output terminals. Document proper operation of each output.

4. Test analog inputs by applying voltage or current to the input at not less than three values, including at or just above minimum range, at or just below maximum range, and midrange. Document actual register values for each applied input value at each input.
5. Provide signal generators, multimeters, and other test equipment as required to verify proper operation of the assembled panel. Simulate input signals, both discrete and analog, to verify operation of control and monitoring circuits.
6. Demonstrate that:
    a. The PLC is fully operational. The Owner shall provide the PLC testing program within one week of notification of the shop test. The Contractor shall load the PLC programs into the respective PLC and demonstrate proper operation of the PLC. In no case shall testing be performed without an operating program functioning in the unit under test. Test discrete inputs by shorting across the input terminals. Document that each input performs properly.
    b. Each I/O module is recognized by the base unit and is fully functional.
    c. Communications ports on the base unit are fully functional.
7. Correct, replace, or repair panel wiring, and/or components until testing demonstrates proper operation. Do not ship control panels to the site until testing has demonstrated satisfactory operation of the PLC.
8. Provide updated and complete ‘as shipped’ drawings at the time of final testing. The Owner shall review the drawings against the panel construction at the time of final testing. Drawings which do not reflect the actual construction of the panel will need to be revised and reviewed again by the Owner against the actual construction prior to shipment of the panel to the job site. ‘As shipped’ drawings which require revisions shall be submitted to the Owner for review at testing notification, prior to the actual field review of these drawings against the panel construction. This process of revision and review of the drawings will be repeated as necessary to produce drawings which reflect the actual construction of the panel at the time of shipment. Do

not ship control panels to the site until the 'as-shipped' drawings are updated, complete, and reflect the actual 'as-shipped' status of the panel.

9. Attention of the Contractor is directed to the fact that more than one shop test and/or review of the panel wiring/drawings may be required. If the first shop test is not satisfactory, or results in the need to make revisions to the panel and/or 'as-shipped' drawings that cannot be affected during the course of the shop test, then a repeat shop test and/or review of the drawings against the construction will be required. The presence of the Owner at up to two shop tests/reviews will be without cost to the Contractor. If more than two shop tests/reviews are required, then the Contractor shall be required to reimburse the Owner for the Owner's costs for the third and each subsequent shop test/review.
10. Submit the results of the test in a formal document within two weeks following satisfactory performance of the test. The test results shall document all problems encountered in running the test, corrective action taken, and the detailed results of each phase of the test
11. After each control panel has been installed at the jobsite:
    a. Conduct a field test of the panel. Testing shall be conducted by physically actuating signaling devices (where possible), installing temporary jumpers, or artificially imposing signals on the field wiring. The purpose of the test is to establish proper operation of the field devices, the integrity of the field wiring, and proper connection of field devices to the panel. The Contractor shall coordinate with the Owner to provide for as complete a testing of the control and monitoring systems as is practical prior to placing the panel on line for actual control and/or monitoring of the process. The Contractor shall make corrections or repairs to the wiring and/or devices as necessary to provide proper operation of the system. If testing indicates that field devices require modifications to connectors or contact action, the Contractor shall make the wiring or connection modifications as necessary to coordinate with the PLC program and contract documentation.
    b. If testing indicates that the equipment functions properly but that changes to the PLC program are required, the Owner will revise the program(s) and provide the new program(s) for installation in the PLC. The Contractor shall be prepared to install up to 3 revised programs into each PLC during startup/commissioning without additional cost to the Owner.
    c. Submit the results of all tests in a formal document within two weeks following satisfactory performance of the test. The test results shall document all problems encountered in running the

test, corrective action taken, and the detailed results of each phase of the test.

3.2 CONFIGURATION

A. Configuration of the PLC

1. Configure the IP address and network setting to allow device to be used on network. This may include configuring device in a different VLAN and/or IP subnet range than the default. IP Addresses shall be furnished by the Owner's programmer during submittal review.

3.3 INSTALLATION

A. Install PLC control system in accordance with manufacturer's written instructions.

END OF SECTION

SECTION 40 67 16

CONTROL PANELS

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Control panels (whether provided under Division 26, or provided, or specified to be provided, with equipment specified under other Divisions).

B. Section Includes:

1. Control panels modified under this Section include:

1.3 BIOSOLID TREATMENT CONTROL PANELREFERENCES

A. Referenced Standards:

1. National Electrical Manufacturers Association (NEMA):

a. ICS 1, General Standards for Industrial Control and Systems.
b. ICS 4, Terminal Blocks for Industrial Use.
c. ICS 6, Enclosures for Industrial Controls and Systems.
d. Publication No.250, Enclosures for Electrical Equipment (1000 V maximum).

2. National Fire Protection Association (NFPA):

a. National Electric Code (NEC).
b. Standard for Electrical Safety in the Workplace

3. Joint Industrial Council

a. JIC-EMP-1.

4. International Society of Automation

1.4 SYSTEM DESCRIPTION

A. Control Panels

1. The system includes control panels for control and/or monitoring of the process equipment. Control panels shall meet the requirements of this Section.

B. Configuration of supplied components

1. Devices connected in the panel shall be configured to communicate.

2. Control systems and monitoring systems utilizing fieldbus or remote I/O type communications shall be configured to make available all the monitored data to the PLC device.

1.5 SUBMITTALS

A. General: Submit each item in this Article as described in Section 26 05 01 and Division 1 Specification Sections.

1. For "BIOSOLID TREATMENT CONTROL PANEL" PLC the Owner shall supply the process control portions of the PLC program based upon the configurations provided by the Contractor for the shop test.
2. For PLCs supplied with equipment the manufacturer shall supply the full PLC program.
3. Provide the configuration, as required, to allow communications to fieldbus devices using digital signaling. Field devices include digital bus enabled instruments and variable frequency drives.

B. Product Data: For each type of system components specified in the section. This includes, but is not limited to:

1. Specification sheets (cut sheets) of all proposed equipment (indicate the exact devices that are to be supplied). Including manufacturer name, catalog descriptions, ratings, wiring and piping diagrams, dimensional drawings, anchoring details, installation instruction, and test results.

C. Shop Drawings:

1. Shop Drawings shall include, but not be limited to, the following:
    a. Panel Layout Drawings:
        1) Shall be dimensioned and to-scale.
        2) Shall include nameplate text.
        3) Shall indicate conduit and wiring access locations. Enclosures which will not accept the quantities of conduits as shown on the Contract Plans will be rejected.
    b. Materials of construction.
    c. Elementary wiring diagrams and terminal block drawings, differentiating between panel and field wiring.
    d. Bill of Materials including the reference name or number, quantity, complete English language description, manufacturer, model number, local supplier and wiring or piping reference.
    e. Loop diagrams with all components connected per ISA standards.
    f. The terminal designation (designations for terminals may be chosen by the panel builder unless noted otherwise on contract

drawings) shall be shown on the elementary wiring diagrams, analog loop diagrams, and terminal block drawings.

D. Testing Materials and Documentation:

1. Provide configuration in electronic file format suitable for directly loading into PLC, Variable Frequency Drive, Network Switch, etc. (see Section 3.5 for further information) at least ten days prior to desired Owner witnessed test date.

a. The configuration shall include all the devices connected through field busses, including serial and Ethernet connections.

1) Devices which receive commands from the PLC (for example, VFDs, valve actuators, motor overload relays) shall each be configured with at least two PLC-to-device, “write” command registers and at least ten device-to-PLC, “read” feedback registers.

2) Devices which do not receive commands from the PLC (for example, flow meter transmitters, pH transmitters, pressure transmitters, temperature transmitter, gas detector transmitters) shall each be configured with at least four device-to-PLC, “read” feedback registers. Unless otherwise noted, it is not necessary to provide two-way communications to these devices.

2. Supply descriptions in native electronic file format.

a. The native file format shall be suitable to directly load into the devices, such as Radio, Variable Frequency Drive, Network Switch, etc. without need for transcribing or other editing.

b. The native file format shall be able to be decoded using the manufacturer’s configuration software suite to a human readable format. It is acceptable to send a PDF or similar file in addition to the native file for annotations or other notes.

3. Provide register address or symbolic data layouts detailing where each device stores data relevant to the protocol in use.

4. Provide the sequence of testing plan, including the steps noted as required and the testing steps which are a part of the control panel supplier’s standard procedure.

E. Operation and Maintenance Manual: At the completion of the project, the operating and maintenance information shall be updated to reflect any changes during the course of construction. The Operation and Maintenance Manual shall include the following:

1. Component Maintenance and Repair Manuals (specified in Division 1).
2. Spare Parts List
3. Product Data

4. Record Drawings: At the completion of the project, the drawings shall be updated to reflect any changes during the course of construction.

1.6 QUALITY ASSURANCE

A. Refer to Section 26 05 01.

B. Control panels and work supplied under this Section shall be provided by a single manufacturer, except those provided with equipment specified under other Divisions. Control panel manufacturer shall be one of the following:

1. Total Energy Management (Richland)
2. Quality Controls Corporation (Lynnwood)
3. Technical Systems Incorporated (Lynwood)
4. Control Freek (Spokane)
5. Townsend Controls (Pasco)
6. Systems Interface (Mukilteo)
7. All Phase Automation And Controls (Yakima)

C. Comply with UL 508 “Standard for Industrial Control Equipment”.

D. Provide control panels bearing the label of a recognized testing laboratory, or otherwise acceptable to the State of Washington Department of Labor and Industries.

E. Submit and obtain approval of shop drawings and make approved shop drawings available prior to placement of conduits in slabs to ensure placement is coordinated with panel access locations.

F. Shop testing of the panel is required. Refer to the “Testing” section below for shop test information.

G. Product Selection for Restricted Space: Space for installation of control panels is limited. The Plans indicate typical physical sizes or dimensions for control panels, including clearances between control panels and adjacent surfaces and items. Control panels with larger dimensions may be acceptable, but it is the responsibility of the Contractor to submit detailed drawings showing the required revisions to the structural, process, mechanical, electrical, and other plans to accommodate centers with larger dimensions in order to obtain approval before a change is accepted. The Supplier/Contractor shall coordinate the size of the control panels with the available space and shall verify that the proposed control panels are capable of being installed in the available space prior to making a submittal. Control panels of dimensions larger than the available space shall not be submitted. The decision of the Owner as to the acceptability of control panels with larger dimensions than as shown on the Plans will be final. If the larger equipment is deemed acceptable, it is the Contractor’s responsibility to provide any required revisions to the structural, process, mechanical, electrical, and other designs without additional cost to the Owner.

H. Submit and obtain approval of shop drawings and make approved shop drawings available prior to placement of conduits in slabs to ensure placement is coordinated with control panel access locations from approved shop drawings. Do not place conduits in slabs prior to the receipt of approved shop drawings. Any relocation of conduits that are required because of incorrectly placed conduits prior to receipt of approved shop drawings shall be completed at the Contractor's expense.

1.7 STORAGE AND HANDLING

A. Store equipment per requirements of Section 26 05 02 paragraph 1.10 and as follows:

1. After completion of shop assembly and testing, enclose panels in heavy-duty polyethylene envelopes or secured sheeting to provide complete protection from dust and moisture. Place dehumidifiers inside the polyethylene covering.
2. Skid-mount the equipment for final transport. Show shipping weight on shipping tags, together with instructions for unloading, transporting, storing, and handling on job site.
3. Remove equipment protection only after equipment is safe from hazards such as dirt and moisture and damage from construction operations. Field repair of material or equipment made defective by improper storage or site construction damage by other trades is not acceptable.

PART 2 — PRODUCTS

2.1 MATERIALS

A. Control panel enclosures shall be factory UL labeled enclosures fabricated into a rigid, self-supporting structure unless otherwise noted. Panels shall be of NEMA type construction as required for the location indicated on the Plans. Free standing panels shall be provided with channel sills where shown on the Plans. Enclosure conduit entry locations shall be able to accept the quantities and sizes of conduits as shown on the Contract Plans.

1. Welded construction
2. Completely enclosed, self-supporting, and gasketed dust-tight.
3. Seams and corners welded and ground smooth.
4. Provide full length piano hinges rated for 1.5 times the weight of the door and door mounted instruments.
5. Furnish doors with keyed alike locking handles and three-point catch.
6. Provide each panel with lifting eyebolts. Furnish stainless steel base channels.
7. Provide slotted bolt holes in the base, 1 1/2 inches long for field adjustment.

B. Hinges: Stainless steel.

C. Nameplates: Phenolic.

2.2 COMPONENTS

A. Fuses

1. Control power fuses are FRN for ratings above ten amperes and FNQ for ten amperes and below. FRN fuses are mounted in phenolic blocks with a fuse puller mounted adjacent to them. FNQ fuses are mounted in a Buss CHM1I modular fuse holder with indicator light. Label all fuse holders with fuse identification number and fuse size and type. Provide three spare fuses of each type and size in each panel. Provide box mounted on panel interior marked "SPARE FUSES" to hold the spares.
2. Control power fuses connected to non-signaling circuits (for example, solenoids, actuators, relay coils, network switches, PLC power supplies) less than 10 amperes and less than 250 volts shall be 13/32” x 1-1/2” (10.3 x 38.1 mm) midget or CC type, dual element time delay, supplementary protection fuses. Cooper-Bussmann LP-CC dual element series or Littlefuse CCMR series unless otherwise noted or required by Manufacturer of connected equipment.
   Provide finger-safe modular, lever style fuse holder with blown fuse indicators, Allen-Bradley 1492-FB, Cooper Bussman EH series or equal. Plug-in fuse holders mounted to terminal blocks or lever style fuse holders are not acceptable.
3. Signal power for reference voltage (for example, PLC Input Signals, VFD control circuits, and similar) shall be fast acting fuses 1/4” x 1-1/4” AGC or 13/32” x 1-1/2” Midget MCL or CC type fuses. The ¼” x 1-¼” AGC type fuses shall be rated at a minimum of 1 amperes and meet MIL-STD-202, Method 207 (Hi Shock) standard. Fuses shall be manufactured by Cooper Bussmann or Littlefuse.
   Provide finger-safe terminal block, lever style fuse holder with blown fuse indicators, or Allen-Bradley 1492-H4 or-H5 series.
4. 5mm x 20mm fuses (for example, Cooper Bussmann GAS) are not acceptable for any application.
5. Provide three spare fuses of each type and size in each panel. Provide box secured to panel door interior for signal power fuses marked “SPARE FUSES”.
   Provide specialty fuse holder for fuses, Cooper Bussmann 5TPM or similar for control power fuses. Mount to panel door interior. Label above each position the ampere rating of the fuse.

B. Pilot devices (control units and stations): heavy duty, oil-tight type per NEMA ICS-1; pilot lights push-to-test universal voltage, LED type.

1. Allen-Bradley
2. Cutler-Hammer

3. General Electric
4. Square D

C. Relays

1. Control relays for switching 120 VAC power circuits or motor starting circuits shall be electro-mechanical machine tool, heavy-duty type per NEMA ICS Standard with 120 VAC coils and a minimum of SPDT contacts rated B-300 by NEMA standards: Allen-Bradley 700 N, General Electric CR 120, Square D Company Class 8501, Type G or equal, Eaton. Equip relays with surge suppressers. IEC rated relays are not permitted. Provide SPDT, DPDT, or 4PDT sets of contacts as required to install circuits as shown on drawings.
2. Control relays for logic control circuits shall be permitted to be mini-ice cube style type relays. Coils shall be rated 120 VAC or 24 VDC (as required). Relays shall provide minimum SPDT contacts which shall be rated B300 by NEMA standards. The coil terminals and contact terminals shall be on opposite sides of the relay base. Relays shall have indicator flags, screw clamp terminals and surge suppressors or Zener diodes across the coil. Provide Allen-Bradley 700-HK series, or equal. Provide SPDT, DPDT, or 4PDT sets of contacts as required to install circuits as shown on drawings.
3. Time delay relays shall be electronic type Allen Bradley 700 Series or equal.
4. Intrinsically safe relays shall be fixed sensitivity type U/L approved for use with a remote pilot device (dry contact) located in Class I, Division 1, Group C and D area. ISR units shall be as manufactured by GEMS, Stahl, or equal.
5. Relay bases shall have all terminals for relay coils located on opposite side of the base as all terminals for contacts.

D. Terminals:

1. Provide DIN rail mounted terminal blocks with screw clamp connections. The terminal blocks shall be Entrelec MA 2.5/5 or equal.
2. Provide all accessories such as jumper bars, end stops, and end sections needed for a complete and functional system of terminal blocks.
3. 4-20 mA analog signals shall utilize a “knife-disconnect” terminal blocks on the signal terminal connected to the PLC input card’s positive input. The terminal blocks shall be Entrelec MA2.5/5.SNB or equal.

E. Power supplies

1. 120VAC to 24 VDC shall be Phoenix Contact 2903149 or equal.
2. 24 VDC Class 2 power supply shall be Phoenix Contact 2903147 or equal.

F. Uninterruptible Power Supplies (UPS)

1. 120VAC shall be Phoenix Contact 2905909, or equal.
2. 24VDC UPS shall be Pheonix Contact 2907066, or equal.

G. Loop Indicators

1. shall be Panel Mount with a NEMA 4X/IP65 Sealed Front Bezel
2. shall have a operating ambient temperature range of at least 0° to 50°C.
3. shall be suitable for use with power available in the panel in which the indicator is installed.
4. shall have an isolated 4-20 ma current loop input
5. shall have provisions to adjust the minimum and maximum engineering units
6. shall be a Precision Digital PD6600 series or equal

H. Conductors:

1. Class C stranded copper conductors of SIS or MTW insulation (for 120 VAC or 24 VDC power or discrete signal circuits).
2. Stranded #18 AWG copper conductor with thermoplastic insulation, foil or stranded wire shielding, and overall gray PVC jacket (for analog instrumentation circuits).

I. Wireways

1. shall be a minimum of one inch wide and three inches deep
2. shall have removable snap on covers and perforated walls for easy wire entrance
3. shall be constructed of non-metallic materials with a voltage insulation in excess of the maximum voltage carried therein.
4. shall be Panduit Type G, Panel Channel, or equal.

J. Rack Mount Angles

1. Provide rack mount angles in each communications enclosure for mounting of 19” communications equipment. Hoffman A90RP24F5, or equal.

K. Surge Protective Device shall be DIN rail mountable without a separate kit, shall have a listed surge current capacity of 45,000 amps, provide transient protection in all modes for a 20 ampere, 120 volt alternating current power circuit, and provide a form C relay output to signal surge arrestor problem. Provide Sola/HEVI-Duty STFE Elite DIN Rail STFE200-10N or equal.

L. 110VAC Receptacle (for UPS) shall have duplex NEMA 5-15R power receptacle and be DIN rail mountable without a separate kit. Provide Weidmuller DRAC DP 15 or equal.

M. Miniature VAC Circuit Breakers

1. Provide Phoenix Contact TMC 81C series, Rockwell Automation 1492-SPM series, or equal, sized per drawings or appropriately for the loads to be protected.

N. Miniature VDC Circuit Breakers

1. Provide Phoenix Contact PTCP E1 series or equal, sized per drawings or appropriately for the loads to be protected.

2.3 ACCESSORIES

A. Panel Nameplates and Identification:

1. Identify each item on the control panel with rectangular nameplates.
2. Provide nameplates of rigid phenolic plastic laminate with engraved lettering or engraved metal plate with filled lettering. Use black background with white lettering.
3. Minimum letter height is ½ inch for instrument description and ¼ inch height for instrument tag number.
4. Provide each panel with a 2" by 10" (minimum) main nameplate with1 inch high lettering with panel identification.
5. Abbreviations are not permitted unless approved by the Owner or specifically shown on the nameplates, schedules, or drawings.
6. Install nameplates plumb and parallel to the lines of doors or structure to which they are attached. Attach to the sheet metal structure by a thin coat of adhesive and sheet metal screws. Make adhesive and screw application in a manner to avoid buckling or distorting nameplates due to use of excessive adhesive or over tightening of screws.

B. Provide SELV or NEC Class 2 power supplies for devices shown mounted within or connected to the Control Panel for devices specified without a NRTL listing.

PART 3 — EXECUTION

3.1 FABRICATION

A. General:

1. Control panels shall be factory or shop fabricated units completely assembled, wired and tested before shipment to the job site.
2. Panel construction, in general, shall meet JIC EMP-1 standards and applicable NEMA and IEEE standards.
3. The panels shall be constructed in accordance with electrical testing laboratory standards and shall be so labeled (the standards of a recognized electrical testing laboratory).
4. Size panels for the enclosed equipment and the available space for mounting of the panel, but not smaller than as shown on the Contract Documents.

5. Panels shall be descaled, cleaned and primed in preparation for painting. Painting shall consist of one coat of flat white enamel in the interior and two coats of hard finish exterior enamel, gray in color for the exterior. Paint shall be suitable for field touch-up. Spare paint (one quart) shall be provided for touch-up purposes.

B. Component Installation.

1. Minimize welding to panel fronts and avoid distortion of panel metal.
2. Reinforce around areas of the enclosure weakened by openings or mounting of heavy equipment/components.
3. Accurately and cleanly cut or nibble cut-outs, and finish free of sharp edges or burrs. Make cutouts plumb, level, and on-line vertically or horizontally within 1/32 of an inch where components are in rows or columns.
4. Provide minimum 1-5/8 inches spacing between horizontal rows of externally mounted components; 1-1/2 inches minimum between vertical columns of components.
5. The distance from the bottom row of components to the floor shall be not less than 36 inches, unless specifically shown as less. In general, all indicating lights, pushbuttons, and similar control devices, shall be mounted in accordance with the sequence of operation from left to right and top to bottom.
6. Provide minimum 1/4 inch spacing between components mounted on the panel sub-plate, Provide minimum spacing between the component and the wire duct of 1-1/2 inches above and one inch below. Provide additional space if required to access terminals, adjusting screws, and similar items.
7. Components mounted in the interior shall be fastened to an interior subpanel using machine screws plus adhesive to insure vibration-free attachment.
8. Interior component mounting and wiring shall be grouped as much as possible by function and then by component type. Interiors shall be so arranged that control relays, terminal blocks, fuses, etc., can be replaced or added without disturbing adjacent components.

C. Panel Wiring:

1. Color coding of insulation shall be black for power, white for 120V neutrals, red for AC controls which derive their source from within the panel, yellow for AC controls which derive their source external to the panel, blue for low voltage DC controls, green for grounding conductors.
2. Shop or factory wire panels to identified terminal blocks equipped with screw type lugs.
3. Raceways for panel wiring.

    a. Size raceways per the requirements of NEC.

b. Provide panel wireways between each row of components, and adjacent to each terminal strip.

4. Provide wire bending space per NEMA ICS 6.
5. Label wiring within the panel with wire numbers and run in wiring duct neatly tied and bundled with tie wraps or similar materials. Identify each wire termination, including all jumpers, with permanently marked, heat shrink type wire markers. Arrange wire labels to permit reading of identification when installed. Apply heat per manufacturer's instructions to create a tight fit of the label to the wire.
6. Connect wiring internal to the panel to the "inside" of the terminal strip. Connect field wiring to the "outside' of the terminal strip. Wires to enclosure door mounted components are considered as internal wires. Connect no more than two wires to any one control terminal point. Provide terminal jumpers where more than two wires terminate at the same point.
7. Arrange wiring inside the panel to separate low voltage control signals of the milliamp, millivolt or other low energy type from inductive power circuits.
8. Connect grounds and shields of circuits which derive power internal to the panel to a panel common ground bus which shall be grounded by the electrical contractor in the field.
9. Physically separate signals entering controllers for amplification as control outputs from all line voltage wiring and shield with continuous foil shielding or enclose them in metal raceway.
10. Provide necessary power supplies for control equipment.
11. Termination requirements:

    a. Terminate panel wiring on device or terminal block screw terminals using slip-on spade tongue insulated crimp (compression) terminators, slip-on stud insulated crimp (compression) terminators, or stripped and tinned conductor ends. Stranded conductors shall not be terminated bare to terminals or devices.
    b. Provide terminal strips for the termination of panel wiring not directly connected to panel mounted devices.
    c. Terminals shall facilitate wire sizes as follows:

        1) VAC applications: Wire size 12 AWG and smaller.
        2) Other: Wire size 14 AWG and smaller.

    d. Label each I/O terminal to indicate tag number of the conductor and connected device. Locate terminals for termination of multiconductor shielded cables adjacent to each other to minimize lengths of unshielded conductor at the terminations.

e. Provide terminals for individual termination of each signal shield. Locate the terminal adjacent to the terminals for the signal conductors.
f. Provide 20 percent excess terminals for future expansion.
g. In general, mount terminal strips on the bottom horizontal edge of the sub-plate. Mount additional terminal strips, if required, on a thirty-degree angle bracket at the bottom of the sub-plate. Where terminal strips are mounted side-by-side, elevate one set of terminals 1-1/2 inches above the sub-plate to allow wire to pass underneath.
h. Provide a minimum of two inches between terminal strips and wireways or between terminal strips.
i. Shielded cables used for analog signals shall be terminated with not greater than 2 inch of conductor left outside the shield. This applies to field wires entering the panel for termination, and to panel conductors. Conductor twist shall be maintained over the unshielded length to as close as possible to the point of termination. Where the overall jacket is cut back to expose the individual conductors, provide a heat shrink sleeve over the jacket, the signal, and the shield (drain) conductors. Insulate the shield (drain) conductor where not covered by the jacket or the sleeve. Where shield (drain) conductors are not terminated, cut the conductor even with the jacket so that it is covered by the sleeve to prevent inadvertent contact with other devices, terminals, or conductors in the panel.

3.2 SOURCE QUALITY CONTROL

A. Control Panel Testing

1. The entire assembled panel shall be meggered and tested to be free from grounds and shorts.
2. Circuits and interlocks shall be rung out and tested to assure that they function correctly before the panel is shipped.
3. Revise all drawings upon completion of the work to show "as shipped" condition of the panel.

3.3 INSTALLATION

A. Install free-standing panels on concrete pads where shown on the Plans. Install with channel sills where shown on the Plans. Provide stainless steel shims to level units.

B. Install wall or stanchion mounted panels level and plumb.

C. Anchor panels rigidly in place with approved anchorage devices.

3.4 TESTING

1. See section 40 63 43 for testing requirements.

3.5 STARTUP

1. The Control Panel Fabricator shall provide a minimum of 10 man-days on site time for startup of the control system prior to, during and following the Contractor's installation and testing. On site time shall be coordinated with the Owner on site time during startup, but may include additional time when the Owner is not present.
2. Revise all drawings upon completion showing "as built" conditions including the labeling of field wiring connections.
    a. Submit primary copy of these drawings for inclusion into the Operations and Maintenance Manual.

3.6 CLEANING

A. On completion of installation, inspect interior and exterior of control panels. Vacuum interior and wipe clean all interior surfaces. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

END OF SECTION

SECTION 40 70 11 – INSTRUMENTATION FOR PROCESS SYSTEMS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this section includes furnishing, installing, testing, startup, training, and warranty support for all process system instrumentation, including flow meters and pressure transmitters, and all required appurtenances, complete and operable, as specified and shown on the Plans.

B. Electrical wiring and equipment with electrical connections and control and safety devices shall be Recognized Electrical Testing Laboratory (RETL) listed and labeled, or the manufacturer shall obtain approval from the Washington State Department of Labor and Industries.

C. All process system instrumentation and appurtenances for this project shall be the products of a single manufacturer, unless otherwise noted.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 78 00 – Operation and Maintenance Manuals

1.03 SUBMITTALS

A. Refer to Section 01 33 00 – Submittal Procedures, for general submittal requirements.

B. Submit manufacturer's complete descriptive product data and specification sheets for all process system instrumentation and appurtenances. Clearly identify all accessories and options being provided, as specified.

C. Submit a copy of the manufacturer's written warranty, as specified.

D. Submit operation and maintenance manuals in accordance with Section 01 78 00 – Operation and Maintenance Manuals.

E. Following successful installation and startup of all actuators, submit a copy of the manufacturer's field startup report.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver process system instrumentation to the job site at appropriate time for installation. All equipment and materials shall be crated and/or packaged with protective wrappings to prevent damage during delivery, storage and handling.

B. Store all equipment and materials above ground and in weather tight enclosures. Keep all equipment and materials dry and protect from excessive heat or cold.

1.05 STARTUP SERVICE

A. The manufacturer or manufacturer's qualified representative shall provide a minimum of two (2) days of startup service to inspect the installation of all components, confirm proper setup and operation of all process system instrumentation, and instruct the Owner and Engineer in operation and maintenance of all equipment. Refer to part 3 of this section for additional requirements.

1.06 TOOLS AND SPARE PARTS

A. Provide any other special tools or spare parts as recommended by the manufacturer.

B. Spare parts shall be properly packaged and labeled for easy identification without opening and protection for long term storage.

1.07 WARRANTY

A. All process system instrumentation supplied under this section shall be warranted to be free from defects in workmanship, materials and design for a period of one (1) year from the date of substantial completion.

PART 2 – PRODUCTS

2.01 GENERAL

A. All process system instrumentation shall be adequately supported and securely mounted in locations shown on the Plans and as specified herein. Devices specified to have remote-mounted transmitters/signal converters shall be provided with additional support brackets and/or hardware necessary to securely mount them in locations as directed by the Engineer. Coordinate installation with other equipment, piping, and electrical system installations.

B. All process system instrumentation shall be suitable for indoor and outdoor use, and capable of functioning in ambient temperatures ranging from -20 ºF to 140 ºF, and a relative humidity up to 100%. Devices located in process tanks, flumes, trenches, vaults, or any other locations susceptible to flooding or immersion, shall be watertight and adequately protected for use in such environments. Devices located in hazardous areas shall meet the area classification identified.

2.02 MANUFACTURERS

A. Subject to compliance with these specifications, all flow meter and pressure transmitter process instrumentation shall be the products of the following manufacturer:

1. Endress+Hauser, Inc., 2350 Endress Place, Greenwood, IN 46143; Phone: (888) 363-7377; www.us.endress.com.

B. Submersible level transducers for wastewater applications shall be as manufactured by Siemens Water Technologies (U.S. Filter Control Systems), 1239 Willow Lake Boulevard, Vadnais Heights, MN 55110; Phone: (800) 224-9474; Fax: (651) 766-2701.

2.03 ELECTROMAGNETIC FLOW METERS

A. General

1. Electromagnetic type flow meters shall be provided and installed in piping as specified and shown on the Plans. Flow meter design, including the flow sensor, transmitter/signal converter, display, and appurtenances, is based upon Endress+Hauser Promag W series flow sensor with a Promag 400 series transmitter.

2. Flow meters shall be of the pulse DC type, volumetric liquid flow rate detector. Magnetic flow meters shall be of low frequency electromagnetic induction type and shall produce a DC pulse signal directly proportional and linear to the liquid flow rate.

3. Meter accuracy shall be 0.5 percent of the flow rate between 10 percent and 100 percent of the range setting. Below 10 percent of the range setting, accuracy shall be diminished no more than a flow rate equal to 0.1 percent of the range setting.

4. Meters shall be sized to maintain the specified accuracy for the anticipated full range of flow with velocities between 3 and 10 ft/s, or as recommended by the manufacturer.

B. Power Supply

1. The flow meter sensors and transmitters shall be designed for operation on a 24VDC power supply, as shown on the Plans. The flow meter transmitter shall be a microprocessor based signal converter, and shall include a magnetic driver to power the magnetic coils of the flow sensor in addition to the transmitter. Sufficient interconnecting manufacturer's cable shall be supplied for remote mounted transmitter installations.

C. Flow Sensor

1. The meter body and flanges shall be constructed of carbon steel and have a two-component epoxy, polyurethane, or baked-on enamel coating. Flanges shall be standard ANSI class 150 lb. drilled. Meters shall be clearly marked with engraved tags connected to the meter indicating meter number and source of water or other medium flowing through meter. Tags shall be attached to the meter by adhesive or screws and shall be visible and readable from a distance of at least 10 feet.

2. Provisions for grounding to the liquid and to a positive ground shall be provided and installed with each meter. The grounding electrode shall be constructed of Hastelloy C, stainless steel, or other material as approved by the Engineer. The grounding electrode shall be built in to the meter or separate grounding ring(s) supplied. A grounding lug shall be provided on the meter/meter head for connection to the building grounding system. Grounding connections shall be made in accordance with the manufacturer's instructions. During startup the manufacturer's representative shall confirm adequate grounding.

3. The metering tube/measuring pipe shall be constructed of stainless steel. Meter liners shall be suitable for the medium being metered. For water, sewage, and sludge applications the meter liner shall be ebonite hard rubber or other material as approved by the Engineer. For chemical solution applications the meter liner shall be Teflon or other material as approved by the Engineer. Epoxy coating liners will not be accepted.

4. The meter terminal box shall be constructed of polycarbonate, fiberglass reinforced polyamide, or other material as approved by the Engineer. Terminal boxes for meters located in process tanks, flumes, trenches, vaults, or any other locations susceptible to flooding or immersion, shall be NEMA 6P rated, supplied with manufacturer's optional potting kit or otherwise sealed and watertight.

D. Transmitter

1. The flow meter transmitter shall produce a 4-20 mA DC signal proportional to flow through the meter for transmitting to a PLC and for other receivers as shown on the Plans. A 30VDC, 250 mA (maximum) signal (pulse) shall be produced for every measured flow of a preconfigured volume. These pulses shall be suitable for use with the discrete cards used in the PLC, and shall be configured so that the minimum pulse width is at least 100 ms.

2. Flow meter transmitters shall be integral to the meter tube or remote mounted on a wall or support adjacent to the meter tube at a location and height as shown on the Plans, or directed by the Engineer. Meters located in process tanks, flumes, trenches, vaults, or any other locations susceptible to flooding or immersion, shall have remote-mounted transmitters. Provide the manufacturer's optional wall-mount bracket and terminal box cover for remote-mounted installations. Sufficient interconnecting manufacturer's cable shall be provided to run from the flow sensor to the transmitter without splicing.

3. Transmitters for both integral and remote mounted installations shall be NEMA 4X/6 rated and constructed of polycarbonate, fiberglass reinforced polyamide, or other material as approved by the Engineer. Transmitters shall be provided with a two-line minimum backlit liquid crystal display (LCD), one line showing gallons per minute (GPM) and the other showing cumulative gallons. The display shall be scaled in GPM for the calibration range of the meter.

2.04 PRESSURE TRANSMITTERS

A. Pressure transmitters shall be provided and installed in piping as specified and shown on the Plans. Transmitters shall be two-wire, capacitance-based analog devices capable of measuring gauge pressure or level. Pressure instrumentation specified are based upon Endress+Hauser Cerabar M PMP51 series sensor and transmitter.

B. Transmitters shall have a liquid crystal display (LCD) with 4-20 mA analog output, suitable for operation from a 24VDC power supply. The transmitter housing shall be dual-compartment design, constructed of powder coated die-cast aluminum with 1/2-inch NPT conduit connections. Wetted parts of the transmitter shall be constructed of Type 316 stainless steel. Enclosures shall have a NEMA 4X rating. Transmitters located in hazardous (classified) areas shall have explosion proof enclosures or be certified intrinsically safe, and shall be suitable for installation in the area classification specified or identified on the Plans.

C. Pressure transmitters shall meet the following performance criteria:

1.	Total Accuracy Performance:	±0.34% of URL
2.	Long Term Stability (1-year):	±0.1% of URL
3.	Long Term Stability (5-year):	±0.2% of URL
4.	Total Error:	±0.35% of URL/year

D. All transmitters shall be installed with and isolation valve at the process connection for ease of maintenance, as shown on the Plans. Size and type of valve shall be as specified and shown on the Plans, minimum 1/2-inch NPT. Transmitters for clean water installations shall be supplied with a factory assembled block and bleed valve. Transmitters for sewage and sludge installations shall be supplied with a threaded diaphragm seal directly connected to the transmitter and constructed of Type 316 stainless steel with a Teflon lined diaphragm and a minimum 1/4-inch NPT diameter flushing connection. A stainless-steel nipple and isolation valve shall be installed on the flushing connection.

E. Pressure transmitters shall be mounted at a location as shown on the Plans, or directed by the Engineer. Transmitters shall be installed so the display can be easily read from the finish floor level. Remote diaphragm seals shall be provided where required, or where indicated on the Plans, for process connections that are greater than 5 feet above the finish floor elevation. Remote seals shall be constructed of Type 316 stainless steel, in a size and style as shown on the Plans. Provide sufficient stainless-steel capillary tubing and silicone filling liquid between the remote seal and transmitter. Provide fill and drain ports with valves as required for proper installation and maintenance.

F. Optional mounting brackets and hardware shall be supplied with each transmitter, type to fit the location and mounting requirements as shown on the Plans.

2.05 SUBMERSIBLE LEVEL TRANSDUCERS

A. Submersible level transducers for wastewater applications shall be two-wire, loop powered instruments that use a gauge pressure piezoresistive sensor element to measure hydrostatic head-pressure that is proportional to the height of the liquid above the sensing diaphragm, which is converted to a 4-20mA output signal that spans the full pressure range of the transducer. Transducers shall be model A1000i, as manufactured by Siemens Water Technologies (U.S. Filter Control Systems).

B. The submersible transducer housing shall be constructed of Teflon coated Type 316 stainless steel, with a large diameter protruding Teflon coated Buna-N sensing diaphragm that isolates the sensor element from the media. The transducer housing shall have a minimum 1-inch NPT diameter support connection. The transducer shall be suitable for operation from a 24VDC power supply. Transducer accuracy shall be ±0.25% of full scale with long term stability of 0.2% of full scale per year.

C. The transducer cable shall be constructed of heavy-duty polyethylene with a vent tube and shielded 18 AWG conductors. Sufficient length of manufacturers vented cable shall be supplied as required for the installation plus an additional 5 feet, minimum. The transducer shall be barometrically compensated via a rigid breather tube connected to a panel mounted sealed breather assembly. The manufacturer's optional terminal connection junction box with hinged and gasketed cover and built-in breather assembly kit shall be supplied with each transducer. Junction boxes shall be NEMA 3/4X rated, constructed of Type 304 stainless steel, and shall be sufficiently sized to house the termination board(s), breather tube, bellows, and excess vented cable. Where required or shown on the Plans, an intrinsically safe barrier between the transducer and junction box shall be provided to make the level transducer system suitable for use in a Class I, Group D, Division 1 or 2 classified location.

D. Submersible level transducers shall be suspension cable supported. Provide the manufacturer's optional cable suspension mounting kit, including a 2-foot long 1-inch NPT Type 316 stainless steel pipe with coupling, bolt, cable clamps, hardware, and sufficient length of 1/8-inch diameter stainless steel cable. The pipe connection shall be slotted for the vented cable to pass through. Provide a stainless-steel mounting bracket at the top of the structure to support and secure the suspension cable and vented transducer cable.

2.06 RADAR LEVEL SENSORS

A. General:

Non-contact liquid level measurement devices for wet wells, tanks, and open channels shall be free-space radar type, unaffected by changing media, temperature, gas blankets or vapors. Devices specified herein are based on Endress+Hauser Micropilot Series FMR 20, and shall the following minimum features:

1. The pulsed time of flight radar transmitter shall operate at 26 GHz using 2-wire technology for level measurement and/or open channel flow measurement.

2. Accuracy shall be ±0.08-inches and maximum measuring distance shall be 0 to 66 feet.

3. The radar shall have CSA C/US General purpose approvals as required. The radar unit shall be rated for IP66/68, NEMA4X/6P. The radar sensor body shall be constructed of PVDF and shall have hermetically sealed wiring and fully potted electronics, eliminating water ingress.

4. The radar unit shall be suitable for operation in a process temperature range of -40 to 176 degrees F, and a pressure range of -14.5 to 43 psi.

5. The unit shall provide diagnosis information according to NAMUR NE107, with clear text messages to remedy. It must be possible to view a graphical representation of the actual signal and envelope curve on the display.

6. The process connection shall be 1-inch NPT, with 1/2-inch NPT female conduit connection.

7. The radar output signal shall be 4-20 mA dc loop powered.

8. The radar device shall have Bluetooth wireless technology interface that can be operated and configured via this interface using the manufacturer's app. The range under reference conditions shall be 33 feet. The Bluetooth connection shall have both encrypted communication and password encryption for security purposes. The Bluetooth wireless technology interface shall be capable of being deactivated. The radar device shall be capable of being configured with 4-20mA/Hart, remote RIA 15 display, or Bluetooth as options.

9. The radar signal on alarm shall be 22.5mA.

10. The radar shall have a linearization function with up to 32 value pairs entered allowing conversion of the measured value into any unit of length, weight, flow or volume.

11. The radar unit shall be rated for IP66/68, NEMA4X/6P.

12. The radar unit shall be supplied with an optional adjustable mounting bracket constructed of Type 316L stainless steel.

13. Where required or shown on the Plans, an intrinsically safe barrier between the radar and junction box shall be provided to make the level sensor system suitable for use in a Class 1, Group D, Division 1 or 2 classified location.

PART 3 – EXECUTION

3.01 INSTALLATION AND STARTUP

A. Install process measurement devices and appurtenances in accordance with the manufacturer's instructions. Coordinate installation with installation of equipment, piping, electrical systems, and other related construction.

B. The manufacturer or manufacturer's representative shall provide a minimum of two (2) days of onsite startup, testing and verification of installation for all process measurement devices and appurtenances. All construction, including assembly, installation, electrical and process connections, adjustment and calibration shall be complete and ready for operation, prior to scheduling the services of the manufacturer.

C. For flow meters, the manufacturer's representative shall certify in writing to the Engineer that proper grounding installation has been achieved.

D. Following successful startup and testing of the process system instrumentation, the manufacturer's representative shall submit a detailed field report confirming proper installation and successful operation of instruments, and conformance of the process system instrumentation with the Plans and Specifications. A copy of the field report shall also be included in the project O&M manuals.

E. The manufacturer or manufacturer's representative shall provide a minimum of one (1) day of onsite instruction and training to the Owner and Engineer in the operation and maintenance of all process system instrumentation and appurtenances.

END OF SECTION 40 70 11

SECTION 40 73 11 – PROCESS CONTROL SWITCHES AND GAUGES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this section includes furnishing, installing, testing, startup, training, and warranty support for all process control switches and gauges, including float switches, pressure switches and gauges, and all required appurtenances, complete and operable, as specified and shown on the plans.

B. Electrical wiring and equipment with electrical connections and control and safety devices shall be Recognized Electrical Testing Laboratory (RETL) listed and labeled, or the Contractor shall obtain approval from the Washington State Department of Labor and Industries.

1.02 RELATED SECTIONS

A. Submittals 01 33 00 – Submittals Procedure

B. Section 01 78 00 – Operation and Maintenance Manuals

C. Division 26 – Electrical

D. Section 40 20 11 – Process Piping

E. Section 40 70 11 – Instrumentation for Process Systems

1.03 SUBMITTALS

A. Refer to Submittals 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit manufacturer's complete descriptive product data and specification sheets for all process control switches, gauges, and appurtenances. Clearly identify all accessories and options being provided, as specified and shown on the plans.

C. Submit operation and maintenance manuals in accordance with Section 01 78 00 – Operation and Maintenance Manuals.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver process control switches and gauges to the job site at appropriate time for installation. All equipment and materials shall be crated and/or packaged with protective wrappings to prevent damage during delivery, storage and handling.

B. Store all equipment and materials above ground and in weather tight enclosures. Keep all equipment and materials dry and protect from excessive heat or cold.

1.05 TOOLS AND SPARE PARTS

A. Provide special tools and spare parts as recommended by the manufacturer.

B. Spare parts shall be properly packaged and labeled for easy identification without opening and protection for long term storage.

1.06 WARRANTY

A. All process gauges shall have a ten (10) year system warranty from the date of substantial completion.

PART 2 – PRODUCTS

2.01 GENERAL

A. All process control switches and gauges shall be adequately supported and securely mounted in locations shown on the plans and as specified herein. Coordinate installation with other equipment, piping, and electrical system installations.

B. All process control switches and gauges shall be suitable for indoor and outdoor use, and capable of functioning in ambient temperatures ranging from -20ºF to 140ºF, and a relative humidity up to 100 percent, unless otherwise specified. Switches and gauges located in process tanks, flumes, trenches, vaults, wet wells, or any other locations susceptible to flooding or immersion, shall be watertight and adequately protected for use in such environments. Switches and gauges located in hazardous areas shall meet the area classification identified.

2.02 FLOAT SWITCHES

A. Liquid level switches shall be hollow-body, hermetically sealed, rigidly molded in abrasion and corrosion resistant polypropylene, with a mercury free SPDT switch. The switch shall be cushioned and mounted along the main axis at about a 65-degree inclination. A three-conductor oval cable of sufficient length shall serve to convey electrical signals and provide support for the unit. The cable shall be heavily sheathed in PVC for resistance to immersion, corrosion and abrasion. The cable shall be assembled into the small end of the sensor. The sensor body shall also contain and eccentric metal weight to cause pivoting of the sensor body between two stable positions, with the sensor immersed or non-immersed. Switches shall be as manufactured by Dwyer Instruments, Inc., SJE-Rhombus, Gems Sensors and Controls, or approved equal.

B. The elevation of liquid level switches shall be adjustable without special tools. The liquid level switches shall be suspended within the vault/wet well so that they do not interfere with access to the vault/wet well floor, other equipment, or the operation of other instruments.

C. A float mounting bracket shall be provided as shown on the Plans. Provide strain reliefs that support and hold the level control cables. The cables shall be continuous to the control junction box. No splices shall be made in the wiring inside the vault/wet well. Sufficient cable length shall be provided to allow for full adjustment of the floats for the entire vault/wet well depth.

D. Multi-level float switches shall be Madison M-Series or approved equal with stainless steel floats and float guide, suitable for operation from a 24VDC power supply. Number of floats and length of float guide shall be as shown on the Plans and suitable for the application.

E. Float switches shall be UL listed and suitable for installation in a Class I, Group D, Division 1 classified area where required.

2.03 PRESSURE GAUGES

A. General: Provide a pressure gauge on the suction and discharge side of each pump and at all other locations shown on the Plans. The range of all gauges shall be approximately two times the normal system pressure so that when the system is operating, the pressure gauge will read near center scale or as indicated on the Plans. Gauges on suction side of pumps shall be compound direct reading type. Anticipated required gauge pressure ranges shall be as follows:

Location	Quantity	Service Type	Pressure Range
Rotary Lobe Pump Suction	1	Sludge	0-15 psi
Rotary Lobe Pump Discharge	1	Sludge	0-30 psi
Inlet Hopper Feed Pump Discharge	1	Sewage	0-10 psi

The above list does not include all gauges required for the project. Refer to the Plans and other specification sections for process gauges required for packaged process equipment, and to provide a complete installation of all equipment and materials.

B. All gauges and appurtenances specified herein shall be process gauges as manufactured by Ashcroft, Marsh, REOTEMP, or Engineer approved equal.

C. Clean/Utility Water and Air Service Gauges

1. Gauges for clean water service shall be 4-1/2-inch dial; stem mounted black phenolic case; high impact, non-cracking plastic lens; bourdon tube assembly; glycerin-filled gauge mechanism and case, suitable for a process temperature range of -40 to 200 degrees F; white dial background with black numerals and gradations; accuracy of ±0.5 percent of full scale; 1/2-inch NPT connection; pulsation dampener; maximum pointer; red set hand; and under/overload stop protection.

D. Sewage/Sludge Gauges

1. Gauges for sewage, sludge and scum service shall be the same as specified above for clean water gauges, except they shall be provided with a 300 series stainless steel clean out type diaphragm with a 1/2-inch NPT female process connection and 1/2-inch NPT female gauge connection. Diaphragm shall have a 1/4-inch NPT female flushing connection. Diaphragm shall be Ashcroft® Type 101, or approved equal, with optional 316 stainless steel top and bottom housing and diaphragm, 300 series SS clamps rings and clamping bolts.

2. Tubing between diaphragm and wall-mounted gauge (where applicable) shall be flexible spiral armor, stainless steel capillary tube. Entire diaphragm, tube and gauge assembly shall be assembled and fill with liquid at the factory. It shall be the responsibility of the Contractor to provide the gauge supplier with necessary data on individual locations for length of tube, pressure range, etc.

E. Chemical Gauges

1. Gauges for chemical service shall be the same as specified above for clean water gauges, except they shall be provided with a 1/2-inch NPT diaphragm seal. Diaphragm seal shall be Ashcroft® Type 200, or approved equal, with PVC housing, Teflon diaphragm, 316 SS top housing, and 300 series SS clamps rings and clamping bolts.

PART 3 – EXECUTION

3.01 INSTALLATION AND STARTUP

A. Install all process control switches, gauges, and appurtenances in accordance with the manufacturer's instructions. Coordinate installation with installation of equipment, piping, electrical systems, and other related construction.

END OF SECTION 40 73 11

SECTION 40 78 00

PANEL MOUNTED DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes control stations used for motor or other control, but mounted external to motor starters or motor control center.
B. Related Sections include the following:

1. Section 26 05 02 for additional materials and installation information.

1.3 SUBMITTALS

A. General: Submit each item in this Article as described in Section 26 05 01 and Division 1 Specification Sections.
B. Product Data: For each type of control station specified in the section. This includes, but is not limited to:

1. Specification sheets (cut sheets) of all proposed equipment (indicate the exact devices that are to be supplied).
2. In addition to the requirements of 26 05 01 and Division 1 Specification sections, submit only one manufacturer for each product type. Multiple manufacturers for the same product will be rejected.

C. For each type of control station

1. Pilot Devices
2. Enclosures
3. Auxiliary Components

D. Operation and Maintenance Manual: At the completion of the project, the operating and maintenance information shall be updated to reflect any changes made during the course of construction. The Operation and Maintenance Manual shall include the following:

1. Maintenance Manuals (specified in Division 1).
2. Product Data

1.4 QUALITY ASSURANCE

A. Refer to Section 26 05 01 paragraph 1.7.
B. Source Limitations: Obtain similar control station devices through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store equipment per requirements of Section 26 05 01 paragraph 1.11.
B. Remove equipment protection only after equipment is safe from hazards such as dirt, moisture, and damage from construction operations. Field repair of material or equipment made defective by improper storage or site construction damage by other trades is not acceptable.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with additional requirements of the Contract, provide products by one of the following:

1. Allen–Bradley
2. Siemens Energy & Automation, Inc.
3. Square D Co.
4. Eaton Corp.; Cutler-Hammer Products.

2.2 COMPONENTS

A. Control stations shall consist of selector switches, pushbuttons, pilot lights, potentiometers, and similar devices, individually or group mounted in a single enclosure.
B. Pilot devices:

1. Selector switches:

a. Heavy duty, oiltight type.
b. Contact block quantity and arrangement as indicated on wiring diagrams, and required for specified functionality.

i. Dry and indoor locations: standard contact blocks rated for 10 A continuous current.
ii. Wet or outdoor locations: Hermetically sealed contact blocks.

c. Maintained contact type for selector switches, unless shown otherwise.
d. Knob type operators, black in color.
e. Legend plate, marked as indicated on the Plans.

2. Pushbuttons

    a. Heavy duty, oil tight type.
    b. Contact block quantity and arrangement as indicated on wiring diagrams, and required for specified functionality.

        i. Dry and indoor locations: standard contact blocks rated for 10 A continuous current.
        ii. Wet or outdoor locations: Hermetically sealed contact blocks.
    c. Maintained contact type for selector switches, unless shown otherwise.
    d. Flush type operators, with half shroud.
    e. Green colored buttons for START or ON and red color for STOP or OFF. Black in color for other functions, unless otherwise indicated.
    f. Legend plate, marked as indicated on the Plans.

3. Pilot lights

    a. Heavy duty, oiltight type.
    b. Lamps

        i. LED, or incandescent type.
        ii. Allows replacement of lamp without removal from enclosure.
        iii. 24 volt lamp
        iv. Push to test type.
        v. Glass lens
        vi. Color as indicated on the Plans.
4. Potentiometers

    a. Heavy duty type.
    b. One turn type, with linear adjustment throughout range, 1% resolution or better.
    c. 3 wire interface.

C. Enclosures:

1. Formed of sheet steel and continuously welded with screw on or clamped covers. Enclosures may be hinged.

    a. NEMA 1 and 12: Painted Steel.
    b. NEMA 4X: Stainless Steel.
    c. NEMA 7: Cast Iron.

2. NEMA type per location as stated in Section 26 05 02 “Basic Materials and Methods”, unless indicated otherwise.

D. Multi-status indicator lights shall consist of multi-color LED indicators group mounted in a single enclosure.

1. 24 VDC
2. Red/Blue/Amber LED light
3. Suitable for Class 1 Division 2 locations
4. Programmable flash rate to differentiate status urgency.

    a. Red – 240 FPM
    b. Amber - 120 FPM
    c. Blue – Steady

5. Edwards Signaling model 105XBRiRBA24D
6. Accessories:

    a. Mounting bracket: 105BM
    b. Outlet box attachment: 105BX

E. Momentary Push Button shall consist of a normally open, protruding center, and spring return.

1. White
2. AC or DC
3. Edwards Signaling model 695-W
4. Accessories:

    a. Mounting plate: 147-1

F. Held Push Button shall consist of a normally closed and normally open contacts as required, turn to reset.

1. Polycarbonate housing
2. Rounded cover to prevent inadvertent activation.
3. Safety Technology International (STI) model SS2xx1ZA-EN,

    a. Color noted on plans
    b. Message noted on plans

4. Accessories:

    a. Weatherproof shield: STI-6517

2.3 IDENTIFICATION

A. Provide each control station with an engraved nameplate per the requirements of Section 26 05 01 paragraph 1.3 and as follows:

1. Nameplate is Lamacoid or equal plastic laminate or engraved metal plate. Lettering is white, 3/8”; backgrounds are black. No abbreviations are permitted unless approved by the Owner. Engraving is subject to the Owner’s approval.
2. Provide individual legend plates for each pilot device.
3. Identify conductors at each termination by yellow sleeve wire markers heat-shrink or stretch-on type with indelible black letters and numbers at each termination or splice.

PART 3 EXECUTION

3.1 INSTALLATION

A. Utilize manufacturer’s accessory mounting devices appropriate for mounting location designated on the Plans.
B. Mount level, plumb and rigid without distortion of enclosure.

1. Provide bushings on conduits entering from above or at the sides.
2. Provide metallic, insulating grounding bushings on conduits entering from below.

3.2 GROUNDING

A. Provide ground continuity to facility electrical ground system.

3.3 CONNECTIONS

A. 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.

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing:

1. Test the equipment and electrical circuits for proper connection, continuity, and absence of undesirable shorts and grounds. Test wire and cable installation, when complete and seventy-two hours prior to energization of the system. Check for continuity, visual damage, marking, and proper phase sequence before performing insulation testing.
2. Test all operating controls for proper operation.
3. Make continuity tests of each circuit.
4. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units, and retest.

END OF SECTION

DIVISION 41 – MATERIAL PROCESSING AND HANDLING EQUIPMENT

SECTION 41 22 11 – GANTRY CRANE & HOIST

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work included in this section consists of furnishing and installing a gantry crane and hoist system, and all required appurtenances for a complete crane system as shown on the Plans and specified herein.

1.02 RELATED SETIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 78 00 – Operation and Maintenance Manuals

C. Division 26 - Electrical

1.03 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC): Manual of Steel Construction, Part 5, Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts.

B. American National Standards Institute (ANSI):

1. ANSI B30.11 - Monorails and Underhung Cranes.

C. American Society for Testing and Materials (ASTM) Publications:

1. ASTM A36 - Carbon Structural Steel.

2. ASTM A325 - Structural Bolts, Steel, Heat Treated, 120/150 ksi Minimum Tensile Strength.

3. ASTM A490 - Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.

D. American Welding Society (AWS):

1. AWS D1.1 - Structural Welding Code.

E. Occupational Safety and Health Administration (OSHA): OSHA Specification 1910.179 - Overhead and Gantry Cranes.

F. American Society of Mechanical Engineers (ASME):

1. ASME B30.16 – Overhead Hoists (Underhung).

2. ASME HST-1M – Performance Standard for Electric Chain Hoists.

G. European Federation of Materials Handling (FEM)

1. FEM 9.682 – Rules for the Design of Serial Lifting Equipment – Selection of Lifting Motors.

H. International Organization for Standardization (ISO):

1. ISO 4301-1 – Cranes and Lifting Appliance – Classification.

J. Japanese Industrial Standards (JIS):

1. JIS B 8815 – Electric Chain Hoists.

K. International Electrotechnical Commission (IEC):

1. IEC 34-5 – Rotating Electrical Machines – Classification of Degrees of Protection Provided by Enclosures of Rotating Electrical Machines.

2. IEC 529 – Degrees of Protection Provided by Enclosures.

L. The National Fire Protection Association (NFPA):

1. NFPA 70 – National Electric Code.

M. Underwriters Laboratories (UL):

1. UL 1340 – Standards for Hoists.

1.01 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Product Data: Submit the manufacturer's literature and product data for the crane assembly, hoist and trolley, including information on all required accessories.

C. Shop Drawings: Submit shop drawings showing crane configuration, dimensions, fabrication, assembly, and installation details.

D. Wiring Schematics: Submit wiring schematics showing all wiring connections.

E. Informational Data: Submit crane assembly design data and calculations.

F. Closeout Data: Submit the manufacturer's installation, operation, and maintenance data in accordance with Section 01 78 00 – Operation and Maintenance Manuals

G. Sumit manufacturer's written warranty for warranty period specified.

1.02 QUALITY ASSURANCE

A. Manufacturer: Company specializing in designing and manufacturing cranes with 25 years successful experience.

B. Installer: Company experienced in assembly of cranes with 5 years successful experience and acceptable to crane manufacturer.

C. Crane shall be designed, fabricated, and installed in accordance with ANSI B30.11 and OSHA 1910-179.

D. Base crane structural design on live load capacity plus 15 percent for hoist and trolley weight and 25 percent for impact.

E. Perform welding by certified operators in accordance with AWS D1.1.

F. Bolted connections shall be in accordance with torque tightening procedures specified in AISC Manual, Part 5.

G. Clearly label crane with rated load capacity. Place label at height and location easily read from floor level and loading position.

1.03 WARRANTY

A. Provide under provisions of Section 01 78 00 - Closeout Submittals: 10-year warranty for crane to cover defects in materials and workmanship.

PART 2 - PRODUCTS

2.01 GENERAL

A. The gantry crane system shall be as manufactured Gorbel, Inc., P.O. Box 593, Fishers, New York 14453-0593; 800-828-0086; www.gorbel.com, or equal.

2.02 PERFORMANCE REQUIREMENTS

A. Capacity and Design Loads: The gantry crane assembly shall be rated for lifting a minimum of 6,000 pounds.

1. The crane assembly shall be designed to withstand the dead load (caused by the weight of the crane assembly and components themselves), the live load and hoist load, and the inertia forces caused by movement of the crane assembly, components, and loads during standard operation.

2. The crane assembly shall not exceed the specified deflection, and stress level upon application of such loads.

3. Standard capacity ratings shall represent the net rated load at the hook of any type of hoist with the same load rating installed on the crane assembly having the hoist trolley weight within the established limits. The crane assembly shall be so designed in the load-carrying parts that the calculated static stress in any part of the material, based upon the rated load capacity, shall not exceed 40% of the published average ultimate strength of the material; thus providing a margin of safety allowing for variations in the properties of material, manufacturing and operation conditions, and design assumptions. The rated load capacity, of each crane assembly shall be clearly labeled on each crane assembly using a label size easily read from the floor level and/or loading position.

4. The crane assembly shall be pre-engineered for use with powered hoists. A factor of 15% of the gantry crane capacity shall be allowed for the hoist and trolley weight with an additional 25% of the capacity allowed for impact.

B. Temperature and Environment

1. The crane assembly shall be designed for indoor operation with ambient temperatures between 5° and 200°F (-15° and 94°C) and a normal to humid atmospheric conditions.

C. Locations and Clearances

1. As shown on drawings.

2. Moving members of the crane assembly shall be separated by a clearance of at least 3 inches vertically from any overhead obstruction, and 2 inches horizontally, from any lateral obstruction.

D. Painting and Packing

1. The non-aluminum crane assembly components shall be painted before shipment with self-priming alkyd industrial baking enamel paint in manufacturer's standard color

2. High temperature, high-pressure Iron Phosphate wash shall be performed prior to painting to clean and remove debris, dirt and oils.

3. At least one spray can of color-matching paint for each color shall be shipped with each standard painted crane assembly for field touch-ups. Unused paint shall be turned over to owner, in addition to extra materials required in this section.

2.02 FIXED HEIGHT GANTRY CRANE

A. Type: Fixed height, movable, steel gantry crane with casters; Model No. FGM - 3-15.2-13 as manufactured by Gorbel, Inc., or equal.

B. Overall span: 13 feet.

C. Height under beam: 15.25 feet.

D. Construction: Fabricate from ASTM A36 steel sections with finished ends and surfaces.

1. End frames: Square tubular steel uprights welded to channel base and knee braces to provide stability.

2. Beam: Steel I-beam bolted to plates welded to top of uprights and reinforced with gussets.

3. Casters: Urethane casters with cam brake.

E. Hoist trolley: Rigid-body trolley designed to ride on bottom flanges of crane beam and carry hoist and load.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Assemble crane in accordance with manufacturer's instructions and shop drawings.

B. Do not modify crane components in any manner without advance, written approval by crane manufacturer.

3.02 FIELD QUALITY CONTROL

A. Inspect assembled crane. Verify all bolts are tight and lockwashers fully compressed. Verify uprights are plumb and beam is level. Ensure casters pivot, lock, and move smoothly. Adjust as required and correct deficiencies.

B. Clean surfaces. If necessary, touch-up paint damage, scratches, and blemishes with manufacturer provided matching paint.

C. Protect crane from other construction operations.

3.03 DEMONSTRATING AND TRAINING

A. Provide demonstration and training session for Owner's representative covering operation and maintenance of gantry crane.

END OF SECTION 41 22 11

DIVISION 43 – PROCESS GAS AND LIQUID HANDLING, PURIFICATION, AND STORAGE EQUIPMENT

SECTION 43 21 00 – POSITIVE DISPLACEMENT ROTARY LOBE PUMPS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The work included in this section consists of furnishing, installing, testing, and placing in operation equipment and incidentals required for positive displacement, rotary lobe pumps, motors and coordinated control systems as hereinafter specified. Furnish pumps, motor, motor controls and other equipment as show on the Drawings. The station shall be complete with pumps, motors, piping, valves, electrical work (including motor controls), structures, connections and appurtenances, tested and ready for operations.

B. The pumping units shall be of the positive displacement, HiFlo® rotor type, specifically designed for pumping Sludge. The rotor lobes shall be of a HiFlo® design to provide uniform Pulse free flow throughout the entire operating range. The pump shall have not less than 4 rotor tips.

C. The equipment and products specified in this Section and shown on the Plans are based upon the "basis of bid" manufacturer indicated. Substitute or alternate manufacturers must be approved in accordance with the procedures specified in Section 01 25 50 - Substitution of Major Equipment Items and Products, and by written approval of the Engineer.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 78 00 – Operation and Maintenance Manuals

C. Division 26 – Electrical

D. Division 40 – Process Interconnections

1.03 REFERENCE STANDARDS

A. American Gear Manufacturing Association (AGMA)

B. American Institute of Steel Construction (AISC)

C. American Iron and Steel Institute (AISI)

D. American Society of Mechanical Engineers (ASME)

E. American National Standards Institute (ANSI)

F. American Society for Testing Materials (ASTM)

G. American Water Works Association (AWWA)

H. American Welding Society (AWS)

I. Anti-Friction Bearing MANUFACTURERS Association (AFBMA)

J. Hydraulic Institute Standards

K. Institute of Electrical and Electronics Engineers (IEEE)

L. National Electrical Code (NEC)

M. National Electrical MANUFACTURERS Association (NEMA)

N. Occupational Safety and Health Administration (OSHA)

O. Steel Structures Painting Council (SSPC)

P. Underwriters Laboratories, Inc. (UL)

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit manufacturer's technical product data, including product description, technical data, and installation instructions.

C. Submit shop drawings showing complete dimensions and details of construction of pump equipment, including anchoring, connections, and weights of major components.

D. Data on the characteristics and performance of the pump. Data shall include guaranteed performance curves, based on actual shop tests of similar units, which show that they meet the specified requirements for head, capacity and horsepower. Curves shall be submitted on 8 ½" by 11" sheets, at as large a scale as is practical. Catalog sheets showing a family of curves will not be acceptable.

E. A complete total bill of materials of all equipment.

F. Submit operation and maintenance manuals in accordance with Section 01 78 00 – Operation and Maintenance Manuals, for all equipment included under these specifications. The maintenance instructions shall include troubleshooting data and full preventative maintenance schedules and complete spare parts lists with ordering information. Manuals shall be prepared with descriptions, etc., that are required to instruct operation and maintenance personnel unfamiliar with such equipment.

G. Upon completion of installation and successful startup, testing and operation, submit manufacturer's certification of proper installation, testing, and instruction. Submit manufacturer's startup and testing report, including an in-field performance test data. Startup reports shall include all pertinent data to confirm that successful startup and operation has been achieved for each unit. The manufacturer's certification, startup, and testing report(s) shall be included in the operation and maintenance manuals.

H. Submit manufacturer's written warranty for warranty period specified.

1.05 QUALITY ASSURANCE

A. All equipment in this Section shall be furnished by or through a single supplier. The Contractor shall be responsible for the coordination and proper operation of the entire system. Equipment shall be fabricated, assembled, erected, and placed into proper operating condition in full conformity with the Drawings, Specifications, instruction, and recommendations of the equipment manufacturer.

B. Qualifications of Manufacturer: The equipment covered by these Specifications shall be standard units of proven ability as manufactured by competent organizations having long experience in the production of such equipment. The pumps furnished shall be designed, constructed and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed. Pumps shall be manufactured in accordance with the Hydraulic Institute Standards, except as otherwise specified herein. All Equipment furnished under this Specification shall be new and unused and shall be the standard product of Manufacturer showing a successful record of manufacturing and servicing the equipment and systems specified herein for a minimum of twenty (20) years, and be ISO 9001:2008 compliant, and shall be either fully assembled or manufactured in the United States of America.

1.06 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be responsible for coordinating and scheduling delivery, installation, pre-start-up testing and performance testing, as specified in this Section and required by the manufacturer.

B. The Contractor shall be responsible for unloading, handling and storage of all equipment and materials, in accordance with the manufacturer's requirements. Upon delivery, the Contractor shall carefully inspect all equipment and materials for any damage and to verify general compliance with the Plans and Specifications.

1.07 STARTUP SERVICE

A. The Contractor shall furnish the services of the Manufacturer’s field service technician, who has complete knowledge of proper operation and maintenance of the equipment, for a period of no less than two (2) days to inspect the installed equipment, supervise the initial test run, and to provide instruction to the plant personnel. The first visit shall be checking and inspecting the equipment after it is installed. The second visit will be to operate and supervise the initial field test. At least one (1) of the two (2) days shall be allocated solely to instruction of plant personnel in operation and maintenance of the equipment. The instruction period shall be scheduled at least 14 days in advance with the Owner and shall take place prior to start up and acceptance by Owner. The final copies of operation and maintenance manuals specified must be delivered to the Engineer prior to scheduling the instruction period with the Owner.

1.08 SPECIAL TOOLS AND SPARE PARTS

A. One (set) of special tools required for normal operation and maintenance of equipment shall be provided. All such tools shall be furnished in a suitable case for storage and easy identification.

B. Spare parts shall be supplied as recommended by the manufacturer and shall include the following minimum parts:

1. One set of Cartridge mechanical seals

2. One spare rotor set

3. One set of front and back wear plates

4. All lubricating oils required for the first year of operation shall be provided. The products supplied shall be factory pre-filled, in accordance with manufacturer’s recommendations.

C. Spare Parts shall be properly bound and labeled for easy identification without opening the packaging and suitably protected for long term storage.

1.09 WARRANTY

A. All equipment supplied under this section shall be warranted for a period of one (1) year from the date of substantial completion. Distributor warranties will not be accepted.

B. The equipment shall be warranted to be free from defects in workmanship, design, and materials. If any part of the equipment should fail during the warranty period, it shall be replaced and the unit(s) restored to service at no expense to the Owner.

C. The manufacturer's warranty period shall run concurrently with the Contractor's warranty period. No exception to this provision will be allowed.

PART 2 – PRODUCTS

2.01 GENERAL REQUIREMENTS

A. The basis of design for rotary lobe pumps is the Model VX136-105H4Q, as manufactured by Vogelsang.

B. Equipment shall be designed and selected for continuous duty pumping of sludge. Pumps shall operate at variable speed and shall be capable of running dry, for a short period of time, without damage to the pump and or drive unit. Pumps shall be suitable for exposure to sludge and organic particles in concentrations as great as 6 percent. The pumped fluids are expected to range in temperatures up to 100 °F degrees F, and a pH between 6 and 8.

C. The pumps, along with associated drive appurtenances, shall be mounted on a piggy-back fabricated steel, adjustable base plate for sheave drive adjustment. The base plate shall be hot dip galvanized after fabrication.

2.02 PERFORMANCE REQUIREMENTS

A. Primary Duty Point: 150 gpm

B. Differential Pressure: 25 psi

C. Suction Conditions: 0.0 ft, flooded

D. Solids Content: 6.0%

E. Motor Horsepower: 5 hp

F. Maximum Motor RPM: 1200

2.03 PUMPS

A. Each pump shall be of heavy duty, positive displacement rotary lobe design. The wet end shall be constructed of High Wear Resistant Special Steel. The front cover shall be constructed of 0.6025 (Grey Cast Iron), with a minimum Brinell hardness of 230 – 260, and permit removal of the rotors without disturbing piping, bearings, and mechanical seals. The case shall also be machined to accept a reversible front and rear wear plate, constructed of High Wear Resistant Special Steel, to a finished hardened reversible surface of 370-430 HB Brinell. Pumps not equipped with a removable wear plate that use the front door for its wear surface or require bolts that are recessed below the lobe path, are not acceptable for any wearing surface.

B. The pump shall utilize at minimum, HiFlo® 4-tip rotors, which are driven through positive timing gears running in oil. Solid cores of Grey Cast Iron A48, Class 40 B shall be covered with a layer of NBR, with a Durometer hardness 58. The geometry of the rotor core shall be the same as that of the finished rotor. Pulse free The rotor shall be specifically designed for pumping sludge. Rotors shall be positioned to the shaft by replaceable hardened key ways, and secured to the shaft by internal/external expansion bolt and flush discs requiring no recesses in the end cover. Pumps utilizing lobe designs with fewer than 4 tips, will not be considered, due to the high potential for wear on the lobes, as a result of fewer sealing lines. Designs with replaceable lobe tips shall not be acceptable.

C. Both front and rear rotor case cover plates shall be fitted with a renewable hardened wear surfacing, with a minimum Brinell hardness of 370-430 HB Brinell. Rotors shall be positioned on the shaft by replaceable hardened key ways, and secured to the shaft by internal/external expansion bolt that is tightened from the inside of the support cover.

D. The shafts shall be of carbon steel ASTM A293 fitted with replaceable stainless steel sleeves where passing through the seal area. They shall be timed in their rotation by straight cut timing gears running in a separate oil chamber which also contains the ball and roller bearings for each shaft. Pumps requiring external re-timing in the event of blockage will not be considered. The shaft shall be a minimum of 60 mm in diameter where the rotors, bearings, and mechanical seals contact the shaft, to decrease the potential of torsional shaft fatigue. The use of step down, angular v-notch cut, or threaded, shafts will not be acceptable due to shaft fatigue and potential of breakage. The shaft sleeves where the mechanical seal rides, shall be removable through the front of the pump, when removing the cartridge mechanical seal, and without disturbing the surrounding piping. Maximum shaft deflection at operating pressure shall be 0.0019 inch.

E. Cartridge mechanical seals shall be provided for each positive displacement pump. The seal shall include the mechanical seal faces, the seal holder and carrier, all applicable o-rings, the mechanical seal faces, and stainless steel shaft sleeve. The use of manual pre-load mechanical seals will not be accepted. A blocking chamber located behind the mechanical seal, and in front of the bearing housing lip seal shall be fitted into the cartridge seal of the pump to prevent contamination of the bearings on the event of a seal failure. This chamber shall be suitable for fill, from the top of the pump, and have an external pressurized oil bottle to review the status of the mechanical seals operation, mounted on the top of the pump, located in easy view of the operator. Pumps with open to air cavities located behind the mechanical seal housing, those that require water flush or quench, or those without oil bottles, will not be accepted, due to their potential for product spill failure on the surrounding areas of the pump, and the added maintenance and cost associated with mechanical seal water flushing systems.

F. Port connections shall be ANSI Class 150 # raised face, 4 inch Gooseneck x Gooseneck designed flanges to reduce the chance of vapor locking, and increase the reliability and suction lift capability, through its unique design. They shall be hot dipped galvanized steel, for long life, and abrasion resistance.

G. The removable end cover shall be flush with no recesses or dead pockets where solids can accumulate. The cover shall be sealed with NBR o-rings and provide complete access to the pump chamber without disconnecting pipe work glands or bearings. The removable front cover is to be mounted to the pump with 4 individual bolts to provide unhindered access to the rotors to facilitate ease of maintenance and operator safety.

H. The pump and motor shall be mounted on a steel base plate complete with necessary, guards, and mounting hardware.

I. Pumps and motors shall operate at any point within their operating range without undue noise and vibration. Vibration at any point in the operating range shall not exceed the limits allowed by the Hydraulic Institute.

J. The top and bottom housing segments of the pump shall be constructed of 0.6025 (Grey Cast Iron), hardened to a minimum of 160-250 HB Brinell, and be adjustable based on wear. The adjustment shall be accomplished by simply moving steel shims from one hole to the next in the pump housing, allowing for the closing of tolerance around the rotors. This adjustment must be available a minimum of two times from factory tolerance. The use of one-piece, block, cast housings or the use of radial wear plates will not be accepted.

K. Bearings shall be B-10 Life, 100,000 hours. Bearings and timing gears for all pump sizes shall run in an oil chamber provided with a bolt to show the level with the centerline of the lower shaft.

L. The pump timing gears shall run in oil and shall be mounted in a gear case contiguous with the pump case. The gear case shall be fitted with oil fill and drain connections on the top and bottom. Designs that use side drains will not be acceptable, due to the inability to completely drain the fluids on the pump.

M. The manufacturer shall be ISO 9001:2008 compliant, as evidenced with a current ISO certificate at the time of bid. The pumps in the specification shall be manufactured or fully assembled in the United States of America. Manufacturers that are ISO compliant, but not certified to ISO 9001:2008, or do not fully assemble or manufacture their pumps in the USA, will not be considered.

2.04 MOTORS

A. All motors shall be built in accordance with latest NEMA, IEEE, ANSI and AFBMA standards where applicable.

1. The motors supplied shall be specifically designed for inverter duty to allow for operation with variable frequency drives. The motors shall be compatible with the pumps provided by the Manufacturer.

2.05 PRESSURE RELIEF CONTROL

A. Pump discharge pressure switch: The CONTRACTOR shall furnish and install for each pump pressure switches on the pump discharge line. The pressure switches shall be set to the Manufacturer’s recommendations.

PART 3 – EXECUTION

3.01 INSTALLATION:

A. The equipment shall be installed where indicated on the Plans, in accordance with the manufacturer’s written instructions and under the supervision of the manufacturer’s representative.

B. Upon completion of the installation, the Contractor shall submit a certificate from the MANUFACTURER stating that the installation of the equipment is satisfactory, that the equipment is ready for operation, and that the operating personnel have been suitably instructed in the operation of lubrication and are of each unit.

3.02 SHOP PAINTING

A. Before exposure to weather and prior to shop painting all surfaces shall be thoroughly cleaned, dry and free from all mill-scale, rust, grease, dirt and other foreign matter.

B. All exposed portions of the pumps and motors shall be shops primed, with primer compatible with field painting as specified.

C. All nameplates shall be properly protected during painting.

D. All pumps shall be painted in the USA and a certificate confirming conformance to this requirement shall be submitted during the submittal phase of this specification.

3.03 INSPECTION AND TESTING

A. General

1. The Engineer shall have the right to inspect, test or witness tests of all materials or equipment to be furnished under these specifications, prior to their shipment from the point of the manufacture.

2. The Engineer shall be notified in writing prior to initial shipment, in ample time so that arrangements can be made for inspection by the Engineer.

3. Field tests shall not be conducted until such time that the entire installation is complete and ready for testing.

B. Factory Pump Tests

1. Factory testing in accordance with the standards of the Hydraulic Institute shall be required for all pumps. The entire assembly, including the pump and motor assembled on the base, shall be tested. This test must take place at an ISO certified facility within the USA.

2. Certified pump performance curves shall be submitted, including head, capacity, and brake horsepower, for each pump supplied.

3. Prior to conducting a pump test, notification of such test and a list of test equipment and test procedures shall be forwarded to the Engineer at least ten working days before the scheduled test date. All electronic transducers, meter, gauges, and other test instruments shall have been calibrated in accordance with the requirements of the Hydraulic Institute Standards. Copies of calibration data shall be provided.

4. All pumps shall be tested at full speed and complete staging through the specified range of flow, and head/capacity/efficiency curves plotted at maximum output speed. During each test, the pump shall be run at each head condition for sufficient time to accurately determine discharge, head, power input, and efficiency.

5. If any pump tested, fails to meet any specification requirement, it will be modified until it meets all specification requirements. If any pump tested, fails to meet the efficiency requirements at any of the listed flow or head conditions listed and all reasonable attempts to correct the inefficiency are unsuccessful, the pump(s) shall be replaced with units(s) which meet the specified requirements.

C. Field Tests

1. In the presence of the Engineer such tests as necessary to indicate that the pumps and motors conform to the operating conditions specified shall be performed. A 30-day operating period of the pumps will be required before acceptance. If a pump performance does not meet the specified requirements, corrective measures shall be taken. All test procedures shall be in accordance with factory test procedures specified above and certified results of tests shall be submitted. Provide, calibrate, and install all temporary gauges and meters, make necessary tapped holes in the pipes, and install all temporary piping and wiring required for the field acceptance tests. Written test procedures shall be submitted to the Engineer for approval 30 days prior to testing.

2. Noise and vibration tests shall be conducted in conformance with the Hydraulics Institute Test Codes and OSHA Standards of Occupational Noise Exposure. Maximum allowable noise level, corrected for background sound, shall not exceed 85 dBA when measured at a horizontal distance of 3 meters from the equipment being tested, at a height of 3 meters above floor level. The actual natural frequency of the installed pumping units will be verified using industry accepted procedures.

3. All pumps operating settings, alarms, controls, and shutdown devices shall be calibrated and tested ruing the field tests.

4. The Contractor shall furnish all power, water, facilities, labor, materials, supplies and test instruments required to conduct field test.

5. Deliver to the Engineer, upon completion of satisfactory testing of the equipment, reports as specified in Part 1.

D. Field Electronic Control System Tests:

1. The electric control system shall be test operated for proper functioning prior to the pump mechanical test. The control system shall be checked out using simulated operating signals as per pump Manufacturer's recommendations.

2. The Contractor shall check all drives for correct clearances, alignment, and lubrication in accordance with Manufacturer's instructions. The Contractor shall check direction of rotation of all motors and reverse connections if necessary.

3. The Contractor shall meet all the testing requirements of Division 26.

E. Field Alarm System Testing:

1. Check each alarm and detection device for proper operation.

END OF SECTION 43 21 00

DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

SECTION 46 33 33 – POLYMER BLENDING AND FEED EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish two (2) polymer blending systems with progressive cavity pump, motors and controls, including all integral piping, valves, fitting, pipe supports, special equipment and appurtenances in accordance with these specifications, including all incidental work necessary to make it complete, satisfactory and ready for operation.

B. The polymer dilution and feed system shall be capable of effectively activating and fully blending with water a homogenous polymer solution ranging from 0.1% to 1% concentration of emulsion polymers with active contents up to 75%.

C. The equipment and products specified in this section and shown on the Plans are based upon the “basis of bid” manufacturer indicated. Substitute or alternate manufacturers must be approved in accordance with the procedures specified in Section 01 25 50 – Substitution of Major Equipment Items and Products, and by written approval of the Engineer.

1.02 RELATED SECTIONS

A. Section 01 25 50 – Substitution of Major Equipment Items and Products

B. Section 01 33 00 – Submittals Procedure

C. Section 01 78 00 – Operation and Maintenance Manuals

D. Section 46 76 33 – Centrifuge

1.03 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit shop drawings of equipment for approval in accordance with Section 01 33 00 – Submittals Procedure. Shop drawing submittals shall be complete with one submittal for the entire system. Individual manufacturer’s submittals for portions of the unit will not be approved. Manufacturer shall submit the following minimum information with their shop drawings:

1. Manufacturer’s catalog information, physical and operational description, and specifications.

2. Drawings showing the general dimensions of the equipment and confirming the size of the unit. Drawings shall also include size and location of required piping connections, structural supports, construction details, list of input/output signals for control panels, wiring diagrams, weights of major components, and utility connection requirements.

3. List of any design modifications to accommodate the equipment proposed.

4. Information and location of nearest parts, service crews, and repair facilities to the City of Selah.

5. List of all variances from Technical Specifications. (Note: Failure to specifically list and fully explain all variance will be cause for rejection of submittal).

6. Any other required information to clearly and readily demonstrate compliance with all parts of the Technical Specifications.

7. Design calculations.

C. Operation and Maintenance Information shall be furnished in accordance with Section 01 78 00 – Operation and Maintenance Manuals. Where additional, more detailed submittals are necessary, those requirements are included in this section.

D. Submit manufacturer's written warranty for warranty period specified.

1.04 QUALITY ASSURANCE

A. Manufacturers shall be of established good reputation regularly engaged in the fabrication of such equipment. Unless otherwise noted, any equipment offered shall be current modifications that have been in successful regular operation under comparable conditions.

B. Manufacturer shall have persons qualified in problem troubleshooting the equipment permanently located within 350-mile radius of the City of Selah.

C. Pre-assemble and factory test system to ensure compliance with pressure and operational requirements.

D. The approved system shall produce a completely homogenous polymer and water solution free of visible polymer agglomerations, or "fish-eyes."

1.05 STARTUP SERVICE

A. The manufacturer shall furnish the services of an authorized factory representative of the equipment manufacturer to provide installation assistance, inspection, certification of installation, functional testing, startup and job site training. A minimum of two (2) days in two (2) trips shall be provided. One (1) day shall be provided for installation assistance, inspection, certification, startup and functional testing, and one (1) day shall be provided for training.

1.06 SPECIAL TOOLS AND SPARE PARTS

A. One (1) set of special tools required for normal operation and maintenance of equipment shall be provided. All such tools shall be furnished in a suitable case for storage and easy identification.

B. Spare parts shall be supplied as recommended by the manufacturer.

C. Spare parts shall be properly packaged and labeled for easy identification without opening and protection for long term storage.

D. At a minimum provide the following spare parts for each unit:

1. Neat polymer pump spare parts kit.

1.07 WARRANTY

A. All equipment supplied under this section shall be warranted for a period of one (1) year from the date of substantial completion. Distributor warranties will not be accepted.

B. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced and the unit(s) restored to service at no expense to the Owner.

PART 2 – PRODUCTS

2.01 GENERAL REQUIREMENTS

A. The Polymer Feed System shall be capable of automatic preparation of polymer solution from liquid concentrate (neat or emulsified polymer) and automatic metering of the polymer solution to the application point. The preparation system shall feed polymer solution to the sludge dewatering centrifuge, as shown on the Plans. Refer to Section 46 76 33 - Centrifuge, for additional information.

B. Electrical wiring and equipment with electrical connections, including the motors, and control and safety devices, shall be Recognized Electrical Testing Laboratory (RETL) listed and labeled, or the manufacturer shall obtain approval from the Washington State Department of Labor and Industries for the electrical portions of the equipment.

2.02 MANUFACTURERS

A. The basis of design for the polymer activation, dilution, and feed system equipment and components specified herein is FKC Polymer Makedown system, Model L4S-1200-PC-S-6-A-13, manufactured by CleanWater1., 550 Sycamore Drive, Milpitas, CA 95035; Phone: (858) 218-3745; www.cleanwater1.com.

2.03 SERVICE CONDITIONS AND PERFORMANCE REQUIREMENTS

A. Control panel supply voltage shall be: 120 VAC.

B. The polymer dilution/feed system shall be capable of producing polymer solution with active polymer-to-water solution concentrations between 0.1% and 1.0%, or as recommended by the centrifuge equipment manufacturer.

C. Maximum dilution water capacity shall be 1,200 GPH (20 GPM) at 70 psi. Water source will be potable water.

2.04 MULTI-ZONE MIXING CHAMBER

A. A hydrodynamic blending device specifically designed to dilute and activate emulsion, dispersion, and solution type polymers with viscosities up to 75,000 cps and active contents up to 75 percent shall be provided. Systems without a proven track record with all types of polymer described above will not be considered.

B. The liquid polymer activation chamber's mixing energy shall be staged such that it provides for high, non-damaging mixing energy over the full operating range of the system which then dissipates through concentric chambers. The integral water control device, which shall also produce mixing energy by creating a pressure drop across its orifice, shall be constructed of PVC body with stainless steel internals and shall be designed to allow orifice replacement without disassembly of any other part of the system. The system shall be designed for use with either potable or non-potable dilution water.

C. A mixing chamber drain valve with 1/2-inch fitting shall be provided and plumbed to the nearest floor drain. The mixing chamber shall have a maximum rated pressure of 150 psi.

D. Provide a bronze, adjustable-range pressure relief valve on mixing chamber with a range of 50 to 175 psi.

E. At no time shall polymer be exposed to excessive shear. Systems which are "retention time dependent" - a system which is prone to induce insufficient or excessive mixing energy depending on flow rate and the subsequent retention time in the mixing chamber, or which utilize conventional static mixers, mixing blocks, eductors or flash mixers, shall not be considered. All components that require periodic maintenance shall be readily accessible.

F. Provide a neat polymer check valve specifically designed to isolate neat polymer from dilution water. The valve shall be designed with an open, unobstructed path to the valve seat. The valve body shall be constructed of Teflon. The ball shall be stainless steel. The spring shall be covered with a PVC boot, to prevent polymer from passing through the spring. The valve shall be readily accessible for cleaning and shall be easily disassembled. Conventional check valves, and or check valves that are installed inside the mixing chamber, or which require mixing chamber disassembly for servicing will not be accepted.

2.05 DILUTION WATER CONTROL

A. The dilution water flow rate shall be monitored by a Rotameter type flow meter. Unions shall be provided on the inlet and outlet of the Rotameter to allow easy removal for cleaning.

1. Materials of Construction: Metering Tube – Machined Cast Acrylic; Internal Components – Type 316L Stainless Steel; Fitting – PVC; Elastomers – Buna-N.

B. Unit shall have an electric solenoid valve for on/off control of total dilution water flow.

1. Materials of Construction: Brass body, NBR Seal.

2. Manufacturer: Parker Skinner Valve or equal.

3. The valve shall be rated NEMA 4X.

C. The dilution water flow rate shall be manually adjusted through a flow control valve connected directly to the mixing chamber. Valve shall be constructed of PVC body, SS needle, and brass seat.

D. Dilution water differential pressure shall be monitored by an industrial duty differential pressure switch rated NEMA 4X with a range of 0-90 psi. Pressure switches with plastic construction or fittings and mechanically actuated switches shall not be acceptable. United Electric model J21K-254-M900 or equal.

E. A suitably sized pressure reducing valve shall be supplied for installation in the dilution water line. Pressure reducing valve shall be constructed of bronze with adjustable output pressure of 25-75 psi to reduce incoming line pressure variations.

2.06 POLYMER METERING CONTROL

A. Unit shall have a neat polymer metering pump. Pump shall be a four (4) stage positive displacement, progressive cavity type. Rotor shall be Type 316 stainless steel. Stator shall be fluoroelastomer. Pump shall have a packing seal.

B. Pump shall be drive by a 1/4 HP (minimum), TEFC, 0-90VDC motor. Variable speed capability shall be provided by an SCR controller. Maximum speed of the pump shall not exceed 650 RPM.

C. Provide a metering calibration assembly rigidly mounted to the system frame and sized to provide a one-minute drawdown at 100 percent pump capacity. The column shall be graduated in increments of 0.1 gallons/10mL. Supporting the calibration column with the polymer piping is not acceptable.

D. Each metering pump shall be protected with a thermal type loss of flow sensor, rated NEMA 4 with local and remote indication of alarm on low/loss of flow. Pressure switches or mechanical or reed type switches shall not be acceptable. IFM Efector model SI-1000 or equal.

2.07 CONTROLS

A. A control panel affixed to the system's frame shall be provided, rated NEMA 4X and constructed of FRP. The control panel shall consist of all switches, relays, indicator lights, digital displays, and controllers as required herein. The control panel components shall be NEMA 4X. Switches and indicator lights shall be Allen Bradley series 800E. All skid-mounted electrical components interconnected to control panel shall terminate on terminal blocks. Terminal blocks shall be sized for 14-gauge wire with terminal block numbers and a legend. Wires shall be neatly run through wire race-way and numbered with adhesive type labels. Control panel shall have a short circuit current rating of at least 6,000 amps.

B. Control Devices:

1. Main Power/System ON-OFF-REMOTE selector switch.

2. NEMA 4X, panel-mounted potentiometer for local control of pump speed.

3. Alarm reset Push-Button.

C. SCR Controller:

1. Input Voltage: 115/230 VAC.

2. Output Voltage: 0-90 VDC or 0-180 VDC.

3. HP Rating: 1/8-1 @ 90 VDC, 1/4-2 @ 180 VDC

4. Signal Input: 4-20mA or 0-10VDC, selectable.

5. Max Output Current: 10 Amps.

6. Adjustable min speed, max speed, current limit, IR compensation and signal input adjust.

7. 3 percent linearity through 60:1 speed range

8. Manufacturer: Minarik, model PCM23001A.

D. Indicators:

1. System running indicator, white full voltage pilot light.

2. Low water differential pressure alarm.

3. LCD display of pump rate.

4. Low polymer flow alarm.

E. Inputs (by others):

1. 4-20mA metering pump pacing signal.

2. Contact Closure (maintained) for remote starting/stopping of polymer system.

F. Outputs:

1. System "Running" status, dry contact

2. System in "Remote mode" status, dry contact.

3. Low Water Pressure Alarm, dry contact.

4. Low Polymer Flow Alarm, dry contact.

G. Alarms:

1. Loss of Dilution Water Flow Alarm, Differential Pressure Type. Metering pump goes to stand-by mode when low dilution water pressure occurs. The pump automatically restarts when pressure returns.

2. Loss of Polymer Flow Alarm, thermal sensor type. System goes on standby when low/loss of polymer flow occurs, requires manual restart. An adjustable 0 to 60 second time delay relay shall be provided to prevent nuisance alarms from occurring.

2.08 MAINTENANCE:

A. Unit shall be open frame design to allow easy access to all components.

B. Mixing chamber shall be easily disassembled and reassembled to allow access to all parts exposed to neat polymer.

C. Polymer check valve shall be readily accessible. Check valves installed inside mixing chamber shall not be acceptable.

2.09 MATERIAL SPECIFICATIONS

A. Connections – Plumbing:

1. Dilution water inlet, 1-inch FNPT.

2. Neat polymer inlet, 1-inch FNPT.

3. Solution discharge, 1-inch FNPT.

B. Connections – Electrical

1. Standard, grounded male plug - 120/1/60, 15 amps max.

2. Terminal blocks for interconnecting all skid-mounted electrical devices.

3. Terminal blocks for all remote input and output signals.

C. Dimensions: Frame, 32 inches wide x 27 inches deep x 62 inches high.

D. Feed Unit Construction:

1. The system's frame shall be of rugged Type 304 stainless steel construction. No mild steel shall be used. The skid shall be constructed of 3/16-inch minimum Type 304 stainless steel. The frame shall be constructed of 3/16-inch angle or structural stainless steel tubing. The panel supporting the control panel shall be a minimum of 12-gauge. Vertical frame members shall be gusseted. All pipe supports shall be stainless steel. The skid shall be designed for fork-lifting and shall have holes for mounting to concrete pad. The systems frame shall be designed for an integral dilution water booster pump in the event the plant’s hydro-pneumatic system is incapable of providing sufficient dilution water. Maximum system dimensions shall be per schedule above. Control panel shall be mounted in vertical position and at 60 inches high. Pump suction shall not exceed 18 inches from the skid.

2. Piping and valves shall be mounted with rigid pipe clamps. Fasteners required to mount components to system frame shall be minimum 1/4-20.

3. Dilution water plumbing shall be schedule 80 PVC. Hose shall be braided vinyl. Hose fittings shall be schedule 80 PVC. No nylon fittings shall be used.

4. Mixing chamber – 316 Stainless Steel.

2.10 ACCESSORIES

A. Horizontal Tote/Drum Adapter Kit: Provide tote/drum suction kit with a 2-inch NPT connection, isolation ball valves, 1-inch quick disconnect adapter, vent connection and 10 feet of 1-inch clear, braided, PVC tubing.

PART 3 – EXECUTION

3.01 INSTALLATION

A. All above equipment will be installed by the Owner's installation contractor in accordance with the manufacturer's recommendations, approved shop drawings, and these Specifications.

B. Check out of final system installation, start-up, calibration, and instruction of operating personnel shall be performed by an authorized representative of the manufacturer. These services shall be an integral part of providing this equipment.

C. This Specification describes a complete operational polymer preparation system. Unit shall have been totally assembled and shop tested as a complete system prior to delivery. Systems requiring field assembly and construction shall not be considered as complying.

D. Upon completion of the installation, the manufacturer shall submit a certificate stating that the installation of the equipment is satisfactory, that the equipment is ready for operation, and that the operating personnel have been suitably instructed in the operation, lubrication and care of each unit.

3.02 FIELD INSPECTION AND TESTING

A. General

1. Field tests shall not be conducted until such time that the entire installation is complete and ready for testing and the manufacturer's certification of proper installation has been received.

2. The manufacturer shall provide the services of a factory trained representative to perform all tests specified in this section.

3. The manufacturer shall notify the Engineer a minimum of 5 days in advance of running any tests unless otherwise specified. No tests shall be approved unless the Engineer or a representative of the Owner is present.

B. Field Inspection and Owner Instruction

1. The manufacturer shall furnish the services of a field service technician, who has complete knowledge of proper operation and maintenance of the equipment, for a period of not less than two (2) days in two (2) trips to inspect the installed equipment, supervise the initial test run, and to provide instruction to the plant personnel. The first visit shall be for checking and inspecting the equipment after it is installed and supervise the initial field test. The second visit will be for operator training.

2. At least one (1) of the two (2) days shall be allocated solely to instruction of plant personnel in operation and maintenance of the equipment. The instruction period shall be scheduled at least 10 days in advance with the Owner and shall take place prior to acceptance by Owner.

B. Field Tests

1. In the presence of the Engineer such tests as necessary to indicate that the equipment conforms to the operating conditions specified shall be performed. Each unit shall be run to demonstrate its ability to operate successfully under normal operating conditions. A 30-day operating period of the equipment will be required before acceptance. If performance does not meet the specified requirements, corrective measures shall be taken.

2. All operating settings, alarms, controls, and shutdown devices shall be calibrated and tested during the field tests.

3. Deliver to the Engineer, upon completion of satisfactory testing of the equipment, reports as specified in Part 1.

C. Field Electric Control System Tests

1. The electric control system shall be test operated for proper functioning prior to the equipment test. The control system shall be checked out using simulated operating signals as per equipment manufacturer’s recommendations.

2. The Owner’s installing contractor will check all drives for correct clearances, alignment and lubrication in accordance with manufacturer’s instructions. The contractor will check direction of rotation of all motors and reverse connections if necessary.

D. Field Alarm System Testing

1. Check each alarm and detection device for proper operation.

END OF SECTION 46 33 33

SECTION 46 76 28 – DRIED SLUDGE CONVEYORS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This section includes supply and installation of four (4) sludge conveyors to be used in movement of partially dewatered sludge between processes and for discharge to a City-owned truck.

B. The sludge conveyor installed between the new centrifuge and new dryer shall be the responsibility of the centrifuge manufacturer.

C. The sludge conveyor (cooling conveyor) installed for discharge of dried sludge from the dryer to the City-owned truck shall be the responsibility of the dryer manufacturer. See Section 46 76 71 for additional requirements regarding sludge discharge.

D. The two (2) sludge conveyors installed between the existing dryer conveyor and the City-owned truck (cooling and conventional) shall be the responsibility of the centrifuge manufacturer.

E. The equipment and products specified in this Section and shown on the Plans are based upon the "basis of bid" manufacturer indicated. Substitute or alternate manufacturers must be approved in accordance with the procedures specified in Section 01 25 50 - Substitution of Major Equipment Items and Products, and by written approval of the Engineer.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals Procedure

B. Section 01 78 00 – Operation and Maintenance Manuals

C. Division 26 – Electrical

D. Section 46 76 33 – Centrifuge

E. Section 46 76 71 – Indirect Biosolids Drying System

1.03 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals Procedure, for general submittal requirements.

B. Submit manufacturer’s technical product data, including product description, technical data, and installation instructions.

C. Submit shop drawings showing complete dimensions and details of construction of equipment including anchoring, connections, and weights of major components. Shop drawings shall also include installation details and all other pertinent information necessary to confirm design and coordination with other items of work.

D. Sumit operation and maintenance manuals in accordance with Section 01 78 00 – Operation and Maintenance Manuals, for all equipment included under these specifications. The maintenance instructions shall include troubleshooting data and full preventative maintenance schedules and complete spare parts lists with ordering information. Manuals shall be prepared with descriptions, etc., that are required to instruct operation and maintenance personnel unfamiliar with such equipment.

E. Upon completion of installation and successful startup, testing, and operation, submit manufacturer's certification of proper installation, testing, and instruction. Submit manufacturer's startup and testing report, including all in-field performance test data. Startup reports shall include all pertinent data to confirm that successful startup and operation has been achieved for each unit. The manufacturer's certification, startup, and testing report(s) shall be included in the operation and maintenance manuals.

F. Submit manufacturer's written warranty for warranty period specified.

1.04 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be responsible for unloading, handling, and storage of all equipment and materials, in accordance with the manufacturer's requirements. Upon delivery, the Contractor shall carefully inspect all equipment and materials for any damage and to verify general compliance with the Plans and Specifications.

1.05 SPECIAL TOOLS AND SPARE PARTS

A. One (1) set of special tools required for normal operation and maintenance of equipment shall be provided for each conveyor.

B. Spare parts shall be properly packaged and labeled for easy identification without opening and protection for long term storage.

C. All lubricating oils required for the first year of operation shall be provided. The products supplied shall be factory pre-filled, in accordance with the manufacturer's recommendations.

1.06 WARRANTY

A. All equipment supplied under this section shall be warranted for a period of one (1) year from the date of substantial completion. Distributor warranties will not be accepted.

B. The equipment shall be warranted to be free from defects in workmanship, design, and materials. If any part of the equipment should fail during the warranty period, it shall be replaced and the unit(s) restored to service at no expense to the Owner.

C. The manufacturer's warranty period shall run concurrently with the Contractor's warranty period. No exception to this provision will be allowed.

PART 2 - PRODUCTS

2.01 GENERAL

A. The conveyor shall be as manufactured by JDV Equipment Corporation, or Engineer-approved equal.

B. Screw Conveyor Sizing:

1. The dried biosolids screw conveyor flights shall be sized as required to meet the capacity of the dried sludge surge mixer output, 9-inch diameter minimum.

a. Minimum conveyor capacity for Conveyor 09 C 01 shall be 40 cubic feet per hour of dewatered sludge comprised of approximately 20 percent solids from the new centrifuge to the new dryer inlet hopper.

b. Minimum conveyor capacity for Conveyor 09 C 02 shall be 40 cubic feet per hour of dried granular sludge comprised of approximately 90 percent solids from the new dryer to the City's truck.

c. Minimum conveyor capacity shall be 40 cubic feet per hour of dried granular sludge comprised of approximately 90 percent solids from the existing dryer discharge conveyor to the City's truck.

C. Materials of construction:

1. Trough and chute: 304 stainless steel, 1/8 inch thick minimum

2. Trough cover: 304 stainless steel, 12 gage minimum

3. Spiral flights: Cold-formed, carbon-based micro alloy steel, spring steel, Brinell

4. Hardness: 250 minimum. Thickness: 3/8-inch minimum

5. Shaft: Minimum 1-1/2-inch diameter welded to spiral with sealed housing at tail bearing

6. Fasteners: Type 316 stainless steel

7. Drive shaft: AISI 1045

8. Finish paint: Provide fusion bonded epoxy, minimum thickness of 10 mils

D. Conveyor configuration:

1. Conveyor 09-C-01 from the centrifuge discharge to the inlet hopper shall be installed at an angle of 30 degrees with a discharge height above the floor level of 11 feet. The horizontal distance from the discharge chute on the centrifuge to the discharge chute on the conveyor is 19'. The approximate conveyor length shall be 22 feet.

2. Cooling conveyor 09-C-02 from dryer discharge conveyor to truck loading bay shall be installed at an angle of 30 degrees with a discharge height above the floor level of 13 feet. The horizontal distance from the discharge chute on the dried sludge surge mixer to the discharge chute on the conveyor is 23'. The approximate conveyor length shall be 27 feet.

3. Conveyor 09-C-03 from existing dried biosolids conveyor to 09-C-02 shall be installed at an angle of 0 degrees with a discharge height above the floor level of 12 feet. The horizontal distance from the discharge chute of the existing dryer discharge conveyor to the discharge chute on the conveyor is 33'. The approximate conveyor length shall be 33 feet.

E. The conveyor tail shaft bearings shall type "E" roller bearings, cast iron housing, outboard-mounted, with a split gland seal at the trough end. Bearings shall include oil pipes for remote lubrication.

F. The drive shaft shall incorporate rubber lip and waste pack type combination seals.

G. Structural supports of ASTM-A-36 members shall be provided and shall be 304 stainless steel. The manufacturer shall design the supports to carry all loads placed on the conveyor assembly. The discharge end of the conveyor may be supported from the building structural members, provided additional framing is installed to support the load. Supports shall not be located where they interfere with truck loading access.

H. Loading area shall be coordinated with the discharge chute from the dried sludge surge mixer. A removable inspection cover shall be provided just upstream of the load area.

I. Provide flexible chute below conveyor discharge. Minimum length - 3 feet

J. The non-driven end of the screw conveyor shall include a zero speed switch direct coupled to the tail shaft to indicate equipment failure. The switch shall provide a signal to the sludge dehydrator control panel.

2.02 DRIVE MOTOR

A. The screw conveyor is to be driven by a chemical/mill duty integral gear reducer/motor drive unit mounted to an adapter flange mounted to the end place of the conveyor, with adapter flange mounting and end thrust capacity, as required to achieve a final speed of 20 RPM maximum. Reversing capabilities shall be achieved via a “Reversing Motor Starter" located in the motor control center. Motor shall be 2 HP TEFC, 460V, 3Ø, 60 Hz.

2.03 SAFETY EQUIPMENT

A. The conveyor shall be provided with OSHA style guards at motor driven rotating components.

B. The conveyor shall include an OSHA safety stop switch with cable supported on both sides by 304 stainless steel closed end eye-bolts.

2.04 CONTROLS

A. A hand/off/automatic switch will be provided within sludge dehydrator control panel and integrated with sludge dehydrator PLC.

B. Automatic start-stop operation of the conveyor shall be controlled by the sludge dehydrator control panel.

C. Provide local operating station as shown on the electrical drawings.

2.05 SPARE PARTS

A. The screw conveyor shall be furnished with the following spare parts:

1. Lubricants for 1-year of operation.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install screw conveyor at locations shown on Plans. Verify support locations and anchoring requirements with manufacturer. Level and align supports and grout base plates.

B. Coordinate conveyor installation with sludge dehydrator surge mixer installation.

C. Make electrical and safety switch connections in accordance with electrical plans and Division 16.

D. Install flashing and flexible connection between conveyor and surge mixer.

E. The screw conveyor shall be installed in accordance with the manufacturer’s installation instructions and in compliance with all OSHA, local, state, and federal codes and regulations.

3.02 FIELD QUALITY CONTROL

A. The conveyor manufacturer shall furnish the services of a factory representative to check the installation of the conveyor and make any field adjustments necessary to ensure proper mechanical operation. The conveyor manufacturer shall submit to the Engineer, a written report certifying that the equipment has been satisfactorily installed and lubricated.

3.03 OPERATION AND MAINTENANCE MANUALS

A. Provide six (6) operation and maintenance manuals. Manuals shall include equipment descriptions, operating instructions, drawings, troubleshooting techniques, and a recommended maintenance schedule.

END OF SECTION 46 76 28

SECTION 46 76 33 – CENTRIFUGE

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Work described in this section includes furnishing labor, equipment, materials, tools, and incidentals required for a complete and operable installation of one (1) horizontal decanter model centrifuge, centrifuge controls, and related appurtenances.

B. The centrifuge shall be specifically designed to utilize all new technology. The centrifuge shall be a solid bowl, horizontal, continuous feed, scroll type unit. The centrifuge equipment shall be designed and built to operate continuously or intermittently. The bowl/scroll design shall utilize the conical section for optimal dewatering of the cake solids.

The centrifuge manufacturer shall be responsible for providing a complete centrifuge system as described herein. The equipment shall be installed by an installing contractor who shall be responsible for off-loading the equipment, providing any temporary storage, and installing the equipment in place. Installation shall include mounting the unit, piping the unit, providing power to the panels and all interconnected wiring and piping required between the various components.

All equipment specified herein shall be fabricated, assembled, erected, and placed in proper operation condition in full conformity with drawings, specifications, engineering data instructions, and recommendations of the equipment manufacturer.

C. The equipment and products specified in this Section and shown on the Plans are based upon the "basis of bid" manufacturer indicated. Substitute or alternate manufacturers must be approved in accordance with the procedures specified in Section 01 25 50 - Substitution of Major Equipment Items and Products, and by written approval of the Engineer.

1.02 DESIGN REQUIREMENTS

A. The equipment shall be suitable for exposure to continuous 95% relative humidity conditions and for operation in ambient air temperatures from 40-110 degrees F.

B. The sludge to be dewatered will be a product of municipal wastewater treatment.

C. The unit shall be capable of continuous operation for up to 24 hours per day, seven days per week.

D. The centrifuge shall be optimized for dewatering. In addition, the adjustable pond setting dams may require changing for optimum process capabilities.

E. The design criteria for the centrifuge shall be as flows:

Parameter	Value
Type of sludge:	Waste Activated Sludge
Feed concentration, %TS	1.0
Sludge feed rate, gpm	160
Solids loading, lbs./hour	800
Expected cake solids*, %TS	16-25
Expected polymer dosage*, lbs./ton d.s.	15-30
Expected recovery*, %TSS	95-99

*To be confirmed by sludge sample or pilot test.

1.03 SUBMITTALS

A. Submit drawings and equipment data in accordance with the General Conditions and the following:

1. Equipment Data Sheet

2. Materials of Construction/Abrasion Protection Features

3. Vibration Isolator Detail

4. Centrifuge Installation Instructions

5. Lubrication and Maintenance Schedule

6. Equipment Shipment/Storage Instructions

7. Spare Parts and Tools List

8. Discharge Connection Details

9. Motor Data Sheets

10. Control Panel Drawings

11. Control Panel Bill of Materials

12. Vibration Monitor Details

13. Process & Instrumentation Diagram

B. One (1) set of operation and maintenance manuals and final as-built drawings to be provided at the completion of the job and in accordance with the General Conditions. One (1) electronic copy of the O&M manual and drawings shall be provided.

1.04 QUALITY ASSURANCE

A. The manufacturer shall guarantee the decanter centrifuge to be free from defects in materials and workmanship for a period of twelve (12) months following installation or eighteen (18)months following the delivery, whichever occurs first. Any defects found within the warranty period shall be repaired or defective components replaced. Ancillary and control components shall be warranted per the original equipment manufacturer's warranty.

B. Certificate of Compliance. The manufacturer shall warrant that the centrifuge(s) shall be manufactured in accordance with the Contract Specifications.

C. The centrifuge units shall be the product of suppliers with a minimum of twenty (20) years' experience.

D. The design and manufacture of the centrifuges for water and wastewater applications shall be specifically designed for the intended conditions of service.

E. Appurtenant equipment shall be new and shall be designed, fabricated and assembled in accordance with the best engineering and shop practices.

F. All manufacturing facilities shall be ISO 9001:2015 and ISO 14001:2015 certified.

G. Individual parts shall be manufactured to standard Metric sizes and gauges.

H. Components of the centrifuge shall be designed for any stresses, which may occur during fabrication, shipping, erection, or maintenance.

I. Materials shall be suitable for service conditions and as described herein.

J. The unit shall be completely tested in the manufacturing facility with a standard factory test panel.

K. The centrifuge manufacturer must have sufficient North American wastewater treatment installations of similar size and application. The referenced installations must demonstrate a history of reliability and service consistent with the current project owner's expectations. Provide a list of a minimum of four (4) such installations with description, contact names, addresses and telephone numbers. Failure of a referenced installation to meet these criteria for performance reliability, and service will be grounds for excluding a manufacturer as an acceptable supplier.

1.05 MAINTENANCE AND SERVICE

A. One set of standard tools shall be provided to disassemble and re-assemble the centrifuge as required.

B. One year's supply of lubricants.

C. SERVICE CENTERS

1. Centrifuge manufacturer must have at least one currently operating full-service center located within the United States.

2. Centrifuge manufacturer must have at least one service technician who is based at the nearest service center, who has been trained specifically on the centrifuge system required for his project and who would be available for a field service call within 48 hours of written notice.

D. The following spare parts will be provided total for all centrifuge units:

1. One (1) set of seals and O-rings

2. One (1) set of matched drive belts

3. One (1) set of grease nipples.

4. One (1) year supply of lubricants

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Dewatering Centrifuge System shall be as manufactured by Flottweg Separation Technology, Inc. or equal.

B. These specifications and accompanying drawings are based upon the use of the Flottweg Model C5E-4/454 as manufactured by Flottweg Separation Technology, Inc. , 10700 Toebben Drive, Independence, KY 410511, Phone Number: (859) 448-2300.

2.02 CONSTRUCTION AND MATERIALS

A. GENERAL: All wetted parts of the centrifuge rotating assembly shall be a minimum of 316 stainless steel, except for the “O” rings, seals, and abrasion-resistant material. “O” rings shall be NBR rubber; lip type seals shall be NBR. The feed tube shall be constructed of 316 stainless steel. The bowl cover shall be of 2 layer stainless steel design with sound insulation. Fiberglass reinforced plastic covers shall not be allowed. The frame and casing shall be fabricated of mild steel. All protective guards shall be constructed of painted carbon steel.

B. BOWL: The centrifuge bowl shall be duplex stainless steel 91.7 in. in length with the inside diameter of 22.4 in. in the cylindrical section, plus a conical beach extension. The bowl shall be manufactured from centrifugal casings of duplex stainless steel. All centrifugal cast material shall be inspected for cracks, shrinkage, porosity, or other defects by means of a liquid dye penetrant test. The bowl shall be designed to operate at a minimum force of 3365 x G. Fabricated or statically cast bowl shells not be allowed.

The front and rear bowl hubs shall be precision cast of duplex stainless steel. The pool depth in the bowl shall be adjustable by use of plate dams at the large diameter end of the bowl. Adjustable weirs should have a means of directing the centrate flow using open vanes to recover energy and reduce power consumption. Methods using tubes or similar shapes shall not be accepted. The bowl shall include a minimum of 18 longitudinal stainless-steel wear strips spaced evenly around the inside surface of the bowl. The wear strips shall preclude scroll wear on the bowl casing and provide a sludge layer to improve sludge transportation and prevent bowl erosion. Bowls utilizing grooves shall not be acceptable.

The solids shall be conveyed by the scroll rotating at a differential speed. The solids shall be discharged from the bowl via a series of rectangular discharge ports. Each port shall be protected by a field replaceable rectangular chilled cast iron bushing with variable thickness capable of taking multiple hits without being destroyed. Designs that utilize circular or round bushings fabricated of tungsten or silicon carbide that restrict product and lead to increased wear shall not be allowed. The bushings shall be weight balanced in pairs.

C. SCROLL CONVEYOR: The centrifuge shall include a 316 stainless steel horizontal scroll conveyor equipped with solid helical flights and independently mounted concentrically within the centrifuge bowl. Both the centrifuge bowl and the scroll conveyor shall be independently balanced such that a scroll conveyor can be interchanged with another from the same model centrifuge. The scroll shall utilize a differential speed to convey solids from the cylindrical section to the conical section and out of the bowl with a minimum disturbance to the pool. The edge and face of the conveyor flight shall be protected by flame applied spray hard surface alloy containing metal carbide..

D. BEARINGS: The centrifuges shall be designed so that the entire rotating assembly is supported by two main pillow block bearings located outside of the process area. Each main bearing shall be grease lubricated ball or cylindrical roller type bearing. Commercially available bearing shall be used. Bearing temperature monitoring shall be included. Seals shall be NBR.

E. FRAME AND CASING: The rotating assembly and bearings of the centrifuge shall rest on a mild steel frame, specifically designed for rigidity and noise reduction. The 2-layered 316 stainless-steel bowl cover shall be designed to act as a protective guard, insulated for sound, and to provide a complete enclosure for odor containment. The product collection chambers shall be stainless steel with flanges to the sludge cake and centrate discharge. Fiberglass reinforced plastic casings (covers) shall not be allowed.

F. NOISE AND VIBRATION

The centrifuge shall be designed such that the average noise level measured at one (1) meter around the periphery of the complete centrifuge assembly shall not exceed 85 dbA when tested at the manufacturing facility without feed and with the inlet and discharges closed. Manufacturers that do not meet the specified noise level must provide a complete sound enclosure with the centrifuge.

The centrifuge when running without feed, shall be measured for vibration in the manufacturing facility. The vibration velocity shall be less than 11.4 mm/s when measured under dry shop test conditions.

1. VIBRATION ISOLATORS: The centrifuge shall be mounted on rubber-type vibration isolators. The number and vibration constant of the isolator shall be as recommended by the manufacturer for the load and impact resulting from the operation of the centrifuge.

   There shall be no rigid connections at the feed tube, vents, solids discharge, liquid discharge, or other components whatsoever to the machine, thus preventing transmission of vibration to structure piping and appurtenant equipment.

2. FLEXIBLE CONNECTORS: To ensure a quiet installation, flexible connectors shall be provided to isolate the centrifuge from the building structure. The solids and centrate chutes shall be equipped with 304 stainless steel backup flanges. All hardware shall be supplied by the installing contractor. Flexible pipe connections shall be supplied for the sludge feed line, polymer connection, and condensate overflow drain. All flexible connections shall be flanged or threaded for simple connection to associated piping.

   Due to local conditions flexible connectors for the main drive motor, scroll drive motor, and centrifuge junction boxes must be furnished by the installation contractor, such that all local electrical codes are met.

   VIBRATION MONITORING: The centrifuge shall be equipped with one (1) vibration monitor located on the centrifuge base which consists of an accelerometer sensor packed in a single unit. The vibration unit shall continuously monitor vibration due to imbalance of the centrifuge. The monitor shall include a 4-20 mA output for real-time monitoring and a dry contact which shall be utilized to shut down the centrifuge in the event of excessive vibration.

G. LUBRICATION:

1. MAIN PILLOW BLOCK BEARINGS AND GEARS: The two main pillow-block bearings on the centrifuge and the gears shall be manually grease lubricated.

2. SCROLL BEARINGS: The scroll bearing shall be sealed and permanently grease lubricated.

H. GUARDS: Guards for all rotating components, gearboxes, and belt drives shall be a minimum 16-gauge powder coated chromium stainless steel and shall be designed to OSHA standards. The guards shall completely enclose the entire belt drive system and be constructed to minimize noise and vibration. Guards manufactured from carbon steel or fiberglass reinforced plastic shall not be allowed.

I. FEED COMPARTMENT:

1. Provide feed tube to introduce sludge into centrifuge through feed ports with minimal turbulence to the pond. The feed tube should be provided with a set of fins/blades inside the feed tube to assist in accelerating the sludge and polymer to lessen the destruction of the floc when entering the feed chamber

2. Feed tube shall be independently removable from rest of the centrifuge without any disturbance to the unit.

J. SOLIDS DISCHARGE AND CENTRATE CHUTES: The contractor shall provide the solids discharge and centrate chutes from the centrifuge to the connections and centrate discharge system below the centrifuge as indicated on the drawings.

1. Solids Discharge.

a. All flexible connectors required for connecting the solids chute to the centrifuge solids outlet and sludge cake conveyor shall be supplied by the centrifuge manufacturer.

b. The centrifuge manufacturer shall coordinate with the Contractor for proper mating of conveyance system at connection points.

c. The solids chute shall be provided with an air vent size as necessary for the equipment supplied.

d. The solids chute shall be provided with an accessible sample port to allow collection of discharged product.

2. Centrate Discharge

a. All flexible connectors required for connecting the centrate chute to the centrifuge liquid outlet shall be supplied by the centrifuge manufacturer.

b. The centrifuge manufacturer shall coordinate with the installing Contractor for proper mating between centrate chute and centrate piping.

c. The centrate chute shall be provided with an air vent, sized as necessary for the equipment supplied.

d. Installing Contractor shall provide a piped connection to a hose bibb for collecting a sample

K. ANCHOR BOLTS: The installing contractor shall provide all equipment anchors.

2.03 ELECTRICAL DEVICES AND CONTROLS

A. ELECTRICAL DEVICES: The following electrical devices will be provided:

1. MAIN (BOWL) DRIVE SYSTEM: The main drive system shall consist of a 75 HP AC inverter duty electric motor and a belt dive system. The belt drive system shall consist of multiple V-belts to provide full load capacity and to withstand the full starting torque of the system. The bowl motor shall be controlled by a/an Schneider 6-pulse variable frequency drive.

The main motor shall be a squirrel cage induction motor. The motor shall have copper windings and be of a high thermal capacity design for operation of 480 VAC/3 phase/60 Hz. power. The motor shall have Class F insulation with a B Rise, TEFC, 1.25 service factor, NEMA design A, oversized cast iron terminal box and continuous duty. The motor temperature shall not exceed 266 degrees F, at 90% nameplate voltage. The noise level shall not exceed 85 dbA sound pressure measured at one (1.0) m from the motor in all directions.

With the motor at ambient temperature, it shall be capable of making two (2) complete starts in succession with coasting to rest between starts. The motor shall also be capable of at least one restart within one hour after any shutdown. The motor bearings shall be grease lubricated, ball or roller anti-friction type of standard manufacture. The bearings shall be conservatively designed to withstand all stresses of the service specified.

2. SCROLL DRIVE SYTEM: The scroll drive system shall consist of a 20 HP AC inverter duty electric motor mounted on the frame and an automatic torque control module incorporated into the PID control loop in the PLC. The scroll drive motor shall be completely independent of the main drive system allowing operation of the scroll when the bowl is stationary. Drive shall be a 6 pulse. The centrifuge shall be equipped with a scroll drive system to provide control of the differential speed between the centrifuge bowl and conveyor. The scroll drive system shall consist of a multi-stage planetary gear that serves as the drive mechanism and gear reduction between the bowl motor and the centrifuge scroll. The gear shall be oil lubricated. The gear shall be independently balanced from the centrifuge and interchangeable. The scroll shall be protected from damage due to high torque overload level measured by the variable frequency drive. A thermal overload protection device in the drive motor shall not be considered as providing for sufficient protection for the scroll drive. The scroll drive shall have a minimum continuous torque rating of 13,000 Nm.

   The scroll gearbox motor shall be a 480 VAC/3 phase/60 Hz. inverter duty motor.

B. GENERAL CONTROLS

1. The centrifuge control system shall have a Programmable Logic Controller (PLC) and an Operator Interface Terminal (OIT). The control system shall be designed to work in manual and automatic modes. Should a disruption occur, the centrifuge monitoring system shall indicate the cause with a first out sequence and define the interruption. The interlock must be reset to continue.

2. The scroll drive is controlled by the automatic torque control module which controls differential speed in the manual mode and torque in the automatic mode. The torque control module is integral to the PLC. In the automatic torque mode, scroll drive speed is automatically adjusted to maintain constant torque, thereby compensating for varying feed characteristics while optimizing residence time and separation. The OIT provides digital display of bowl speed, differential speed, and torque. Set points are entered via a numeric keypad on the OIT.

3. Harmonic mitigation is not necessary as the centrifuge is gently ramped to full speed and back down over long periods of time. There is no requirement for the centrifuge system to include harmonic mitigation devices such as line reactors, harmonic filters, or 18-pulse drives.

4. To continue processing during a short power interruption, loss of power should be detected by instrumentation. If the duration of the interruption is less than 3 seconds, a warning will appear on the OIT and the machine shall continue normal operation. If the duration interruption exceeds 3 seconds, a shutdown alarm shall appear, and a semi-controlled shutdown shall be initiated. The centrifuge system shall provide for an immediate restart by the operator once power is restored. With the centrifuge operating at full speed, the control system shall remain powered up for a minimum of 15 minutes after power is lost.

C. CONTROLS: The following controls will be provided:

1. CENTRIFUGE OPERATOR PANEL: NEMA 4X, 304 stainless steel, 24 VDC, standard wall-mounted control panel, carrying UL and cUL certification containing:

a. Emergency stop pushbutton mounted in the front door.

b. Alarm horn mounted on top of enclosure.

c. Allen-Bradley PanelView Plus 7 Standard Edition with 10” screen mounted in the door. OIT shall be utilized for operational adjustments and shall display fault messages with timestamp and shall be used to acknowledge and silence alarms.

2. MAIN CENTRIFUGE PANEL: NEMA 12, painted steel, 480 VAC, double-door free standing enclosure carrying UL and cUL certification containing:

a. Fan and filter.

b. Though the door operated main disconnect that can be locked in the off position. The main control panel shall be capable of being locked out to prevent the introduction of hazardous voltage and eliminate the need for local motor disconnects. Local motor disconnects are discouraged to prevent damage to the machine.

c. Allen-Bradley CompactLogix PLC programmed to operate any and all necessary sequences capable of interfacing via Ethernet to the SCADA system.

d. Lifting eyes.

e. Pad-lockable 25,000 UL interrupting capacity rate disconnect.

f. 6-pulse main drive Schneider VFD.

g. 6-pulse scroll drive Schneider VFD.

h. VFD’s must be fuse protected to achieve the required Short Circuit Current Rating (SCCR) and to allow the VFD’s and control panel to carry UL and cUL rating.

i. For safety reasons, VFD keypads shall be mounted on the interior of the panel to eliminate unauthorized access. VFD parameters are factory set by manufacturer and shall not be changed by plant personnel. VFD runtime information is populated on the OIT for plant personnel monitoring.

j. Minimum 10% spare terminal connections.

k. Ewon Cosy shall be provided to allow for remote connection to the control components from the manufacturer's headquarters to complete timely simple program changes.

All components in the control panel shall be factory wired.

PART 3 – EXECUTION

3.01 FACTORY TESTING

A. Factory testing of the centrifuge shall be performed at the centrifuge manufacturer's or panel manufacturer's facility to demonstrate the absence of mechanical or electrical defects and that the centrifuge operates within the specified limits. Factory testing of the electrical panels shall be at the panel fabrication facility.

B. Shop Testing Procedure

3. Centrifuge manufacturer shall allow inspection and witness of the shop test of the equipment by the Engineer, Contractor, and Owner at their own cost.

4. Centrifuge or Electrical Panel manufacturer shall allow inspection and witness of the shop test of the electrical panels by the Engineer, Contractor, and Owner at their own cost.

5. Test conditions:

The following tests shall be completed before the centrifuge is released for shipment:

a. Vibration measurement with bowl empty.

b. Vibration measurement with bowl filled with water.

c. Motor starting amperage.

d. Test equipment/procedures.

i. Test equipment shall be calibrated.

ii. Unit and control system shall be tested with a simulation panel.

iii. All circuits shall be checked and all alarms and shutdown conditions simulated to check the alarm controls.

3.02 FIELD MECHANICAL TESTING

A. Field testing of the centrifuge shall be performed to demonstrate the equipment was not damaged during storage, transportation, or installation. Also, that the equipment is properly installed and aligned, and that there are no mechanical defects in any parts. The proper interaction of the centrifuge, drive motor, scroll drive, and control panel will also be demonstrated.

B. It shall be the Owner's responsibility to make sure that qualified technical representatives from the suppliers of all ancillary equipment be present during this test period to demonstrate the proper interaction of their equipment with the centrifuge. The Owner shall be responsible for delays in testing due to non-availability of personnel, services or utilities.

C. Field Testing Procedure

1. Field Inspection.

a. The centrifuge manufacturer will inspect the final installation and supervise the field acceptance tests of the equipment.

2. Function Test

a. Functional testing shall be conducted after the installation of the centrifuge and all appurtenances and the equipment has been operated a sufficient period to make any corrections or adjustments. The complete unit shall be subject to field acceptance tests under actual operating conditions to determine that operation is satisfactory.

b. The functional test shall be made under the direct supervision of the centrifuge manufacturer and in the presence of the Engineer.

c. The functional test shall determine the characteristics of the unit and shall demonstrate that under all conditions of operation the unit:

i. Has not been damaged by transportation

ii. Has been properly installed

iii. Has no mechanical defects

iv. Is in proper alignment

v. Has been properly connected

vi. Is free of overheating of any parts

vii. Is free of objectionable vibration

viii. Is free of overloading of any parts

d. Prior to acceptance the centrifuge manufacturer shall operate the centrifuge for a one (1) day, 6-hour per day period under actual conditions with sludge from the Owner's facility.

3. Vibration Test

a. The centrifuge manufacturer shall verify operations are within tolerances.

3.03 FIELD PROCESS PERFORMANCE TESTING

A. After satisfactory completion of acceptance tests conducted on the centrifuge, the centrifuge shall be tested for three (3), 4-hour periods to determine acceptable performance in accordance with the Design Requirements.

B. The unit shall be fed representative sludge and polymer during which the average performance of the unit must equal or exceed the design performance parameters.

C. During each day's performance test, the Contractor shall be responsible for collecting all required samples and measurements at 1-hour intervals in order to make the following determinations. The first set of samples and measurements shall be taken 1 hour after the beginning of the test run:

a. Sludge feed – total solids

b. Centrate – total solids

c. Centrate – suspended solids

d. Final cake discharge – total solids

e. Plant water (one or two daily composites) – total solids

f. Polymer feed rate – gallons per minute

g. Sludge feed rate – gallons per minute

h. Solids capture – percent

i. Setting for polymer feed pump

j. Setting for sludge feed pump

k. Differential speed

l. Motor amperage

m. Sludge feed – percent volatile solids

n. Sludge feed - SVI

D. During the entire Performance Test period and start-up, all polymer costs shall be paid for by the Owner.

E. During the entire Performance Test period, all laboratory analyses shall be performed and/or paid for by the Owner.

F. All data collected during performance tests shall be made available for the Engineer for determining compliance with the Specifications.

G. The average values of the tests conducted shall meet or exceed the performance criteria.

H. Polymer dosage shall be determined as the total active polymer consumed divided by the dry solids fed to the machine.

I. Test data that are in apparent error shall be discarded.

J. In the event the equipment is not meeting the guaranteed performance, the manufacturer shall at his own expense modify the equipment to meet these standards.

K. The equipment shall be modified and the test repeated until successfully completed, or one year has elapsed since the failure of the first attempted performance test.

L. If incoming sludge to the equipment is not per the specification, performance testing will be waived, and the equipment will be accepted.

3.03 TECHNICAL SERVICES

Technical Services of the manufacturer’s representative shall be supplied in the following areas:

A. Five (5) days to confirm proper installation, alignment, mechanical start-up and field mechanical testing.

B. Five (5) days for process start-up, training, and field process performance testing.

C. For every five (5) days of time allotted to the project, one (1) trip shall be included. One (1) trip shall consist of the associated expenses of airfare and car rental fees, plus accommodations and meals. Additional days shall be billable in accordance with the standard rate schedule. A day is considered one (1) 8-hours shift.

END OF SECTION 46 76 33

SECTION 46 76 71 – INDIRECT BIOSOLIDS DRYING SYSTEM

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Work described in this section includes furnishing labor, equipment, materials, tools, and incidentals required for a complete and operable installation of an indirect biosolids drying system, controls, and related appurtenances.

B. The dryer manufacturer shall be responsible for providing a complete system as described herein. The equipment shall be installed by an installing contractor who shall be responsible for off-loading the equipment, providing and temporary storage, and installing the equipment in place. Installation shall include mounting the unit, providing piping interconnection, providing power to the panels and all interconnected wiring and piping required between the various components.

All equipment specified herein shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with drawings, specifications, engineering data instructions, and recommendations of the equipment manufacturer.

C. This Section describes the process and major mechanical components comprising the Biosolids Drying System (“System”) and establishes the minimum quality standards for equipment, materials of construction, and process performance.

D. The System shall include a complete Instrumentation and Control System (“I&CS”) to provide automated and manual operations for the System. The I&CS shall be designed for unattended fully automatic operation, in conformance with the Supplier's Safety Management Plan. The I&CS shall include all materials and documentation required to install, test, and place into operation the System. It shall include all measuring elements, control devices, signal converters, transmitters, local control panels, motor control centers, digital hardware and software, Human Machine Interface, and communication networks to provide the required functionality.

E. The heating source for the System shall be natural gas with a design heating value of 920 BTU/Std. cubic foot (LHV).

F. Items to be included in the System shall include, but not be limited to, the following:

1. Inlet Hopper with Live bottoms, leveling screws, Load cells, and level transmitter.

2. Feed Pump with temperature sensor and pressure sensor.

3. A fired thermal-fluid heating system using natural gas and utilizing thermal fluid for the indirect heating application. The thermal fluid heating system shall be suitable for the design function and shall include a complete control package, recirculating pump, burner, expansion tank, and ancillary systems.

4. Indirect, thermal-fluid heated, screw dryer, to evaporate water and to produce dried biosolids.

5. Discharge conveyor for transferring the dry product from the dryer to the cooling conveyor.

6. Cooling Conveyor for reducing final product temperature prior to delivery to Owner’s storage or load-out system.

7. Multi-stage condenser for temperature reduction and removal of moisture and particulates from the dryer exhaust-gas system.

8. Odor-control system for removal of odorous emissions from the non-condensable exhaust gas system.

9. Fan(s), to remove air or other non-condensable gases through the System and to control pressure. Including oxygen sensor for monitoring & alarm.

10. Safety features or systems as applicable to the System, to meet the requirements of the Supplier's Safety Management Plan. These may include pressure-relief devices, air-lock devices, inert-gas purge and oxidant-reduction systems, water spray fire protection and prevention systems as required. Features and systems shall generate and maintain an inert or reduced oxidant atmosphere in the dryer for the prevention of deflagrations as permitted by NFPA 69.

11. A complete I&CS package for complete automatic, unattended operation, remote monitoring, and reporting.

12. Electrical system components to include electrical-power distribution, motors, motor starters, motor-control components, variable-frequency drives, junction boxes, skid- mounted raceways or conduits and skid mounted wiring as required for functionality.

13. Equipment and controls not appearing in the list above, but necessary for the complete system are not eliminated by reason of such omission and shall be provided by the Supplier unless specifically noted as being supplied by others.

14. All equipment, instrumentation, electrical components, and wiring methods shall be rated for the hazardous environment, if any, as described in the Supplier's Safety Management Plan and as required by codes and standards including, but not limited to, NFPA 70 and NFPA 499.

G. The equipment and products specified in this Section and shown on the Plans are based upon the "basis of bid" manufacturer indicated. Substitute or alternate manufacturers must be approved in accordance with the procedures specified in Section 01 25 50 - Substitution of Major Equipment Items and Products, and by written approval of the Engineer.

1.02 GENERAL

A. Division 01, General Requirements, which contains information and requirements that apply to the Work specified herein and are mandatory for this project.

B. Unit Responsibility: A single Supplier shall be responsible for supplying the Biosolids Drying System, complete with all accessories and appurtenances. The Supplier shall furnish all components and accessories of the system to enhance compatibility, ease of operation and maintenance, and, as necessary to place the equipment in operation, in conformance with the specified performance, features and functions.

C. Like items of equipment provided hereunder shall be the end products of one manufacturer in order to achieve standardization for operation, maintenance, spare parts and manufacturers' services.

D. AC Induction Motor Requirements: All drive motors on the Dryer System shall be inverter duty ready and shall meet the requirements of NEMA MG 1-2011, Part 31. Provide voltage spike resistant insulation. Capable of constant torque duty over a 10:1 speed range.

E. The control functions contained and described herein are intended to provide proposed minimum performance requirements. They do not necessarily identify each control function, connection, communications or equipment to achieve the requirements. Additional specificity and details shall be coordinated at the time of submittals.

1.03 REFERENCES

A. The following is a list of standards which may be referenced in this Section:

1. American National Standards Institute (ANSI).

2. American Welding Society (AWS).

3. American Society of Mechanical Engineers (ASME): PTC-36, Measurement of Industrial Sound.

4. ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, 2010 Edition.

5. ASTM International (ASTM): G65, Procedure A, Standard Practice for Conducting Dry Sand/Rubber Wheel Abrasion Tests.

6. Occupational Safety and Health Act (OSHA).

7. National Fire Protection Association (NFPA).

8. National Electric Code (NEC).

9. Instrument Society of American (ISA).

10. Institute of Electrical and Electronics Engineers (IEEE).

11. American Gear Manufacturers Association (AGMA).

12. Anti-Friction Bearing Manufacturers Association (AFBMA).

1.04 SUBMITTALS

A. Action Submittals:

1. System Description

a. Process Flow Diagram (PFD) and Heat and Material Balance for the System.

b. Process and Instrumentation Diagram (P&ID) for the System indicating:

i. Standard PIP & ISA symbols, numbering and terminology.

ii. Equipment and motors.

iii. Piping, ductwork, valves and other process line appurtenances.

iv. Instrumentation and control panels.

v. Power connections with voltage(s).

vi. Process control communication and analog- and discrete inputs/outputs (I/O).

c. Process description narrative including equipment operation and logic,

d. Utility Datasheet indicating electrical, natural gas, plant water, potable water and drain requirements including voltage, current, flow, temperature and pressure as appropriate.

e. Safety Management Plan for design, construction, testing, commissioning, personnel training, operations and maintenance. The Safety Management Plan shall include a section on emergency response procedures. The provisions of the Safety Management Plan shall be consistent with the requirement for unattended, fully automatic operation and shall include procedures for safe startup, operation, operating adjustments and all shutdown scenarios (standard planned shutdown and emergency shutdown).

f. Tie-point Schedule indicating size and type of “process”, “controls” and “electrical” connections.

2. Shop Drawings

a. General Arrangement drawing(s) of individual equipment including:

i. Plan and elevation views

ii. Dimensions

iii. Weights and loading

iv. Process connections

v. Access or minimum clearances for service, repair or removal

vi. Bill of Materials listing major components

b. Location plan drawing(s) indicating anchor-bolt locations with general recommended anchor-bolt grades and sizes.

i. Seismic, structural and foundation calculations and design shall be provided by others.

3. Equipment Description

a. Equipment Schedule

b. Motor Schedule, indicating inverter requirements where applicable.

c. Equipment Datasheets for major equipment including:

i. Manufacturer and model

ii. Description data, performance characteristics and efficiencies

iii. Design, code and testing requirements

iv. Materials of construction

v. Motor type, horsepower, speed, phase, voltage and service factor

vi. Speed reducer type, size, ratio and service factor

vii. Bearing type

viii. Seal type

4. Instrument and Controls Description

a. Instrument Schedule including motor controllers (variable frequency drives, VFD).

b. Electrical schematics including:

i. Power distribution also indicating location of VFDs.

ii. Programmable Logic Controller (PLC) components, inputs, and outputs.

iii. Control panel interconnections indicating terminal blocks and numbering, wiring types and labels.

iv. Control panel drawings including:

(i.) Interior and exterior plan and elevation views
(ii.) Placement of operator interface devices

c. Control description including:

i. Function description of process variables or final control elements to be monitored, controlled, alarmed and/or recorded.

ii. Process & Control narrative including logic, permissive and interlocks.

iii. Alarm and fault schedule or Cause & Effect matrix indicating instrument interfaces and automatic shutdown features.

B. Informational Submittals

1. Electronic copy of System PLC program in Rockwell software Studio 5000 format (at delivery of equipment for shipment).

2. Electronic copy of Human Machine Interface (HMI) application in Ignition Edge SCADA format (at delivery of equipment for shipment).

3. Equipment Description

4. Paint Schedule and paint specifications

5. Manufacturer’s catalog information, specifications, and materials of construction.

6. Operation and Maintenance Manual

a. Recommended spare parts with description for all equipment furnished under this section.

b. Set of complete, as-reviewed, equipment general arrangement submittals.

c. Set of complete, as-built, electrical schematics and equipment drawings.

d. Equipment Schedule, as built.

e. Detailed operating procedures for startup, normal operation, normal shutdown and emergency shutdown consistent with the Supplier's Safety and Management Plan.

f. Schedule of routine and preventive maintenance requirements.

g. Schedule of troubleshooting procedures.

C. Quality Assurance and Testing

1. Equipment Testing Procedure(s)

a. The Supplier shall submit test procedures for the following tests for review at least 2 weeks in advance of the notice to conduct the performance testing:

i. Equipment Factory Acceptance Test.

ii. Control System Factory Acceptance Test.

iii. Component Factory Acceptance Test.

iv. Site Acceptance Test (Mechanical and Electrical).

v. Performance (Field) Test.

2. Factory Quality Control

a. Factory test results, reports, and certifications including:

i. System inspection and functional test reports and certificates as per ITP document.

ii. Control panel inspection and functional test reports and certificates.

iii. Shipping, storage and protection, and handling instructions.

3. Field Quality Control

a. The Supplier shall submit test reports within 30 days after completing field testing.

b. Field test results, reports, and certifications including:

i. Supplier's Certificate of Proper Installation.

ii. Performance Test Report.

1.05 SYSTEM INTERFACES

A. Dewatered sludge cake shall be delivered to the System from dewatering device(s) via conveyor (or pump) provided by Contractor.

B. Cooling water with condensate from the Condenser shall flow by gravity to a plant drain provided by the Supplier from a nozzle on the Separator. Piping shall be provided and installed by the Supplier.

C. Non-condensable foul air from the Condenser shall flow to the Odor-Control System from the discharge nozzle on the Foul-Air Fan. Piping/ducting shall be provided and installed by the Supplier.

D. Unless otherwise noted above or shown on the Drawings, no component of the System shall be supported from the building roof or walls. The loads from the System shall be transferred to the foundation or floor slab only.

E. Some equipment components require assembly onsite. The Supplier shall provide, as a minimum, installation and assembly procedures with remote assistance to Supplier during onsite assembly of these components. Supplier will provide onsite supervisory assistance as well.

F. The Contractor shall design and supply piping systems between equipment components that are an integral part of the System. The Supplier shall be responsible for the supply and installation of the interconnecting piping and ducting.

1. The piping and ducting systems covered under this item include:

a. Sludge cake. Feed Hopper/Pump to the dryer inlet nozzle.

b. Foul air. Condenser outlet to odor control unit and Feed Hopper vent to the odor control unit.

c. Thermal fluid. Supply & return piping from the heater skid to the thermal fluid manifold at the dryer.

2. Supply and return thermal fluid piping, including support shall be issued as general design guidance. Detailed design, fabrication and installation of the piping including Piping support and insulation shall be provided and installed by the Supplier.

3. Nitrogen Gas distribution piping with all necessary supports will be designed and supplied by the Supplier.

G. The Contractor shall design and provide utility and process piping systems from the Owner’s battery-limit interface point, to the tie-point designated in the Supplier's general arrangement drawings listed herein.

1. The piping systems covered under this item include:

a. Dewatered sludge cake to the Feed Hopper(s).

b. Natural gas to the Thermal-Fluid Heater.

c. Flue gas from the Thermal-Fluid Heater.

d. Cooling water to the Condenser, & cooling screw.

e. Condensate drains from the Condenser.

H. The Supplier shall design and furnish to Owner all components necessary for installation of the electrical systems that are an integral part of the System including motors, motor starters and associated controls, variable frequency drives (VFD), control panels, instrumentation and all other electrical components as described in this Section.

The Supplier shall design and provide electrical power connections from the Suppliers Power Distribution Panels and Motor-Control Center (MCC) battery-limit interface point designated on the Drawings, to the tie-point at control panels designated in the Supplier's general arrangement and electrical schematic drawings listed herein.

1. The electrical power connections covered under this item include:

    a. Dryer Control Panel

    b. Dryer Motor VFD Panel

    c. Dryer UPS Panel

    d. Thermal-Fluid Heater Local Panel.

J. The Supplier’s Control System shall interface with the Owner’s Plant Control System via Ethernet cabling or Fiber as described herein and as shown on the Drawings.

1.06 SAFETY REQUIREMENTS

A. All equipment furnished shall be designed and manufactured with due regard to safety of operation, accessibility, durability, maintainability, or replacement of parts and shall comply with all applicable provisions of the Occupational Health and Safety Act and other federal, state, and local safety regulations. The System safety provisions shall comply with the Supplier's Safety Management Plan.

PART 2 – PRODUCTS

2.01 GENERAL

A. The System shall consist of the various parts and components as described herein under Part 1 - General. The System shall be capable of continuous operation with a minimum of maintenance.

B. The System shall be suitable for installation in the Owner’s Building.

C. This Section generally describes materials of construction to be used for primary equipment, however, due to variability in the equipment provided by Suppliers, equipment material selection shall be based on a design life of 20 years, considering the anticipated corrosion and abrasion potential of typical municipal sludge in this application.

2.02 SUPPLIER

A. Modifications to Standard Equipment Model Offerings:

1. Listing of a Supplier within this Section shall not be justification for acceptance of the manufacturer's standard model offering.

2. Equipment provided by a listed Supplier shall be furnished and designed or modified as necessary to conform to the performance, functions, features and materials of construction as specified herein.

B. The Biosolids Drying System shall be from the following pre-qualified manufacturers:

1. BCR Bio-Scru, or equal.

2.03 SERVICE CONDITIONS

A. Design Criteria: The Project Design Criteria is summarized in Table 1 (following). The Design Criteria reflects the target dewatering cake solids content of 16 %TS so as optimize feedstock conveyance, bin storage and pumping, and moisture evaporation of the dryers' system.

Table 1: Project Design Criteria

Description	Design Capacity 7836 Dry Lb./Week
Dewatered Cake Solids (%)	20%
Final Product Solids (%)	90%
Wet Solids Feed Rate - LB_{wet}/hr	1,937
Dry Solids Feed Rate -LB_{dry}/hr	387
Final Product Rate – LB_{dried}/hr	431
Evaporation Rate – LB/hr	1,507
Number of hours of Operation Per day	24.0
Number of days of Operation Per week	7

B. The material to be dried will be polymer-conditioned, partially-digested and centrifuge dewatered sludge. The sludge will originate from secondary biological treatment of municipal wastewater, without separate primary clarification treatment. The characteristics of the sludge may fall anywhere within the ranges listed below:

Table 2: Project Sludge Characteristics

PARAMETER	CONDITION	METHOD OF ANALYSIS
Nominal Sludge Type	100% Undigested	N/A
Sludge Feed Concentration (% Dry Solids)	16% to 20%	SM 2540G
Sludge Volatile Solids Concentration (% Dry Basis)	60% -75%	SM 2540G
Total fiber content (%-DS)	< 20	NEUTRAL – ANKOM METHOD OR EQUIVALENT
FOG. -Hexane Extractable Material (mg/Kg-DS)	<30,000	EPA 9107B
Total Petroleum Hydrocarbons (mg/Kg-DS)	< 500	EPA 418.1
Sludge Cake Temperature (°F)	60-95	N/A
Sludge pH	6.0 to 8.0	SW-9045A
Maximum Cooling Water Temperature (°F)	72	N/A

C. The Biosolids Drying System shall be designed to evaporate moisture at the stated rate and process the solids for a dewatered sludge cake feed as specified in the table of conditions above.

D. The thermal fluid temperature fed to the Dryer shall not exceed 550°F.Typically the thermal fluid heater would be 425 to 495°F

E. The dewatered sludge cake to be dried will be fed to the System from the Owner's conveyor/pump into Feed Hopper(s).

F. Sludge shall be dewatered using the Owner's Centrifuge.

2.04 PERFORMANCE REQUIREMENTS

A. The Dryer System shall continuously receive and dry the feed sludge specified above, and continuously discharge the dried solids into a load out conveyor located in the Owner's Building. The Dryer System shall be able to operate:

1. Continuously on demand and shall be suitable for drying the specified sludge continuously for up to 24 hours per day, 7 days per week

2. Without spillage of wet or dry sludge within the Supplier's scope of equipment supply.

B. The System shall dry the feed solids to meet EPA 40 CFR Part 503 Class A pathogen and vector-attraction reduction criteria. Suitable process control systems or features shall be incorporated to ensure these criteria are met on a continuous basis.

C. Supplier shall guarantee that the System shall be capable of the performance requirements specified below, to be confirmed via the field performance testing specified herein while operating with the design basis sludge stream described under the project design criteria and the project sludge characteristics:

PARAMETER	SYSTEM DESIGN BASIS
Guaranteed Minimum Dried-Solids Concentration (% Dry Solids)	90%
Guaranteed Evaporation Rate (LB/hr)	1,507
Thermal Energy - Natural gas (LHV) usage at Guaranteed Evaporative Rate – Ft^3/Hr	2,424[1]
Electricity usage at Guaranteed Evaporative Rate– kWh/1000 LB Water Evaporated	27[2]
Noise levels from dryer system (decibels) in the dryer building	< 85 dB[3]
Required time for start-up - Minutes	20 - 35
Required time for shutdown - Minutes	90-180
Maximum Cooling Water Temperature (°F)	72
Comply with 40CFR Part 503 Requirements	Class A PFRP

Notes:
1. Natural gas flow is calculated based on 920 BTU/Ft3 LHV and the thermal heater skid efficiency of 86% (LHV). Also includes 4% heat loss in the dryer and thermal fluid piping.
2. Consumed electrical power by equipment mentioned included by dryer Supplier in this specification. Does not include load out or bagging system
3. Noise level in the dryer building will be less than 85dB. The thermal fluid heater skid - including Recirculation pump & the combustion fan are placed in an enclosed area with sound barriers. This does not include any building ventilation or items other than provided by Supplier.

D. Evaporation Rate:

$$\dot{M}_{Evaporation} = \dot{M}_{Feed\ Dry\ Solids} \times (1/X_{Feed\ Dry\ Solids} - 1/X_{Product\ Dry\ Solids})$$

where:

$\dot{M}$ = mass flow rate, lbs/hr

X = mass fraction dry solids, lbs/total lbs

E. The system shall be capable of turndown to a processing (evaporation) rate of 50% of the design rate and operate continuously at that rate in a stable fashion.

2.05 SLUDGE DRYING FUNCTIONAL REQUIREMENTS

A. The System to be supplied under this Section shall meet all the specified duties and capacity requirements and shall be designed to meet all requirements and conditions set out herein.

B. The System shall be designed for unattended, fully automatic operation consistent with the Supplier's Safety Management Plan, with start and stop being initiated locally at the Dryer Control Panel Human Machine Interface, or remotely through the Owner's Plant Control System. The System shall be suitable for either batch or continuous operation up to 24 hours per day, 1 to 7 days per week.

C. The System shall operate automatically with full process-, safety- and control interlocking for instances of:

1. Normal sequential startup of equipment.

2. Sequential startup of equipment following an abnormal shutdown, loss of power or emergency shutdown, activated by interlock or operator initiation.

3. Normal sequential shutdown on operator request or selected process events or conditions (such as empty Feed Hopper(s) or full product storage), reverting to a safe process condition.

4. Emergency sequential shutdown from critical fault alarm or operator request.

5. Where permissible, pause on occasions of select equipment faults to allow operators to remedy fault condition.

6. Pause up to 30 minutes, without feed and without discharging material, to allow operators to switch remove or replace storage containers (trailers, bins, Super-Saks, etc.)

2.06 EQUIPMENT DESCRIPTION

A. Dryer Feed System:

1. General:

a. The dryer feed system shall consist of the following equipment:

i. Inlet Hopper(s), quantity one (1).

ii. Inlet Hopper Live-Bottom Screws, quantity two (2) per Hopper.

iii. Inlet Hopper Leveling Screws, if required.

iv. Feed Pump, quantity one (1).

v. Load cells and controller.

b. The sludge conveyance system shall provide positive conveyance of dewatered sludge from the Hopper(s) to the Dryer.

c. Have automation to ensure stable feed rate across all possible head pressure or solids levels in the feed hopper.

2. Inlet Hopper(s):

a. The Hopper(s) shall receive dewatered sludge cake from the dewatering unit located adjacent to the hopper, on a higher elevation.

b. The Hopper shall have a total capacity of 20.0 cubic yards.

i. The maximum sidewall height of the Hopper(s) shall not exceed twelve (12) feet Overall All Height (OAL) above the finished floor to allow feed from the dewatering conveyance, and to allow dumping. The final dimensions shall be determined following submission of Shop Drawings.

ii. The shell of the Hopper(s) shall be a minimum or ¼" thick CS.

c. The Hopper(s) shall be covered to prevent the emission of odors. The cover of each Hopper shall include the following connections:

i. One 12-inch square flanged connection shall be provided for the screw conveyor discharge chutes (by others).

ii. One 4-inch diameter flanged connection shall be provided for a foul-air collection duct (by others).

iii. One 4-inch diameter flanged connection (if required) shall be provided for a pressure-equalization vent.

iv. One 3-inch diameter flanged connection shall be provided for a level transmitter.

v. One 18-inch or larger, round or square access hatch for maintenance.

vi. The final location of all connections shall be determined following submission of Shop Drawings.

d. The Hopper(s) shall include (2) shafted-, ribbon-type, live bottom screws to direct dewatered sludge cake into the suction of the Feed Pump.

i. Each screw shall be separately driven with a geared reducer/motor unit. Each motor shall be inverter grade and controlled by a variable-frequency driver (VFD).

e. Level in the Hopper(s) shall be measured with weigh cells or an alternative reliable level measurement sensor as per Supplier Design.

f. Paint and Coatings (only for Carbon Steel Construction)

i. The Hopper(s) shall be painted or coated per Supplier's standard specifications. See Section 2.10 – Painting

ii. The interior of the Hopper(s) shall be epoxy-coated suitable for immersion and corrosion resistance.

iii. The exterior of the Hopper(s) shall be painted with Supplier's standard colors.

Feed Pump

a. The Feed Pump shall be an open-throat configuration, progressive-cavity style pump designed specifically for pumping of dewatered sludge.

i. The pump shall be fed dewatered sludge cake from the live-bottom screws of the Hopper(s) and shall be capable of pumping the sludge at any point within the range of sludge conditions described listed in Service Conditions in this Section, with a minimum 20% safety factor.

b. Materials of construction shall be suitable for the service.

i. Rotor: tempered C45 steel with ductile chromium coating

ii. Stator: Nitrile butadiene rubber (NBR)

c. The driver for the pump shall not exceed 50 rpm design speed at the maximum volumetric pumping rate and shall include:

i. Motor: Inverter grade, 1800 rpm

ii. Variable-frequency drive (VFD)

iii. Gear reducer

d. High pressure-, over-temperature- and run-dry protection shall be provided for the pump.

e. Design, and supply of the discharge piping & support from the Feed Pump to the Dryer shall be provided by the supplier. Installation shall be the responsibility of the Supplier

f. The Feed Pump shall be Seepex or equal.

B. Thermal Fluid Heating System

1. General

a. The Thermal-Fluid Heating System shall be skid-mounted, pre-wired, pre-plumbed and factory tested to facilitate installation.

b. The Thermal-Fluid Heating System shall be located generally as shown on the Drawings, allowing for personnel access and maintenance clearances as indicated.

c. The primary fuel source for the Thermal Fluid Heater shall be natural gas.

d. A dedicated fuel-gas flow/totalizer shall be provided by others.

e. Combustion gases from the heater to be ducted out of the building to a stack.

f. Contractor will design & supply a double wall stainless steel stack rated for 1,400°F maximum height from heater is 60'.

g. The stack shall include a barometric damper.

h. The Thermal Fluid System shall include a “Cooldown” mode in which the burner is off (not firing) and the Combustion-Air Blower and the Thermal-Fluid Pump are operated simultaneously to dissipate heat from the Dryer System at maximum rate.

i. All components of the Thermal-Fluid System shall be coated with a high-temperature paint rated for at least 850°F, Flame Control 850 Series, per Supplier’s standard specifications or equivalent.

j. Thermal fluid shall be Paratherm NF or equivalent. The Thermal Fluid shall be a non- toxic, mineral-oil based heat-transfer fluid rated for use in closed-loop systems to 600°F. The fluid shall have a flash point above 300°F and a boiling point above 650°F.

2. Thermal Fluid System Local Panel

a. The Panel shall be a NEMA-12 enclosure mounted and pre-wired on the Heater skid.

b. The Panel shall include the flame-failure system and all other controls necessary for safe operation as specified in this Section.

c. The Panel shall include the following features and controls:

i. Status indicator lights

ii. Audible alarm horn

iii. Output signals to the Dryer System Control Panel:

(i.) BMS alarm

(ii.) Thermal-Fluid Pump alarm

(iii.) Stack high-temperature alarm

(iv.) Burner on

(v.) Thermal-Fluid Pump on

(vi.) Heater outlet temperature (analog)

(vii.) Stack temperature (analog)

iv. Input signals to the Dryer System Control Panel:

(i.) Heater System start/stop

(ii.) Pump start

(iii.) Burner start/stop

(iv.) Cooldown mode start

(v.) Firing rate (analog)

3. Thermal-Fluid Heater

    a. The Heater shall be designed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

        i. The heater shall be suitable for design temperature and pressure as required by the Biosolids Dryer.

        ii. The Heater shall have an ASME code stamp.

        iii. The Heater shall include one or more pressure-relief valves on the discharge of the Heater with a relief setting not exceeding the maximum allowable working pressure (MAWP) of the Dryer.

    b. The burner shall meet the following requirements:

        i. The burner shall be designed to not exceed 85 ppmv NOx as measured and corrected at the stack.

        ii. The burner shall meet or exceed all applicable codes and regulations and shall be arranged and piped to ASME CSD 1 and Factory Mutual standards.

        iii. Combustion-air and fuel-gas trains shall be in accordance with NFPA standards and all applicable codes.

        iv. The burner shall be forced draft and provided with a combustion-air blower.

        v. The burner shall be sized for the maximum and minimum heating loads with 10:1 modulation turndown ratio.

        vi. The burner shall include a flame-failure system including:

            (i.) Infrared flame sensor

            (ii.) Burner Management System (BMS), Siemens LMV5x or equal.

            (iii.) High- and low fuel-gas pressure switches.

    c. The heat exchanger coil shall meet the following requirements:

        i. The maximum allowable working pressure (MAWP) shall be 150 psig at 650°F.

        ii. Materials of construction: SA106B.

4. Thermal-Fluid Pump

    a. The Pump shall be a centrifugal pump with

        i. The Pump shall include ball bearings and air-cooled mechanical seals.

    b. The Pump shall be suitable for design flow, temperature and pressure as required by the Biosolids Dryer.

c. Materials of construction:

i. Casing: ductile iron

ii. Impeller: cast iron

iii. Seal: 316 stainless steel/Silicon carbide

5. Thermal-Fluid Piping

a. Piping shall be designed in accordance with the ANSI Power Piping Code, B31.1.

b. Valves shall be rated for thermal fluid duty and shall include stainless steel bellows seals.

c. Where required to accommodate thermal expansion, flexible hoses shall be 316 stainless-steel corrugated hoses with external 304 stainless-steel braided reinforcement.

6. Expansion and Catch Tanks

a. The Expansion Tank shall be sized for 150 percent (150%) of the estimated change in thermal-fluid volume between ambient and operating temperature.

b. The Expansion Tank shall be designed to function as a de-aerator and operate at near atmospheric pressure. The expansion tank shall have a nitrogen blanketing system to reduce oxidative stress. The Expansion Tank shall vent to the Catch Tank.

c. Vent, drain, overflow and discharge lines from the Expansion Tank and thermal-fluid pressure relief valves shall be routed to the Catch Tank.

i. The Catch Tank shall be operated dry.

ii. The Catch Tank shall vent to a safe location outside the building. Vent piping shall be provided by the Supplier.

d. The Expansion and Catch Tanks shall be constructed of carbon steel.

7. The Thermal-Fluid Heater System shall be manufactured by Fulton or Thermal Process Development (TPD) or equal.

C. Dryer

1. General:

a. The Dryer shall be designed to operate with an oxygen-deficient atmosphere.

b. The Dryer shall consist of two (2) parallel, hollow-flite augers units and a jacketed enclosure. The Auger shall be 18” diameter at the minimum

i. Total heat exchange area shall be not less than 450 square feet.

c. The Dryer shall be heated with thermal fluid as described in this Section.

d. The Dryer Auger shall be subjected to Finite Element Analysis (FEA) Fatigue stress assessment. The objective of this analysis is to confirm design through the finite element analysis (FEA) method and show that the augers will conform to the design and fatigue specifications for a 40-year service life as per ASME best practices.

e. The Dryer shall be designed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

i. Each component of the Dryer containing thermal fluid under pressure, such as housing jacket, & auger, shall have an ASME code stamp.

ii. Materials of construction (heated): Carbon steel.

f. The Dryer shall be skid-mounted on a single base/frame constructed of A36 carbon steel to provide support for the shaft bearings, drive assembly and any ancillary equipment, piping, instrumentation, and local control panels.

i. The base/frame shall be supported by legs constructed of A36 carbon steel provided by the Supplier.

g. Bio Solids dryer shall include below features as a minimum

i. Reversible auger to enhance mixing and heat transfer.

ii. The augers units shall be equipped with tabs to promote local solids mixing and heat transfer.

iii. Independent-driven augers with absolute position encoders and controls which permit relative speed control and close approach of flights to facilitate solids mixing and surface cleaning.

Independent-driven augers also allows for Pause or “Rock mode” up to 30 minutes, without feed and without discharging material, to allow operators to remove or replace storage containers (trailers, bins, Super-Saks, etc.).

2. Safety Requirements: To prevent deflagrations and emissions and in conformance with the Supplier’s Safety Management Plan:

a. The Dryer shall include remotely actuated water sprays and controls to quench temperatures for deluge.

b. The Dryer shall include a continuous nitrogen purge and controls as required to generate and maintain an inert (non-oxidizing) atmosphere within the Dryer.

c. Per the requirements of NFPA 69, Chapter 7: “Deflagration Prevention by Oxidant Concentration Reduction”, the Dryer shall include a sensor to monitor oxygen concentration inside the Dryer housing.

d. The Dryer housing shall have sufficient void space above the operating level of wet/dry sludge to allow for removal of vapors at a superficial velocity the lesser of 1.5 meter/second or 20% of the estimated entrainment velocity to minimize dust entrainment and the associated hazards. The Supplier shall submit calculations with the Safety Management Plan to the Engineer as part of the action submittals.

e. The Dryer shall be designed as a closed, sealed system to minimize air leakage into the Dryer and shall operate at a slight negative pressure to prevent emission of odors.

3. Dryer Enclosure

a. One (1) enclosure with a smooth inner surface and external jacket integrally welded to the enclosure wall.

i. The lower trough of the enclosure shall be configured to allow inter-meshing of the auger and a nominal clearance of ½" (inch) or less between the augers and enclosure.

b. End cover plates shall include stuffing boxes to provide shaft seals and permit removal of the auger/agitator shaft(s).

i. Stuffing boxes shall include ports for application of lubricant

c. The Dryer shall include the following process nozzles:

i. The dryer chamber shall include at least three (3)top-mounted, flanged inspection ports.

ii. Two (2) end-cover-mounted flanged access ports.

iii. One (1) 6" (inch) flanged round nozzle, Class 300, on one end-cover access port for sludge feed.

iv. One (1) top-mounted flanged rectangular nozzle at the feed end for the vapor vent.

v. One (1) bottom-mounted flanged rectangular nozzle opposite the feed end, for dried product.

vi. Multiple redundant thermocouple nozzles located along the length of the dryer, top and bottom, to monitor solids and vapor temperature for process control and compliance verification.

d. Prior to insulation, the Dryer housing shall primer-painted with one coat high temperature paint.

e. The Dryer housing shall be insulated and cladded with stainless-steel sheet metal to maintain the outer surface temperature < 140°F.

4. Dryer Augers:

a. Two (2) shaft-mounted, heated, inter-meshed and counter-rotating augers fabricated with hollow cavities and baffling to permit flow of heat-transfer fluid.

b. The auger back flites shall have mixing/cleaning tabs.

c. One end of each shaft shall be hollow to permit the passage of thermal fluid into and out of the auger.

i. Each shaft shall be equipped with a dual-port, rotary union, Kadant ELSJA or equivalent.

ii. The fixed/rotary seal design shall be spring loaded to maintain seal pressure, and the seal ring shall be carbon impregnated with antimony with front and rear carbon guides.

iii. The shaft shall be supported by a precision split graphite bearing.

d. One end of each shaft shall be solid to permit attachment of a gear reducer and a motor.

i. The motor should be rated for inverter duty.

ii. The gear reducer should be manufactured by Dodge or Nord or equal and shall include an electronic absolute-position encoder to monitor shaft rotational position.

iii. The shaft shall be supported with lubricated spherical roller bearing.

e. The independently driven auger rotating at low speed expends minimum energy and hence less erosion of the drying surfaces. The system should include automated self- cleaning of the auger as below:

i. The control system will continuously monitor the energy transferred (as measured by the ΔT between the Dryer inlet and outlet hot oil temperature) to the biosolids. If it drops over a specified setpoint, it indicates a fouled auger flite. If self-cleaning feature is set to “on demand” mode, it will initiate a cleaning cycle for a specified time period.

ii. The independent auger VFD will adjust the auger speed so that the intermeshed auger closes to increase the shear for a controlled period, thus cleaning the flite's face. The control system, along with the electronic absolute encoder, will modulate the VFD and prevent the flite from crashing into each other.

D. Inert-Gas Purge System

1. As per the Supplier’s Safety Management Plan, the Supplier shall provide an inert-gas (nitrogen or equivalent) purge system to purge or blanket the dryer.

2. The Supplier shall provide all necessary appurtenances, including but not limited to, regulator, valves, gauges, switches, and controls for safe and effective operation of the System.

a. The Purge System shall be factory wired and plumbed to the Dryer skid to maximum extent possible.

b. The inert gas supply piping shall be provided by others.

E. Vapor Condenser

1. General:

a. The Supplier shall provide a multi-stage, direct-contact spray condenser using plant cooling water to condense the Dryer vapors.

i. The cooling water/condensate mixture and the exhaust vapor shall not exceed 130°F.

b. Materials of Construction:

i. Wetted vessel materials shall be Type 304 stainless steel.

ii. Internal piping shall be Type 304 stainless steel.

iii. Spray nozzles shall be Type 316 stainless steel.

c. The Condenser shall include a flanged inspection port for each spray nozzle.

d. The Supplier shall provide a flow transmitter and Temperature transmitter for the main cooling water inlet flow to the Condenser.

i. The flow signal shall be a permissive signal for Dryer startup.

2. Separator

a. The Supplier shall provide a gas-liquid Separator to remove and collect the cooling water/condensate from the Condenser exhaust stream.

i. The Separator shall include an internal liquid trap to prevent foul-air vapors from exiting the bottom drain nozzle and entering the drainage system.

ii. Wetted vessel materials shall be Type 304 stainless steel.

iii. The Separator shall include a flanged inspection port.

b. The Supplier shall provide a flow transmitter along with the temperature transmitter for installation at the combined outlet of the condensate drain and cooling screw water outlet.

c. The Supplier shall provide an oxygen analyzer along with the temperature transmitter between the second stage condenser outlet and foul air fan:

i. If the oxygen level exceeds 10% v/v, an alarm is generated, and the operator needs to check and adjust the nitrogen supply to maintain the inert environment inside the dryer.

ii. If the oxygen level exceeds 13% v/v, it should trigger a controlled shutdown of the dryer.

iii. If the non-condensable gases temperature exceeds 120oF, an alarm will be generated, and the operator will need to check and adjust the condenser cooling water flow.

F. Foul-Air Fan

1. The Supplier shall provide a Foul-Air fan to withdraw non-condensable vapors from the Condenser and forward to the Odor-Control System.

a. The Fan shall be variable speed to control Dryer pressure.

b. The Fan shall include:

i. SS 304 casing and impeller.

ii. Stainless steel shaft with Viton seal.

iii. Inverter-duty motor.

c. Piping between the Condenser and the Foul-Air Fan shall be provided by the Supplier. Piping material shall be Type 304 stainless steel.

G. Odor Control

1. General

a. Supplier to provide odor control system for the control of dryer generated non- condensable gases, including H2S and other noxious odors as shown on drawings and specified herein. The odor control system shall be activated carbon and other dry media system consisting of a media containment vessel, dry media, mist filters, interconnecting ductwork and other appurtenances for a complete operating system.

i. Odor control unit (forced draft type) will receive odor air transported by a centrifugal fan (foul-air fan) under pressure into the odor scrubber unit and discharge out the stack extending above the building roofline (stack by others/contractor).

ii. The Odor Control Scrubber system shall include inlet Mist Eliminator. Media shall be bagged and shipped separately for the Supplier's installation in the field.

2. Tank

a. The tank shall be constructed of HDPE or Polypropylene, rated for air temperature of 50 to 150 degree F.

b. The odor scrubber system shall be designed for the following operating conditions and shall meet the following performance criteria throughout minimum 16,000 operating hours of media: Design Airflow rate: maximum (SCFM) 150, typical (SCFM) 5. Air velocity maximum of 12 FPM across media. The system shall demonstrate the below performance from 50-120°F flow conditions.

i. Inlet: 1-10 ppm H2S, Outlet ≤ 0.05 ppm H2S

ii. When Inlet is higher than 10 ppm H2S, system shall display 99.5% removal or greater.

3. Mist Eliminator

a. Provided to remove any greases or mists in air stream. One pad provided with the unit inlet.

b. Sized to product a dirty head loss of ~ 2.0" WC at end of operating life. Clean head loss to be less than 0.5" WC

c. Permanent washable type provides 99.95% grease/mist removal after cleaning.

d. Mist eliminator serviced through an access door complete with compression gaskets and quick release closer.

4. Differential pressure gauges

a. Differential pressure gauges will be provided to continuously monitor the pressure drop across the mist eliminator pad, and the media bed. These gauges will be mounted to the skid and pre-plumbed.

5. Scrubber Media

a. Media shall be designed specifically for catalytic oxidation of hydrogen sulfide, mercaptans, and trace quantities of organic pollutants found in sludge dryer off- gases. Caustic-impregnated and water regenerable carbon will not be acceptable.

b. The hydrogen sulfide removal capacity of the carbon media shall be a minimum of 0.36 g/cc as measured by ASTM Method D 6646-03

H. Discharge Conveyor

1. General:

a. Conveyor operation shall be linked to dryer operation and startup/shutdown processes and shall be interlocked to prevent any unit from operating if any of the downstream conveyors are not operating. During a shutdown, the conveyors shall operate for an adjustable time period after the dryer is shut down to assure that they have been cleared of dried biosolids. Full function of downstream conveyance shall be a permissive for operation of the Dryer.

2. Description:

a. The Discharge Conveyor housing shall be closed and circular. A covered U-trough design is not permitted.

b. Discharge Conveyor housing shall be Stainless Steel 304 materials of construction.

c. The Discharge Conveyor tubular housing shall be insulated with removable blankets consisting or 1” (inch) mineral wool insulation covered with a polyester fabric to maintain the outer surface temperature below 140°F.

d. The auger shall be hollow-shaft, solid flight. Materials of construction shall be SA-36 and SA-106-B carbon steel.

i. Flights at the inlet shall be tapered to prevent compacting the dried solids and plugging.

ii. Shaft bearings shall be sealed Dodge, Type E roller, or equivalent.

iii. Shaft seals shall be lubricated CEMA labyrinth.

e. The Discharge Conveyor shall include a variable speed gear-motor drive.

i. The motor shall be inverter duty and controlled by a VFD.

ii. The gear reducer shall be manufactured by Nord, SEW or equal.

f. The Discharge Conveyor shall be direct-connected and suspended from the Dryer. It shall also be supported on the Cooling Conveyor inlet flange.

I. Cooling Conveyor

1. General:

a. Product cooling shall be provided to cool the dried biosolids. as stated in the Performance Requirements prior to storage or load-out.

i. Cooled biosolids shall not exceed the lesser of the temperature as stated under Performance Requirements listed in this Section or 120°F.

ii. The cooling water supply line to the Cooling Conveyor shall include an actuated shut-off valve (SOV).

(i.) Cooling water shall flow in series from jacket to auger before discharge.

b. Product coolers shall be designed assuming plant effluent will be the cooling medium. The maximum temperature of the plant effluent will be as stated under Service Conditions listed in Table 2 above.

c. To prevent air intrusion into the Dryer, the Cooling Conveyor shall include a Rotary air lock Valve on the outlet.

Conveyor operation shall be linked to dryer operation and startup/shutdown processes and shall be interlocked to prevent any unit from operating if any of the downstream conveyors are not operating. During a shutdown, the conveyors shall operate for an adjustable time period after the dryer is shut down to assure that they have been cleared of dried biosolids Full function of downstream conveyance shall be a permissive for operation of the Dryer.

2. Description:

a. The Cooling Conveyor housing shall be closed and tubular. A covered U-trough design is not permitted.

b. The Cooling Conveyor shall be designed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

i. Each component of the Cooling Conveyor containing water under pressure, such as the housing and auger, shall have an ASME code stamp.

c. The housing shall be jacketed. Materials of construction shall be SA-53 and SA-36 carbon steel.

d. The auger shall be hollow-shaft, solid flight. Materials of construction shall be 304 stainless steel.

i. One end of each shaft shall be hollow to permit the passage of cooling water into and out of the auger.

(i.) Each shaft shall be equipped with a dual-port, rotary union, Kadant ELS or equivalent.

(ii.) Shaft bearings shall be sealed Dodge, Type E roller, or equivalent.

(iii.) Shaft seals shall be lubricated CEMA labyrinth.

e. The Cooling Conveyor shall include a variable speed gear-motor drive.

i. The motor shall be inverter duty and controlled by a VFD.

ii. The gear reducer shall be manufactured by Nord, SEW or equal.

f. A temperature sensor shall be provided in the Cooling Conveyor discharge.

g. The Cooling conveyor shall include a floor-mounted base at the inlet end and the Supplier shall provide a vertical, floor-mounted stanchion to support the Cooling conveyor at the discharge end.

h. The Cooling Conveyor housing shall be coated per painting specifications listed in the Section 2.10 Painting.

i. The Cooling Conveyor shall include a motor/chain-driven Rotary Valve at the outlet.

i. Materials of construction shall be carbon steel rotor, stainless-steel housing, and UHMWPE wipers.

2.07 PROCESS CONTROL SYSTEM (PCS)

A. Control Panels:

1. The Supplier's control-system development shall be coordinated with the Owner’s plant- wide Control System prior to beginning software development.

2. Dryer System Control Panel: The Supplier shall provide a Control Panel, a Motor Control Panel (MCP), and an UPS Load Center, Located in either electrical equipment room or any safe area. Supplier shall also provide a Remote I/O (RIO) panel located at the Dryer, as well as a junction box near the Feed System. The packaged Thermal Fluid Heater System shall have a motor load and control panel affixed to its skid structure.

a. The RIO Panels (Dryer) shall be NEMA 4X, stainless steel, dust tight.

3. The Dryer System Control Panel shall be a wall mounted enclosure, to house the controls equipment, with no components energized with greater than 120VAC power. The Dryer System MCP shall be a freestanding enclosure, to house circuit breakers, motor starters, overloads and VFDs) equipment. The MCP shall include the following:

a. The MCP will have a single point 480VAC supply along with power meter. The MCP shall be intelligent and shall be networked with the Master Control Panel by Ethernet/IP as required. The VFDs for motors rated up to 100 HP shall be integrated in the MCP.

b. VFDs for motors rated 100 hp and higher shall be standalone units.

c. A 120VAC, single-phase power feed from building distribution will feed a separate UPS panel. The UPS will be supplied to power all DC power supplies, PLC, Ethernet switches, the HMI display terminal, and any critical safety equipment such as purge/deluge valves, fire monitoring systems, etc.

4. The Dryer RIO panel shall be a rack mounted NEMA 4X enclosure located at the Dryer skid. The RIO panel shall house Allen Bradley Point I/O. All skid instrumentation used to monitor Dryer process conditions and control local valves shall be marshalled to the RIO panel. Power to the RIO panel shall originate from the UPS. The RIO panel shall include an Ethernet adaptor to communicate with the Dryer Main Control panel. If required by the Safety Management Plan, an inert gas purge kit shall be installed on the RIO panel to meet NEC Class II, Division II Hazardous area requirements.

5. The Thermal Fluid System Local Panel shall be a skid-mounted enclosure to house the control equipment for the Thermal Fluid System. It shall contain, at a minimum, the following:

a. A main circuit breaker with a through-the-door lockable handle. This breaker shall serve as a single-point 480VAC, three-phase, three-wire power connection to the panel, and all other power and control required shall be derived from this single source via the necessary branch breakers and step-down transformers. The 480VAC main power connection shall be from the Owner's MCC or distribution.

b. Motor starters with overloads for all constant speed motors provided under this Section.

c. Step down transformer to supply the Thermal Fluid System separate control panel and instruments.

B. Controls

1. The controls for all components of the System shall be provided by a dedicated programmable logic controller (PLC) mounted in the Dryer System Main Control Panel.

a. The PLC shall be, without exception, Allen-Bradley CompactLogix or Contrologix series.

b. The PLC shall provide all control and monitoring functions as required for the operation and monitoring of the System including, but not limited to, timing, interlocks, permissive functions, startup sequencing, normal- and emergency shutdowns required for safe operation.

c. The PLC shall communicate with the Owner's plant-wide control system via Ethernet/IP as specified herein. Ethernet connection between the PLC and the plant- wide control system shall be separate from the Control Panel Remote I/O Ethernet network.

d. To allow Supplier remote access to the PLC and HMI via VPN for maintenance and support, an ethernet router shall be included

2. Human Machine Interface (HMI):

a. The Panel Mount HMI shall be a 19-inch industrial touch panel, coupled to an internally mounted, fan less, industrial PC running Ignition Client SCADA software.

b. The SCADA software will be capable of data historian function, with local storage provided, and options for remote data storage (by others or Supplier service agreement).

c. The panel mounted HMI shall provide the primary method for an operator to monitor the status of the System and to affect its operation by command or directive entry. Additionally Supplier can provide a PDA/tablet with wireless (WIFI only) access shall also be provided as a mobile HMI alternative to monitor and control the System. The HMI shall provide the Graphics User Interface between the operator and the PLC that controls the functions of the System. The graphics and their layout/presentation shall be by the Supplier and configured specifically for the System covered under this Section.

d. The HMI shall provide all displays and control screens needed to monitor and control the System safely and efficiently.

e. At a minimum, the HMI shall provide for selection of the following:

    i. System Control Mode: LOCAL-REMOTE

    ii. System AUTO-START

    iii. Sludge Feed Rate Setpoint (0-100%)

    iv. Setpoints for all critical temperatures as recommended by the Supplier.

    v. System AUTO-STOP

    vi. System EMERGENCY-STOP

    vii. System PAUSE

    viii. System RUN (un-pause)

    ix. Adjustable set-points to be defined by the Supplier.

f. Display and make the associated signals available to the Owner's plant-wide control system via Ethernet:

    i. Warning and Fault Alarms, including but not limited to:

        (i.) Feed Hopper(s) LOW level

        (ii.) Feed Hopper(s) HIGH-HIGH level (to stop feed to Hopper(s))

        (iii.) Start or Stop Sequencer Failure

    ii. Status of each system component

    iii. All system temperatures including:

        (i.) Dryer

        (ii.) Dryer thermal fluid supply and return

        (iii.) Thermal-Fluid Heater System

(iv.) Stack

(v.) Cooling Conveyor Discharge

(vi.) Condenser

(vii.) Cooling Water

iv. Speed of each VFD

v. Dryer auger VFD current

vi. Sludge Level in the Feed Hopper(s)

vii. Thermal Fluid System status

viii. Status of safety systems including inert-gas purge and water sprays

ix. Status of system components NOT is automatic mode

x. Sequence Step

xi. Sequence Timers

g. Display signals from the Owner's plant-wide control system via Ethernet including:

i. Thermal-Fluid System AUTO-START

ii. System AUTO-STOP

iii. System PAUSE

iv. System RUN (un-pause)

v. Sludge Feed Rate Setpoint (0-100%)

vi. System Power FAILURE

vii. Setpoints for all critical temperatures as recommended by the Supplier.

C. Program Sequence:

1. The PLC shall contain all programming necessary to safely start, stop, and operate the System, in either the LOCAL or REMOTE mode. The following minimum conditions and sequences shall be provided.

a. The control system shall confirm the successful initiation and/or completion of each step in the sequence before continuing with the next step in the sequence.

b. Proper sequencing shall be as required by the Supplier to meet the conditions of the Safety Management Plan, and the overall operational plan outlined herein.

c. If any step in this sequence fails, the PLC shall generate an alarm specifying the failed step.

2. In LOCAL mode, System control shall only be available through the Dryer System Control Panel. All outputs to PCS shall still be available in LOCAL mode.

3. In REMOTE mode, AUTO-START, AUTO-STOP, EMERGENCY STOP and process control setpoints shall be from the PCS.

4. AUTO-START: This command shall instruct the control system to begin the start sequence. The system shall begin the controlled heat-up cycle, and permissive shall be employed to prevent undesirable or unsafe conditions from occurring.

5. AUTO-STOP: This command shall instruct the control system to begin its normal shutdown sequence. The AUTO-STOP sequence shall also be initiated by any of the following conditions:

    a. Inlet Hopper Level LOW-LOW (LL) (LOW level shall be alarm only).

6. EMERGENCY-STOP: This command shall be either manually initiated through the PCS or locally at the Dryer System Control Panel or shall be initiated by an emergency condition occurring that may cause unsafe operating conditions or may damage the equipment.

    a. Definition of these emergency conditions shall be documented in the Safety Management Plan.

7. PAUSE: This command shall instruct the control system to stop feed to the Dryer and stop the discharge of dried biosolids for a limited time to permit changing or replacing the dried product load-out container.

    a. PAUSE duration shall be limited to a maximum of 30 minutes.

    b. After such time, if the system has not been placed back into RUN mode, the AUTO- STOP sequence shall be initiated.

    c. The Supplier shall define the proper sequence of conditions/events for the PAUSE function, which shall be documented in the Safety Management Plan.

D. Unattended System Operation:

1. The Supplier shall include a modem for remote connectivity and a page-out alarm or warning.

2. The supplier shall supply all the required instrumentation, and the PLC program shall adjust any minor changes in the solids feed:

    a. The supplier shall provide all required pressure instruments to maintain constant Feed Pump pressure discharge (flow) to the dryer irrespective of the Hopper Sludge Inventory.

    b. The supplier shall provide a series of redundant temperature sensors in the dryer’s belly for direct solids temperature measurement.

    c. The supplier to ensure the dryer housing pressure is maintained constant.

    d. The supplier shall program the trend page for 40 CFR 503 Class A compliance temperature and the compliance time.

e. Since the solids temperature is a surrogate for the moisture content, the supplier will program the discharge solids temperature vs moisture content curve.

f. If the discharge solids temperature is out of the acceptable range, the control system will initiate "Rock Mode" for up to 30 minutes without feed and without discharging material but will continue to dry the solids.

g. Despite all the above controls, if the system is still in an alarm condition, the control system will send out an alert to the mobile device off-site. The operator can correct the system or initiate a controlled shutdown from the remote.

E. Energy Balance:

1. The supplier shall supply all the required instrumentation, and the PLC program to calculate the energy balance:

a. The Supplier shall program to calculate the thermal energy input by the Hot Thermal Fluid.

b. The Supplier shall program to accept the wet cake moisture content and the dried product moisture content.

c. The Supplier shall program to calculate the thermal energy absorbed by the cooling water.

d. The Supplier shall program the SCADA screen for energy monitoring of electrical and thermal power expenditure against the drying throughput of the machine.

2.08 ELECTRICAL

A. General:

1. The Supplier shall provide all necessary electrical components and skid mounted wiring for a complete, functional system.

2. All Variable Frequency Drives and motor starters for the System shall be provided in the Dryer Motor Panel provided as part of this Section.

B. Wiring: All conductors shall conform to the requirements of NFPA 70, the 2023 National Electrical Code.

1. Equipment skids shall be Factory pre-wired using extended-reach tray cable and terminated from skid-mounted devices to skid-mounted junction boxes.

a. Electrical schematics and wiring requirements shall be included with the action submittals.

2. Raceways and Conduits:

a. All cables shall be supported in aluminum trays, open-ended rigid conduit and/or approved cable supports.

b. The use of flexible, nonmetallic, liquid-tight conduits shall be limited to less than 36” in length where required.

c. DC signals and power circuits shall not be run in the same cable tray without physical separators, or cable integral shielding rated for the supplied EMF from local power cables.

3. Junction Boxes: All skid-mounted electrical devices and instrumentation, except for motor leads, shall be prewired to skid-mounted Junction Boxes. Separate Junction Boxes shall be used for AC and DC power supply and signals:

C. Motor types shall be suitable for the hazardous-area classification in which they are installed. Refer to the Drawings for area classifications.

2.09 ACCESSORIES

A. Equipment Identification Plates: The Supplier shall provide 16-gauge, stainless-steel identification plates with component number (tag number) for all equipment and instruments, securely mounted on the equipment in a readily visible location. The plate shall bear the ¼" (inch) die-stamped, identification tag numbers as indicated in this Specification or as shown on the Drawings.

B. Lifting: Equipment and each component thereof weighing over fifty (50) pounds shall be provided with a means for securely handling, lifting or setting.

1. Lifting lugs, lifting eyes or slots for fork-truck tines to facilitate handling.

2. Piping spools or appurtenances are specifically excluded from this requirement.

C. Anchor Bolts:

1. Minimum ½" (inch) diameter, unless a larger size is shown on the Drawings.

2. Anchoring, seismic and foundation design shall be provided by the Supplier or others.

a. The Supplier shall provide anchor-bolt locations for each equipment component requiring a foundation or attachment to the floor. The Supplier shall also provide an anchor-bolt hole with a diameter at least 1/8" (inch) larger than the required anchor- bolt diameter as determined by the Engineer.

3. Anchor bolts shall be provided and installed by the Supplier.

a. Anchor bolts shall be minimum Grade B7.

2.10 PAINTING

A. General requirements:

1. Unless specified otherwise, surface-prepare, prime and finish coat exposed/exterior ferrous-metal surfaces for all equipment and accessories of the Biosolids Drying System.

2. Coating systems requiring primer- and finish coats shall be provided by the same paint manufacturer and specified as compatible for the application.

3. Supplier shall provide written thickness test results for each equipment component.

B. Low-Temperature Coatings: For equipment with a surface temperature below 200°F, a standard coating system shall be provided.

1. Preparation: In accordance with the paint manufacturer's written specifications, minimum surface preparation shall include solvent cleaning, SSPC SP-1 followed by abrasive blasting to near white metal, SSPC SP-10. Other surface preparation methods may be approved by the Engineer, provided that the method results in the minimum surface profile required by the paint manufacturer.

2. Coatings

a. Primer: One (1) coat lead-free, catalyzed epoxy polyamide metal primer 3 mils minimum dry film thickness (DFT)

b. Finish: One (1) coat aliphatic acrylic urethane, 3 mils minimum DFT.

c. Other coating systems may be used provided they are submitted to- and approved by the Engineer in advance.

d. Color shall be the Supplier’s standard.

C. Medium-Temperature Coatings: For equipment with a surface temperature between 200°F and 450°F, a suitable thermal coating system shall be provided.

1. Preparation: As described above under Low-Temperature Coatings.

2. Coatings

a. Primer: One (1) coat inorganic zinc primer, 2.5 mils minimum DFT.

b. Finish: Two (2) coats silicone acrylic, 2.0 mils minimum DFT.

c. Other coating systems may be used provided they are submitted to- and approved by the Engineer in advance.

d. Color shall be the Supplier’s standard.

D. High-Temperature Coatings: For equipment with a surface temperature above 450°F, a suitable thermal coating system shall be provided.

1. Preparation: As described above under Low-Temperature Coatings.

2. Coatings

a. Primer: One (1) coat inorganic zinc primer, 2.5 mils minimum DFT.

b. Finish: One (1) coat silicone, 2.0 mils minimum DFT. Prepare all surfaces and apply all paint.

c. Other coating systems may be used provided they are submitted to- and approved by the Engineer in advance.

d. Color shall be the Supplier’s standard.

2.11 SPARE PARTS

A. General requirements:

1. Supplier will generate a complete spare parts list during detailed engineering. The spare parts shall be identified as falling in the following categories:

a. Installation and commissioning spare parts: these parts should be kept on hand and available during the system commissioning.

b. Recommended capital spare parts: these parts should be in the inventory on site for the first two years of dryer system operation.

c. Required critical Spare Parts: In addition to above two categories, spare parts list shall identify parts that are critical to the dryer system operation (uptime) shall be identified as “critical spare parts”. Typically, these are not available from distributor such as custom fabricated parts or long lead time. As a minimum, the following critical spare parts shall be required for the dryer.

Item No.:	Spare Parts Description	Units per System	Total per System	QTY Recommended
1	Rotary union, rebuild kit (carbon seal, split rings, gaskets)	set	2	2
2	Rotary joint Q gasket Aluminum	set	2	2
3	Tail End Split Bearing Insert, Graphite Sleeve	EA	2	2
4	Type T, Thermocouple, 12"	EA	5	1
5	Motorized Valve – Deluge Water	EA	1	1
6	Packing ring, 1/2” square braided graphite-impregnated rope	FT	25	25
7	Dryer Discharge End Material Level Sensor	EA	1	1
8	Dryer Chamber Pressure Transmitter	EA	1	1

PART 3 – EXECUTION

3.01 INSPECTION AND TESTING

A. General requirements:

1. The Inspection & Test plan will highlight the Engineer and/or Owner hold, or witness points specified herein and to inspect the progress, materials and procedures at any time during the fabrication and assembly of the Biosolids Drying System and associated equipment.

a. Notify the Engineer and Owner of the test schedule not less than fifteen (15) days in advance.

b. Travel expenses for the purpose of inspection and witness shall be paid by the Owner.

2. Supplier's Test Representative shall prepare a test report and certify any test results.

a. Supplier shall obtain acceptance of test reports from the Engineer or Owner prior to shipment of equipment.

3.02 SYSTEM FACTORY TESTS

A. Perform Supplier's standard functional tests on the System including:

1. Connect equipment comprising functional components of the system as possible.

Perform functional tests on all equipment or components to verify proper operation and response to controls with equipment empty and unheated.

3.03 CONTROL PANEL FACTORY TESTS

A. The Supplier shall perform required testing on the Control Panel(s) to be furnished.

B. Perform manufacturer's standard and the following functional tests on the Biosolids Drying System Control Panel as follows:

1. Gather and furnish test information necessary to show conformance to specified requirements.

2. Test panel(s) for proper construction, electrical connection, and function.

3. Check all alarms, shutdown conditions, and automatic sequences to verify proper function.

4. Simulate interlocks and signals from other connected equipment in order to demonstrate specified Human Machine Interface functions and controls.

3.04 INSTALLATION

A. Install equipment in conformance with the Supplier's written instructions, with supervision and inspection performed by Supplier's representative.

1. Supplier shall attend a Pre-Installation Meeting prior to beginning installation of the System.

2. Supplier shall visit site as needed to supervise and approve of installation of the System components. Minimum Supplier Installation services are 3 days onsite total, over 2 separate trips.

B. Equipment anchoring and mounting shall be in accordance with Supplier's requirements for the load criteria.

C. Installation shall be coordinated with owner supplied building, supplied under separate contract, and reroute of sludge piping and installation. Commissioning may be delayed from the date of equipment delivery. The schedule shall be coordinated with the Owner.

3.05 FIELD TESTS

A. The timing and scheduling for testing shall be coordinated with and be dependent upon the Owner's schedule and quality and quantity of sludge available for testing.

B. Component Test (Site)

1. Prior to startup, all equipment described herein shall be inspected for proper installation, connections, alignment, quiet operation, and satisfactory performance of all components by means of a component test conducted by the Supplier's representative, assisted by the installing Supplier and the Engineer. Minimum Supplier Component Test services are 2 days onsite total, over 1 trip.

2. Equipment testing shall be conducted after the complete installation of the System and all appurtenances, except as approved and accepted by the Owner or the Owner's representative.

3. Proposed test procedures shall be developed by the Supplier and submitted to the Engineer for review, comment, and approval. Testing shall not begin until the test procedures have been approved by the Engineer.

4. A qualified representative of the Supplier shall supervise each test, analyze data, and certify the System performance during the test.

5. The Supplier shall provide a completed and signed Certificate of Proper Installation Form.

6. The Supplier shall successfully complete functional testing prior to performance testing.

C. Pre-Performance Test (Startup/Commissioning):

1. A Supplier's representative, assisted by the installing Supplier, Owners Operator and the Engineer, shall conduct testing to demonstrate continuous, reliable operation, not performance, while drying the sludge as specified herein. Minimum Supplier Pre- Performance Test services are with two people, 10 days onsite total, over 2 separate trips.

2. The Pre-Performance Test shall include operation of the System for a period of 2 business days without unplanned shutdown(s) due to equipment-, controls- or other system failures.

3. Stoppages due to any failure of Supplier's equipment, instrumentation and controls shall not exceed 30 minutes, and such stoppages shall not number more than three over the 2-day period. A greater number of stoppages or a stoppage longer than 30 minutes shall be deemed a failure of the Pre-Performance Test, and the test will terminate.

    a. Stoppages caused by others (Contractor, Engineer or the Owner) may occur without causing failure of the test. The Engineer or the Owner may elect to accept the results of the test including the stoppage or retain the Supplier at added cost to repeat the test to be paid by the Owner.

4. Proposed Pre-Performance-Test procedures shall be developed by the Supplier and submitted to the Engineer for approval. Testing shall not begin until the test procedures have been approved by the Engineer.

5. A qualified representative of the Supplier shall supervise each test, analyze data, and certify the system operation during the test.

D. Performance Test:

1. During the Performance Test, the Supplier shall take any readings or measurements, written or electronic, and collect any required samples for analysis in order to make the following determinations plus any other requirements listed in Performance Requirements in this Section:

    a. Sludge Feed Rate (lbs/hr, calculated based on feed pump speed)

    b. Sludge Feed Concentration (%wt., dry solids fed to the dryer)

    c. Dried Biosolids Concentration (%wt., dry solids discharged from the dryer)

    d. Dried Biosolids Temperature (°F, discharged from the cooling conveyor)

    e. Water Evaporation Rate (lbs water evaporated/hr)

    f. Natural Gas Consumption (therms (HHV), meter readings provided by Owner)

    g. Specific Energy Consumption (Btu/lb water evaporated)

    h. Meet or exceed 40CFR Part 503 requirements for Class A dried biosolids.

2. Samples shall be collected at intervals not exceeding 2 hours.

3. Performance determinations or requirements will be based on the arithmetic average of the test results obtained during the test period. The Supplier reserves the right to exclude obviously high, low or erroneous test results. As specified below, laboratory testing will be performed by the Engineer and/or the Owner.

    a. Analyses shall be based on the laboratory standard methods.

    b. Analyses for solids concentration shall be provided within 24 hours of submittal by the Supplier.

4. The Supplier shall prepare a formal Performance Test Report including all laboratory analysis reports, all measured flows, any mass and energy balance calculations, log sheets, photographs, calibrations, model numbers of test equipment and any other pertinent information to document the required Performance Requirement listed in this Section. Any suggestions for further optimization of the entire process unit will be listed for owners' action if desired.

5. The cost of all laboratory tests necessary to confirm the sludge characteristics for the initial Performance Test on the System will be paid by the Owner. All laboratory tests for the Performance Test shall be in conformance with the applicable portions of standard methods.

    a. If any test is terminated due to any failure of Supplier's equipment, instrumentation and controls, or fails to meet performance requirements, and re-testing is required, the cost of all necessary laboratory tests shall be paid by the Supplier.

6. The Minimum Supplier Performance Test services are 2 days onsite total, over 1 trip.

E. Process Training:

1. A Supplier's representative shall conduct training onsite to Operations, Maintenance, and other personnel. Goals from training include typical and aberrant operations, troubleshooting, maintenance operations, work procedures etc. Both classroom setting and hands on training types. Supplier shall prepare training documents and agenda a minimum of 2 weeks prior to scheduled training. Minimum Supplier Training services are 2 days onsite total, over 1 trip.

END OF SECTION 46 76 71

APPENDIX A

CONSTRUCTION STAKING REQUEST FORM

2803 River Road, Yakima, WA 98902
Office: (509) 966-7000
hlacivil.com

CONSTRUCTION STAKING REQUEST

EMAIL TO: staking@hlacivil.com
QUESTIONS TO: TIMOTHY D. FRIES, PLS at (509) 966-7000

CITY OF SELAH
PHASE 2 - WASTEWATER TREATMENT PLANT IMPROVEMENTS
HLA PROJECT NO. 23166

Contractor Name: _____

Contractor Cell No.: _____ Contractor Email: _____

Date of Request: _____ Time of Request: _____

The Contractor shall provide at least three (3) working days notice as required by the Contract Technical Specifications.

ITEM	DESCRIPTION	STATION TO STATION	WHEN REQUIRED DATE	TIME
1.				
2				
3				

SIGNATURE

_____
Contractor

The Contractor is responsible for providing traffic control for the survey crew at their own expense.

APPENDIX B

GEOTECHNICAL REPORTS

Project Geotechnical Summary and Timeline

1. *Geotechnical Site Investigation Report, October 2025*: provides summary of borings in vicinity of this project (Borings B-8 & B-9). Recommends Rammed Aggregate Pier (RAP) foundation system.

2. *Supplemental Geotechnical Site Investigation Report, March 2026*: updates the October 2025 report with design parameters for structural slab/mat, in lieu of RAP foundation system.

3. *Geotechnical Addendum No. 1 – Micropile Design Criteria, April 2026*: provides updated design information necessary for constructing micropiles for new pre-engineered metal building and centrifuge support.

4. *Revised Geotechnical Recommendations* – Email April 26 2026: provides updated design parameters for micropile design.

Northern, Inc.

Consulting Engineers Environmental Scientists Geologists
Construction Materials Testing Geophysical Services

GEOTECHNICAL SITE INVESTIGATION REPORT

CITY OF SELAH
WASTEWATER TREATMENT PLANT IMPROVEMENTS
260 S. RUSHMORE ROAD / 222 S. RAILROAD AVENUE
SELAH, WASHINGTON

GNN PROJECT NO. 225-1849

OCTOBER 2025

Prepared for

HLA ENGINEERING & LAND SURVEYING, INC.
2803 RIVER ROAD
YAKIMA, WA 98902

Prepared by

GN NORTHERN, INC.
CONSULTING GEOTECHNICAL ENGINEERS
YAKIMA, WASHINGTON
(509) 248-9798

Common Sense Approach to Earth and Engineering
Since 1995



At GN Northern our mission is to serve our clients in the most efficient, cost-effective way using the best resources and tools available while maintaining professionalism on every level. Our philosophy is to satisfy our clients through hard work, dedication, and extraordinary efforts from all of our valued employees working as an extension of the design and construction team.

October 22, 2025

HLA Engineering & Land Surveying, Inc.
2803 River Road
Yakima, WA 98902

Attn: Robert Scott, PE

Subject: **Geotechnical Site Investigation Report**
City of Selah Wastewater Treatment Plant Improvements
260 S. Rushmore Road / 222 S. Railroad Avenue
Selah, Washington

GNN Project No. 225-1849

Dear Mr. Scott,

As requested, GN Northern (GNN) has completed a geotechnical site investigation for the proposed City of Selah Wastewater Treatment Plant Improvements project at the existing facility located at 260 S. Rushmore Road and 222 S. Railroad Avenue in Selah, Washington.

Based on the findings of our subsurface study, we conclude that the site is suitable for the proposed construction provided that our geotechnical recommendations presented in this report are followed during the design and construction phases of the project.

This report describes in detail the results of our investigation, summarizes our findings, and presents our recommendations concerning earthwork and the design and construction of foundations and infrastructure for the proposed project. ***It is important that GNN be retained by the City of Selah to provide consultation during the design phase, as well as field compaction testing and geotechnical monitoring services during the construction phase, to review and monitor the implementation of the geotechnical recommendations***.

If you have any questions regarding this report, please contact us at 509-248-9798.

Respectfully submitted,

GN Northern, Inc.

Karl A. Harmon, LEG, PE
Senior Geologist/Engineer

Imran Magsi, PE, GE
Sr. Geotechnical Engineer



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Appendix V – Refraction Microtremor (ReMi) Survey Results
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1.0 PURPOSE AND SCOPE OF SERVICES

This report has been prepared for the proposed City of Selah Wastewater Treatment Plant Improvements project at the existing facility located at 260 S. Rushmore Road and 222 S. Railroad Avenue in Selah, Washington; site location is shown on the *Vicinity Map* (Figure 1, Appendix I). Our investigation was conducted to collect information regarding subsurface conditions and present recommendations for suitability of the subsurface materials to support the proposed improvements and allowable bearing capacity for the proposed construction.

GN Northern, Inc. has prepared this report for use by the client and their design consultants in the design of the proposed development. Do not use or rely upon this report for other locations or purposes without the written consent of GN Northern, Inc.

Our study was conducted in general accordance with our scope of work outlined in our *Updated Proposal for Geotechnical Engineering Services* dated May 14, 2025, along with our understanding of the proposed project based on the information provided by HLA. Notice to proceed was provided in the form of an authorized *Agreement for Subconsultant Services to HLA Engineering and Land Surveying, Inc.* signed by Benjamin A. Annen on July 22, 2025.

A CAD file (*23166.dwg*) of a preliminary site plan based on ~45% design completion was provided by Mr. Scott via email on April 15, 2025. An updated *Site Map* (dated 07/28/25), annotated with locations of the proposed structures and the area where the piping will cross under BNSF tracks, was later provided by Mr. Scott via email on August 7, 2025. Field exploration, consisting of sixteen (16) exploratory borings and four (4) test-pits, was completed between September 29 and October 1, 2025. The boring and test-pit locations are shown on Figure 2 (Appendix I). Detailed boring and test-pit logs are presented in Appendix II, and results of laboratory testing are attached in Appendix III.

This report has been prepared to summarize the data obtained during this study and to present our recommendations based on the proposed construction and the subsurface conditions encountered at the site. Results of the field exploration and laboratory testing were analyzed to develop recommendations for site development, earthwork, and foundation bearing support. Design

parameters and a discussion of the geotechnical engineering considerations related to construction are included in this report.

2.0 PROPOSED CONSTRUCTION

Based on the information provided, we understand that the overall Wastewater Treatment Plant (WWTP) improvements project will include new construction across three primary areas, including a new influent pump station (lift station) at the main portion of the existing WWTP site located at 222 Railroad Avenue, expansion of existing solids handling facility (new centrifuge and dryer) located at 260 Rushmore Road, and several improvements across the larger currently undeveloped area at 260 Rushmore Road. Improvements across this undeveloped eastern portion of the site will include a new operations/lab building, headworks, aeration basins/selectors, aerobic digester, secondary clarifiers with RAS/WAS/scum pumping, a UV building, and a post-aeration basin. As part of the project, new gravity and force main sewer lines will be installed from the plant improvement area on the east side to the main WWTP area. These sewer lines will cross beneath the existing BNSF railroad through either new casings or by reusing existing casings.

We understand that due to shallow groundwater at the site and location within a floodplain, the plan for the new structures on the east side is to primarily build up from or near existing grades, rather than below-grade construction. Based on preliminary information provided by HLA, we understand that a finish floor elevation (FFE) of 1100' is planned for the operations/lab building, mechanical building, and UV building. We further understand that some of the structures will be constructed to be partially below-grade, including the aeration basins and aerobic digestors (FFE = 1092'), post-aeration basin (FFE = 1090') and secondary clarifiers (FFE = 1088' to 1092'). Based on a *Gravity Sewer Plan and Profile* drawing (dated 8/28/25) prepared HLA, the new influent lift station will be approximately 30 to 32 feet deep.

Structural loading information was not available at the time of this report. Settlement tolerances for the structure are assumed to be limited to 1 inch, with differential settlement limited to ½ inch.

3.0 FIELD EXPLORATION & LABORATORY TESTING

GNN's geotechnical engineer performed an initial reconnaissance of the project site on September 22, 2025 and met with representatives from HLA to observe access constraints and pre-mark the planned boring and test-pit locations for public utility locating services. Site access was coordinated by HLA who also assisted with clearing selective areas covered with stockpiles of imported soils. Public utility clearance was obtained prior to commencement of the field exploration activities and private utility locating with GPR scanning was performed by Utilities Plus at each of the planned points of exploration.

A total of sixteen (16) exploratory borings and four (4) test-pits were completed from September 29 to October 1, 2025 at locations shown on the *Site Exploration Map* (Figure 2, Appendix I). The following table summarizes our exploration relative to the proposed structures:

Table 1: Summary of Site Investigation for Proposed Structures

Boring/ Test-Pit	Proposed Structures	Total Depth (feet BGS)	Date of Drilling/ Excavation
B-1	Operations/Lab Building	21.5	9/29/2025
B-2	Aeration Basins/Selectors	40.3	9/29/2025
B-3	East side of Railroad Crossing	21.5	9/29/2025
B-4	Secondary Clarifier (south)	20.0	9/29/2025
B-5	Secondary Clarifier (north)	11.0	9/29/2025
B-6	UV and WAS/RAS Building	19.0	9/30/2025
B-7	Aerobic Digestors	21.5	9/30/2025
B-8	Solids Handling Bldg. Extension	21.5	9/30/2025
B-9	Solids Handling Bldg. Extension	19.0	9/30/2025
B-10	Influent Lift Station	35.5	9/30/2025
B-11	West side of Railroad Crossing	21.5	9/30/2025
B-12	Aerobic Digestors	14.0	9/30/2025
B-13	Mechanical Building	17.5	10/1/2025
B-14	Headworks	18.5	10/1/2025
B-15	Mechanical Building	18.0	10/1/2025
B-16	Operations/Lab Building	20.5	10/1/2025
TP-1	Post-Aeration Basin	8.0	10/1/2025
TP-2	Gravity & Force Main Sewer Lines	11.0	10/1/2025
TP-3	Gravity & Force Main Sewer Lines	8.0	10/1/2025
TP-4	Gravity & Force Main Sewer Lines	8.0	10/1/2025

Borings were drilled by Ally Construction Services, LLC using a CME-75 truck-mounted drill rig with auto-hammer to depths ranging from approximately 11 to 40 feet below existing ground

surface (BGS). Test-pits were excavated by Glenn Lowrie Backhoe using a John Deere backhoe to depths of about 8 to 11 feet BGS. Borings and test-pits were logged and overseen by a GNN senior geologist/engineer. Upon completion, the boreholes were backfilled in accordance with Washington State guidelines. Paved surface at borings B-8, B-9 and B-10 was patched with cold-mix asphalt. Test-pits were loosely backfilled with excavated spoils.

Samples were obtained from the test borings using a Standard Penetration (SPT) sampler. The SPT sampler has a 2-inch outside diameter and a 1.38-inch inside diameter. Samples were obtained by driving the sampler with a 140-pound automatic hammer, dropping 30 inches in general accordance with ASTM D1586. The number of blows required to advance the samplers through each 6-inch increment is recorded in the field. The SPT resistance, or N-value, is defined as the number of blows required to drive the sampler from 6 inches to 18 inches below the auger tip, with the value reported as the number of blows per one foot of penetration. The SPT N-value, adjusted for hammer efficiency and sampler size, provides an indication of the relative density or consistency of the soil and is indicated on the boring logs. Recovered soil samples were sealed in containers and returned to our laboratory.

The soils observed during our field exploration were classified according to the Unified Soil Classification System (USCS), utilizing the field classification procedures as outlined in ASTM D2488. A copy of the USCS Classification Chart is included in Appendix II. Photographs of the site and exploration are presented in Appendix IV. Depths referred to in this report are relative to the existing ground surface elevation at the time of our investigation. The surface and subsurface conditions described in this report are as observed at the time of our field investigation.

3.1 Refraction Microtremor (ReMi) Survey

A Refraction Microtremor (ReMi) survey was performed on September 30, 2025 by Geophysical Survey LLC to determine the shear-wave velocity profile of the 100-foot soil column (Vs_{100}) below the ground surface for seismic Site Classification evaluation. Seismic surface wave data was collected to estimate the depth to- and shear-wave velocities of the various subsurface soil layers. A copy of the ReMi survey report is presented in Appendix V, and the results of the ReMi survey are discussed in Section 8.1 of this report.

4.0 LABORATORY TESTING

Representative samples of the onsite soils obtained from the borings and test-pits were selected for testing to determine the index properties of the subsurface soils in general accordance with ASTM procedures. The following laboratory tests were performed:

Table 2: Laboratory Tests Performed

Test	To determine
Particle Size Distribution (ASTM D6913)	Soil classification based on proportion of sand, silt, and clay-sized particles
Natural Moisture Content (ASTM D2216)	Soil moisture content indicative of in-situ condition at the time samples were taken
Soil pH (SM 4500-H+B_2011)	Electrometric procedure for measuring pH in soils
Soil Resistivity (ASTM G-187)	Measurement of soil resistivity to assist in the determination of soil's corrosive nature
Chloride and Sulfate (EPA 300.0)	Determination of chloride and sulfate inorganic ions in soil

Results of the laboratory test are included on the boring and test-pit logs and are also presented in graphic form in Appendix III attached to the end of the report.

5.0 SITE CONDITIONS

The site of the proposed improvements span over several different areas of the existing facility, primarily including large portions of the undeveloped areas across the eastern and southern portions and an area adjacent to the existing solids handling facility at the industrial pretreatment plant located at 260 Rushmore Road, as well as the southern portion of the main treatment plant located at 222 Railroad Avenue. The industrial pretreatment plant is identified as Parcel No. 18130121001, while the main treatment plant is identified as Parcel No. 18130122001 by the Yakima County Assessor. The two non-contiguous plant areas are separated by the existing Union Pacific railroad. The project is situated in the northern ½ of the NW ¼ of Section 1, Township 13 North, Range 18 East of the Willamette Meridian.



As seen in the above oblique aerial image from Google Earth, the existing facilities include a variety of surface conditions across the developed and undeveloped portions of the properties. The eastern portion of the industrial pretreatment plant property where construction of several new buildings and structures are planned is relatively flat and undeveloped. This area typically includes a sparse to dense cover of grasses and brush. At time of our field investigation, the northernmost portion of this area, in the general vicinity of the planned lab building, was covered with several stockpiles of imported soils with selected areas of borings recently cleared/flattened. Based on topography provided by HLA, existing surface elevations across this area typically range from ±1095' to ±1093', generally sloping down towards the south.

The area planned for installation of new sewer lines generally traverses east-west across the southern portion of the industrial pretreatment plant property. This area is typically covered with a moderate to dense growth of grasses/brush and some trees. This area hosts a grade relief on the order of about 10 feet, primarily due to the western-most portion that includes low-lying areas (wetland) and stockpiled areas resulting from historic grading activities.

The site of the proposed extension of the solids handling building is also situated at the industrial pretreatment plant. This area is entirely covered with asphalt pavement and includes known underground utilities generally aligned east-west, including but not limited to a water line, a sludge main, and a utility water main. A 3 to 4 foot descending slope is present beyond the southern edge

of this paved area, suggesting that this area has likely been raised with fill placement. Furthermore, based on a review of available historic aerial imagery, it is apparent that the proposed footprint of the new building addition is located on a natural river/stream meander scar (see 1964 photo below). Over the years, it appears that this low-lying area has been subject to placement of uncontrolled fill materials, as evidenced by stockpiling activities (see 1996 and 2005 photos below).



Aerial Photo from 1964



Aerial Photo from 1996



Aerial Photo from 2005

The site of the planned influent pump station is located within the southern portion of the main treatment plant. This area is also covered with asphalt pavement. A chain-link fence along the western property line and a shed structure are also present in the vicinity of the planned structure. Underground utilities in this area include, but may not be limited to, a water line and drain lines.

6.0 SUBSURFACE CONDITIONS

Our understanding of the subsurface conditions across the project site is based on several points of exploration across areas of the proposed improvements. Based on the findings of our investigation, subsurface soils generally consist of an upper variably-thick layer of fine-grained silty/sandy soils typically underlain by the prevailing coarse-grained alluvium consisting of rounded gravels and cobbles. Boring and test-pit logs (Appendix II) show detailed descriptions/stratification of the soils encountered. The following paragraphs describe the subsurface conditions at each of the areas of improvement based on correlating borings/test-pits:

Operations/Lab Building (B-1 & B-16): Soils consist of an upper approximately 2.5 to 3 foot thick layer of fine-grained soils atop the gravelly alluvium that was noted to the full depths of exploration. The upper soils are generally classified as Sandy Silt (ML) and Silt with Sand (ML), and typically appeared relatively loose. Part of these upper soils in boring B-1 are believed to be associated with recently leveled fill soils. The underlying gravels are classified as Poorly Graded Gravel with Silt and Sand (GP-GM) and Poorly Graded Gravel with Sand (GP), and exhibited relative in-place density of 'medium dense' to 'very dense'.

Headworks (B-14): This boring encountered fine-grained Silty Sand (SM) in the upper approximately 3 feet that typically appears relatively loose. The underlying gravels are classified as layers of Poorly Graded Gravel with Sand (GP) and Poorly Graded Gravel with Silt and Sand (GP-GM), and exhibit 'medium dense' to 'very dense' relative density.

Mechanical Building (B-13, B-15): Borings encountered an upper approximately 1 to 4 foot thick layer of relatively loose fine-grained Silty Sand (SM). Boring B-13 on the east side also encountered a layer of 'loose' Sand with Silt & Gravel (SP-SM) with interbedded Gravel with Sand (GP) to about 8 feet BGS. The underlying gravels are classified as Poorly Graded Gravel with Silt and Sand (GP-GM), and are typically 'medium dense' to 'very dense'.

Aeration Basins/Selectors & Aerobic Digestor (B-2, B-7, B-12): Borings completed in this area encountered an upper approximately 2 to 2.5 foot thick layer of relatively loose Sandy Silt (ML), Silt with Sand (ML), and fine-grained Silty Sand (SM). The underlying gravels are classified as Well Graded Gravel with Silt and Sand (GW-GM) and Poorly Graded Gravel with Sand (GP), and typically noted to be 'medium dense' to 'very dense'. However, the in-place relative density in the upper approximately 10 to 15 feet of the gravelly strata in boring B-7 drilled on the east side of the Aerobic Digestor and approximately 7 feet of the gravelly strata in boring B-2 in the Aeration Basins are 'loose'.

UV and WAS/RAS Building (B-6): This boring encountered Silt with Sand (ML) in the upper approximately 3 feet and appears relatively loose. The underlying gravels are classified as Poorly Graded Gravel with Sand (GP), Poorly Graded Gravel with Silt and Sand (GP-GM) and Silty

Gravel with Sand (GM). In-place density of these gravels are 'loose' in the upper approximately 5 to 7 feet BGS, and 'medium dense' to 'dense' below that.

Post-Aeration Basin (TP-1): This test-pits exposed relatively loose, fine-grained Silty Sand (SM) to approximately 2 to 2.5 feet BGS. The underlying gravels, classified as Poorly Graded Gravel with Sand (GP), generally appear 'medium dense' to 'dense'. An approximately 12-inch thick layer of Poorly Graded Sand with Gravel (SP) was found at depth of 5 feet BGS. The test-pit excavation was terminated at 8 feet BGS due to severe caving of the gravelly soils below the groundwater table.

Secondary Clarifiers (B-4 & B-5): Borings at these locations encountered fine-grained Silty Sand (SM) and fine- to medium-grained Poorly Graded Sand with Gravel (SP) to depths of approximately 4.5 to 5.5 feet BGS. These upper sandy soils exhibit 'very loose' to 'loose' relative density. The underlying gravel unit is classified as Well Graded Gravel with Silt and Sand (GW-GM), ranging in in-place relative density from 'medium dense' to 'very dense'.

Gravity & Force Main Sewer Pipes (TP-2 to TP-4): Test-pits along this alignment encountered an upper layer of Silt with Sand (ML) that appears 'loose' to 'medium dense', extending to depths of approximately 1 to 6 feet BGS. The underlying gravels, classified as Poorly Graded Gravel with Sand (GP), generally appear 'medium dense'. Test-pits excavation were terminated at depths of about 8 to 11 feet BGS due to severe caving of the gravelly soils below the groundwater table.

Pipe Crossing under BNSF Railroad (B-3 & B-11): Borings on either side of the BNSF right-of-way encountered an approximate 7 to 10 foot thick layer of 'very loose' to 'loose' Silty Sand (SM) and Silt (ML), underlain by 'dense' to 'very dense' gravelly strata. The gravelly soils are classified as Poorly Graded Gravel with Silt and Sand (GP-GM) and Well/Poorly Graded Gravel with Sand (GW/GP).

Solids Handling Building Extension (B-8 & B-9): Beneath the existing asphalt pavement, borings encountered 'very loose' to 'loose' organic-rich fine-grained soils, classified as Silt with Sand (ML), Silty Sand (SM) and Silty Clayey Sand (SC-SM), to depths of approximately 13 to 13.5 feet BGS. Boring B-9 near the southeast corner of the planned building footprint encountered man-made fill materials that included misc. trash and pulverized concrete debris in the upper

approximately 5 to 7 feet. As discussed in Section 5.0 above, the man-made fill materials are a result of historic stockpiling of uncontrolled fills across the eastern half of the planned building footprint, while the upper native very loose soils seem to be characteristic of low-energy deposits along a remnant natural river/stream channel. The underlying Poorly Graded Gravel with Sand (GP) unit exhibits 'dense' to 'very dense' relative density.

Influent Lift Station (B-10): Below the asphalt pavement section, 'very loose' Silty Sand (SM) was encountered to a depth of approximately 8 to 8.5 feet BGS. The underlying Poorly Graded Gravel with Sand (GP) and Poorly Graded Gravel with Silt and Sand (GP-GM) strata is 'very dense' and extends to the full drilling depth of about 35.5 feet BGS.

6.1 NRCS Soil Survey

Although typically known to be historically disturbed and altered across the project site at the surface, the Natural Resources Conservation Service (NRCS) soil survey map of the site (Appendix VII) identifies the site soils as Umapine silt loam, drained, 0 to 2 percent slopes [169] and Weirman fine sandy loam [182]. The parent material for these units is described as *alluvium.* The typical soil profile for the Umapine unit is described as *silt loam*, and for the Weirman unit as *fine sandy loam* and *loamy fine sand* overlying *very gravelly loamy sand*.

6.2 Groundwater

Groundwater was encountered in each of the borings and test-pits at depths ranging from approximately 4 to 7.5 feet BGS (short-term un-stabilized readings) at time of our exploration in late-September and early-October of 2025. Table 3 summarizes depth/elevation of groundwater at each boring and test-pit location:

Table 3: Groundwater Depths and Approximate Elevations

Boring/ Test-Pit	Groundwater Depth* (feet BGS)	Approx. Groundwater Elevation
B-1	5.6	±1090.4'
B-2	5.0	±1090.0'
B-3	7.9	±1089.1'
B-4	4.9	±1088.6'
B-5	4.6	±1089.4'
B-6	7.0	±1088.0'
B-7	4.8	±1090.2'
B-8	7.6	±1090.4'

B-9	6.2	±1091.8'
B-10	6.2	±1089.8'
B-11	7.5	±1088.5'
B-12	5.2	±1089.8'
B-13	5.5	±1089.5'
B-14	4.4	±1090.6'
B-15	4.4	±1090.6'
B-16	4.3	±1091.7'
TP-1	4.5	±1088.5'
TP-2	7.0	±1085.5'
TP-3	4.0	±1088.5'
TP-4	4.5	±1089.5'

*depths measured at time of drilling/excavation

To further assist in our evaluation, we reviewed the Washington Department of Ecology database of nearby well logs to estimate groundwater levels in the vicinity. Based on our review of nearby well logs, groundwater has been measured at depths of about 6 to 8 feet BGS; well logs are included in Appendix VIII. Groundwater levels in the area fluctuates with precipitation, irrigation, drainage, regional pumping from wells and other hydrogeologic factors, evaluation of such factors is beyond the scope of this study.

7.0 SITE GEOLOGY, GEOLOGIC HAZARDS, AND SEISMICITY

7.1 Regional Geology

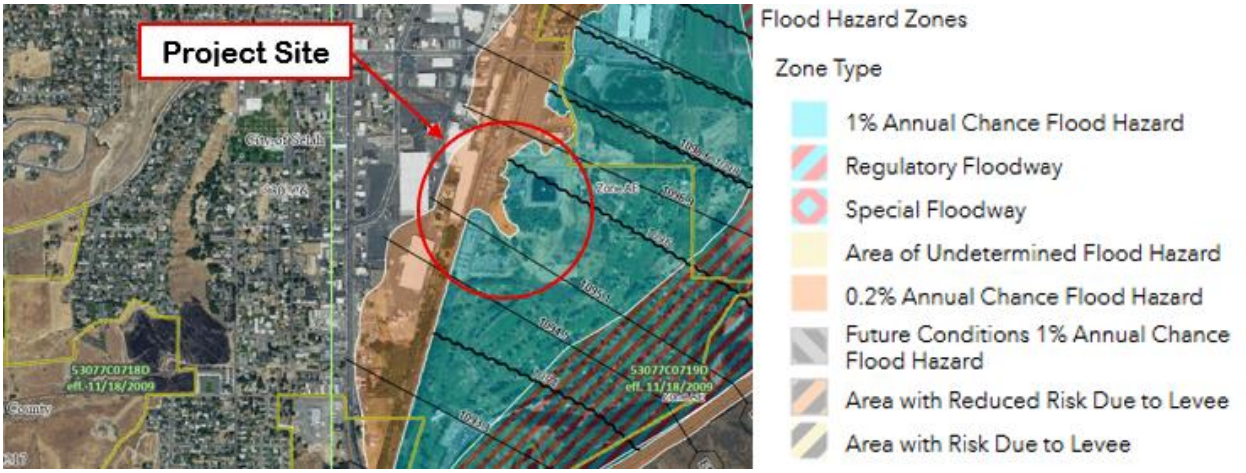
The project site is located on the upper terrace within the Yakima River Valley in the Yakima Fold Belt region of the Columbia Basin physiographic province. The Columbia Basin (aka Columbia Plateau) consists of a broad plain situated between the Cascade Range to the west and the Rocky Mountains to the east. The Columbia Basin was formed by a thick sequence of Miocene Age tholeiitic basalt flows, called the Columbia River Basalt Group that erupted from fissures in north central and northeastern Oregon, eastern Washington, and Western Idaho. The deeper subsurface materials in the vicinity of the site include basalt flows from the Wanapum and Saddle Mountain Basalt Formations, inter-bedded with fluvial-lacustrine deposits of the Ellensburg and The Dalles Formations. Published *Geology of the Selah Area, Yakima County, Washington* map (Campbell, 1977) has mapped the project site as Quaternary alluvium [Qal] consisting of flood-plain deposits from the meandering Yakima River (see Figure 3, Appendix I).

7.2 Site Slopes and Landslides

Based on available topographic data provided by HLA, the site is generally flat with approximately 5 to 6 feet of variation across the site. A field reconnaissance of the subject property was performed to observe site conditions and correlate the information gathered from our preliminary research. During our reconnaissance we looked for common geomorphic features of landslides as well as indications of possible signs demonstrating recent activity and instability of slide masses. No indications of recent failures or significant slope instability were observed on or near the site.

7.3 Flooding and Erosion

The subject property is located in an area mapped by the Federal Emergency Management Agency (FEMA) regarding flooding concerns. As seen in the excerpt below from FEMA's National Flood Hazard Layer Viewer, the western portion of the subject property is mapped as 'Zone X' and the eastern portion of the site is mapped as 'Zone AE'. Zone X indicates an area that has a 0.2% Annual Chance Flood Hazard (100-year flood event) and Zone AE indicates an area that has a 1% Annual Chance Flood Hazard (500-year flood event).



The site is also situated in an area where sheet flow and erosion may occur. The near-surface site soils and surface conditions are known to exhibit a moderate to severe risk for erosion.

Erosion susceptibility from water is based on several factors, including the intensity of rainfall and runoff, soil erodibility, length and steepness of slopes, and surface conditions. The erodibility factor of the soils is a measure of the soil's resistance to erosion based on its physical characteristics. Typically, very fine sand, silt and clay soils are generally susceptible to erosion.

Based on site specific field exploration, observations, and laboratory testing, the surficial soil exposed at the project site consists primarily of silt/silt with sand/sandy silt/silty sand.

Soil erodibility is only one of several factors affecting erosion susceptibility. Soil erosion by water also increases with the length and steepness of the site slopes due to the increased velocity of runoff and resulting greater degree of scour and sediment transport. Appropriate erosion and sediment control plan(s) and a drainage plan shall be prepared by the project Civil Engineer with the final construction drawings.

The need for and design of flood control devices and erosion protection measures is within the purview of the design Civil Engineer. In general, erosion should be mitigated with best management practices (BMPs) consisting of proper drainage design, including collecting and disposal (conveyance) of water to approved points of discharge in a non-erosive manner, and placement of vegetative covers and erosion control mats to on slope surfaces. Appropriate project design, construction, and maintenance will be necessary to mitigate the site erosion hazards.

7.4 Surface Fault Rupture

For the purposes of this report, an "active fault" is defined as a fault that has had displacement within the Holocene epoch or last 11,000 years. The nearest Quaternary-age fault to the site is a segment of the Umtanum Ridge structures, more specifically 'the folds and other faults of the Umtanum Ridge-Gable Mountain uplift' section (USGS Fault ID: 563b). This section of the Class A thrust fault has an average strike of N87°W, with a published age of <130,000 years. Due to the lack of known "active" fault traces in the vicinity, surface fault rupture is unlikely to occur at the project site. While fault rupture would most likely occur along previously established fault traces, future fault rupture could occur at other locations.

7.5 Historic Earthquakes

We reviewed the USGS archive (http://earthquake.usgs.gov/earthquakes/map/) listing earthquakes with epicenters within 100 kilometers of the project site. The following table selectively summarizes this information, listed by order of magnitude:

Table 4: Summary of Earthquakes in 100-km radius

Date of Event	Magnitude	Distance from Site (miles)
May 28, 1981	5.0	42.2
May 28, 1981	4.6	42.4
October 7, 2006	4.5	52.8
December 2, 1987	4.3	7.3
February 18, 2015	4.2	42.8
June 17, 2010	4.2	38.7
February 17, 1981	4.2	41.6
December 1, 1987	4.1	7.7
August 16, 2004	4.0	45.0
October 9, 1998	4.0	31.9
February 1, 1981	4.0	34.6

7.6 Assessment of Liquefaction Potential

Liquefaction is the loss of soil strength from sudden shock or vibration (usually earthquake shaking), causing the soil to become a fluid mass. Liquefaction results in a loss of soil strength and can cause the structure/utility to settle if it occurs in the bearing zone. Soil liquefaction is a natural phenomenon that occurs when saturated granular soils (below the water table) are subjected to vibratory motions, causing an increase in the water pressure within soil pores, as the soil tends to reduce in volume. When the pore water pressure reaches the vertical effective stress, the soil particles become suspended in water causing a complete loss in soil strength.

In general, for the effects of liquefaction to be manifested at the surface, groundwater levels must be within 50 feet of the ground surface and the soils within the saturated zone must also be susceptible to liquefaction. Ground shaking must be of sufficient intensity to act as a trigger mechanism. Two important factors that affect the potential for soil liquefaction are duration as indicated by earthquake magnitude (M) and intensity as indicated by peak ground acceleration (PGA).

As mapped by the Washington State Department of Natural Resource, Division of Geology and Earth Resources (see excerpt below), the project site is mapped with ‘moderate to high’ liquefaction susceptibility.



To evaluate the risk for earthquake-induced liquefaction settlement, GNN attempted to complete a 50-foot-deep exploratory boring. Due to the presence of very dense cobbles (possible boulders) within the underlying gravel strata, the boring was drilled to a depth of approximately 40 feet BGS. Subsurface data obtained from previous geotechnical studies in the area was conservatively used in combination with the data obtained at the subject site for an analysis of potential liquefaction induced settlement.

Our analysis of the potential soil liquefaction susceptibility at the project site was performed using the 1997 NCEER Liquefaction Workshop method that modifies the Seed, et. al. 1985 method. This method is an empirical approach to quantify the liquefaction hazard using SPT blow count data from the exploratory boring performed at the site (and nearby), along with an estimation of earthquake magnitude and peak ground acceleration (PGA) derived from the seismic hazard analysis. The resistance to liquefaction is plotted on a chart of cyclic shear stress ratio versus a corrected blow count $N_{1(60)}$. An estimation of the resulting induced ground subsidence from soil liquefaction was calculated using the 1987 Tokimatsu and Seed method by a computer spreadsheet, Liquefy v2.3.xls (Stringer, 2007). The Qc_{IN} readings and SPT blow counts were adjusted to an equivalent clean sand blow count, $N_1(60)$-CS, according to the estimated fines content of the soil.

The site- and depth-specific data for soil densities (SPT) and soil types obtained from our field explorations was used for our analysis. We have considered a possible 6.8 magnitude earthquake producing a PGA of 0.29g at the site for our analysis.

The results of our liquefaction susceptibility analysis indicate that no measurable manifestation of liquefaction is likely to occur at the subject site during the design basis earthquake, assuming relatively steady groundwater conditions. The potential for seismically induced liquefaction induced settlement and lateral spreading is negligible. Liquefaction analysis outputs are included in Appendix VI.

8.0 SEISMIC CONDITIONS AND CONSIDERATIONS

8.1 Ground Motion Amplification (Site Class)

The "Site Class" is a classification based on the properties of the upper 100 feet of the soil and bedrock materials at a site. Based on the results of a site-specific Refraction Microtremor (ReMi) survey, the weighted-average shear-wave velocity of the upper 100 feet (Vs_{100}) of the site soil profile is **1,303.1 ft/s**. Based on the average shear-wave velocity, the project site can be classified as a **Site Class C** (very dense soil & soft rock) as described in as described in Section 20.3 and Table 20.3-1 of ASCE 7-16.

8.2 Seismic Design Parameters

Seismic parameters for a code-based response spectrum with a return period of 2,475 years based on ASCE/SEI 7-16 was obtained for the project site (Latitude: 46.6497°N / Longitude: 120.5235°W) using the online ASCE Hazard Tool (ascehazardtool.org). The following tables present recommended site-specific seismic design parameters:

Table 5: ASCE 7-16 Code-Based Seismic Design Parameters (Site Class C)

Seismic Design Parameter	Value (unit)	Definition
S_S	0.477 (g)	MCE mapped spectral response acceleration at short periods
S_1	0.198 (g)	MCE mapped spectral response acceleration at 1-second period
F_a	1.3	Site coefficient for spectral response acceleration at short periods
F_v	1.5	Site coefficient for spectral response acceleration at 1-second period
S_{MS}	0.619 (g)	MCE spectral response acceleration at short periods as adjusted for site effects
S_{M1}	0.297 (g)	MCE spectral response acceleration at 1-second period as adjusted for site effects
S_{DS}	0.413 (g)	Design spectral response acceleration at short periods
S_{D1}	0.198 (g)	Design spectral response acceleration at 1-second period
PGA	0.21 (g)	Site modified peak ground acceleration
PGA_M	0.253 (g)	MCE geometric mean peak ground acceleration

9.0 ASSESSMENT OF SOIL CORROSIVITY

Selected soil samples from the borings and test-pits were tested for soluble sulfate, soluble chloride, pH, and electrical resistivity. Results of laboratory testing are presented in Appendix III and summarized in Table 6 below:

Table 6: Laboratory Results of Soil Corrosivity Testing

Sample ID	Sulfate (mg/kg)	pH	Resistivity (ohm-m)	Chloride (mg/kg)
B-3 @ 2.5’	918	6.4	3.0	57
B-6 @ 2.5’	11.7	8.2	41.7	18
B-11 @ 5’	21.9	8.4	35.7	14
TP-1 @ 1.5’	75.9	8.0	6.5	553
TP-2 @ 2.5’	9.6	8.5	37.0	30
TP-4 @ 2.5’	7.2	7.6	111.1	10

The values may be used to estimate potential corrosive characteristics of the onsite soils with respect to contact with the various underground materials which will be used for project construction. The measured pH of sampled soils ranges from 6.4 to 8.5. The pH tests indicate that near-surface soils are slightly acidic to moderately alkaline.

A commonly accepted correlation between soil resistivity and corrosivity towards unprotected ferrous metals (National Association of Corrosion Engineers (NACE), 1984) is provided below:

Minimum Resistivity (ohm-m)	Corrosion Potential
0 to 10	Severely Corrosive
10 to 20	Corrosive
20 to 100	Moderately Corrosive
Over 100	Mildly Corrosive

Based on the measured apparent resistivities obtained from soil resistivity testing of the site soils, the upper soil strata is considered moderately to severely corrosive to ferrous metals. Soils samples from boring B-3 and test-pit TP-1 resulted in a resistivity of less than 10 ohm-m and are considered severely corrosive.

Sulfate and other salts can attack the cement within concrete causing weakening of the cement matrix and eventual deterioration by raveling. This attack is in the form of a chemical attack, a chemical reaction between sulfate and the cement used in concrete. According to ACI 318, if

sulfate concentrations exceed 1000 ppm there will be special requirements. Results of soluble sulfate testing indicate samples of the on-site soils tested generally possess sulfate concentrations of less than 1000 ppm when classified in accordance with Table 4.3.1 of the ACI Design Manual. A sample from boring B-3 resulted in a soluble sulfate concentration of 918 mg/kg, and may exhibit a moderate degree of sulfate attack to cement concrete. Concrete should be designed in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 4.

Chloride ions can cause corrosion of reinforcing steel. ACI 318 provides commentary relative to the effects of chlorides present in the soil from both internal and external sources. While soils tested for soluble chloride generally resulted in relatively low concentrations, a sample from test-pits TP-1 was found to have a chloride concentration of greater than 500 mg/kg.

A minimum concrete cover of cast-in-place concrete should be in accordance with Section 7.7 of the 2007 edition of ACI 318. Additionally, the concrete should be thoroughly vibrated during placement. The information provided above should be considered preliminary. These values can potentially change based on several factors, such as importing soil from another job site and the quality of water used during grading.

Select historic aerial photos of the area surrounding boring B-3 show evidence that the site has been used over time to store stockpiles of soils along with miscellaneous apparent trash and debris of an unknown nature. It is possible that this noted history at this location could have resulted in the anomalously high indications of severely corrosive conditions. Once the steel casing alignment and depth is finalized, GNN recommends additional soil sampling and analytical testing for corrosivity parameters prior to construction.

10.0 SUMMARY OF FINDINGS & CONCLUSIONS

Conditions imposed by the proposed development have been evaluated on the basis of preliminary elevations and engineering characteristics of the subsurface materials encountered in the exploratory borings and test-pits and their anticipated behavior both during and after construction. The following is a summary of our conclusions and professional opinions based on the data obtained from a review of selected technical literature and the site evaluation.

- Based on this geotechnical evaluation of the surface and subsurface conditions and our understanding of the proposed project, from a geotechnical perspective, it is our opinion that the site is suitable for the proposed construction, provided the recommendations in this report and any subsequent evaluation are followed in the design and construction of the project.
- Design-level grading, drainage and foundation plans for the proposed construction were unavailable at the time of this report preparation. GNN shall be provided an opportunity to review the final grading and foundation plans as they become available.
- Subsurface soils across the project areas generally consist of an upper variably-thick layer of fine-grained silty/sandy soils typically underlain by the prevailing coarse-grained alluvium consisting of rounded gravels and cobbles. The upper fine-grained soils were typically noted to be relatively loose, while the underlying gravels were generally medium dense to dense. Some loose gravelly soils were noted in selected areas, typically near the groundwater table.
- Groundwater was encountered at depths ranging from approximately 4 to 7.5 feet BGS within each of the borings and test-pits at the time of our field investigation. Groundwater is a factor in design and construction at this site. Proposed new structures that extend to depths near or below the groundwater table will require dewatering during construction.
- Dewatering should be performed such that the groundwater level around nearby existing structures is unaffected, as lowering the water level around existing structures could induce settlements. This lowering of groundwater will likely impact the existing pretreatment lagoon. A pre-dewatering condition and elevation survey of the adjoining structures and utilities should be completed.
- We understand that new structures on the east side of the project site will primarily be built up from or near existing grades, therefore the *operations/lab building*, *mechanical building*, and *UV building* will be constructed with a planned finish floor elevation (FFE) of 1100'. Considering the subsurface conditions encountered, a shallow spread foundation system is considered appropriate for support of these proposed structures.
- We further understand that the *aerobic digestors, aeration basins, post-aeration basin,* and *secondary clarifier* structures will be constructed to be partially below-grade at FFE ranging

from 1092' to 1088'. Considering the relatively shallow groundwater depths encountered at the project site, this structure will likely require dewatering during construction.

- The new influent lift station will extend below the surface grade to a depth of be approximately 30 to 32 feet deep. Given the proximity of existing treatment plant structures and utilities, open excavation and dewatering is not considered a feasible option for this structure. Construction of the lift station will require the use of a sunken caisson to facilitate installation below the groundwater level.
- The underlying geologic condition for seismic design is site class 'C'. The *minimum* seismic design should comply with the 2021 International Building Code (IBC) and ASCE 7-16.
- Based on the findings of our subsurface exploration and liquefaction analysis, no measurable manifestation of liquefaction is likely to occur at the subject site during a design basis earthquake event.
- Near-surface site soils can be readily cut by normal grading equipment.
- The relatively clean underlying sandy/gravelly soils, particularly at or below groundwater elevation are very highly prone to severe caving and sloughing in open excavations; active dewatering during excavation and construction will be required.
- The on-site near-surface fine-grained soils are susceptible to wind and water erosion when exposed during grading operations. Preventative measures and appropriate BMPs to control runoff and reduce erosion shall be incorporated into site grading plans.

11.0 GEOTECHNICAL RECOMMENDATIONS

The following geotechnical recommendations are based on our current understanding of the proposed project as described in Section 2.0 of this report. The recommendations presented in this report are predicated upon appropriate geotechnical monitoring and testing of the site preparation and foundation and building pad construction by a representative of GNN's **Geotechnical-Engineer-of-Record (GER)**. Any deviation and nonconformity from this requirement may invalidate, partially or in whole, the following recommendations. GNN shall be engaged to review grading and foundation plans in order to provide revised, augmented, and/or additional geotechnical recommendations as required.

Note that the applicability of our geotechnical recommendations is contingent upon good construction practices. Poor construction techniques may alter conditions from those on which our recommendations are based and, therefore, result in reduced foundation capacity and additional settlement, as appropriate.

11.1 Clearing, Grubbing, and Site Grading

At the start of site grading, existing pavements, surface vegetation and any abandoned underground utilities shall be fully removed from within, and extending a minimum 5 feet beyond, the proposed improvement footprints. Based on our explorations, we estimate approximately 4 to 6 inches of material must be stripped from the grassy areas; deeper and possibly shallower stripping depths may be necessary as identified by GN Northern during earthwork. Areas disturbed during clearing shall be properly backfilled and compacted as described in this report. Site grading shall incorporate the requirements of IBC 2021 Appendix J. A representative of our Geotechnical engineer shall observe site clearing, grading, and the bottoms of excavations before placing fills. Do not commence site clearing and grading operations until temporary Erosion and Sedimentation Control (ESC) measures are in place. As part of the erosion and sediment control plan, the contractor should implement necessary BMP measures and protect the subgrade from exposure to moisture. Local variations in soil conditions may warrant increasing the depth of over-excavation and recompaction. Do not place backfill or fill soil material on surfaces that are saturated, muddy, frozen, or contain frost, snow, or ice. To prevent potential pumping and unstable ground conditions and improve compaction efforts, we recommend performing site grading during dryer periods of the year. Seasonal winter and wet weather conditions could adversely affect grading operations.

Following stripping and prior to placing foundations, the exposed subgrade should be evaluated by proof-rolling. The subgrade should be proof-rolled with a fully loaded (30-ton) tandem-axle dump truck or similar heavy rubber-tire construction equipment to identify soft, loose, or unsuitable areas. A representative of the GER should observe the proof-rolling. Soft or loose zones identified during the field evaluation should be compacted to an unyielding condition or be excavated and replaced with structural fill.

Soil conditions shall be evaluated by in-place density testing, visual evaluation, probing, and proof-rolling of the imported fill and re-compacted on-site soil as it is prepared to check for

compliance with recommendations of this report. A moisture-density curve shall be established in accordance with the ASTM D1557 method (Laboratory Compaction Characteristics of Soil Using Modified Effort) for all onsite soils and imported fill materials used as structural fill.

Each test-pit was loosely backfilled during our site investigation. During site development, the earthwork contractor is required to re-excavate the test-pits and backfill the excavations with suitable fill material and compact as appropriate for the location within the building/structure pads and hardscape areas.

11.2 Temporary Construction Dewatering

Groundwater was encountered at approximately 4 to 7.5 feet BGS and will be a factor in design and construction of any below-grade structures and underground utilities. Hence, temporary dewatering will be necessary to facilitate construction, unless the sunken caisson method is used, as recommended for lift station structure. The contractor should be responsible for ground and surface water control within contract limits. In this regard, grading, slope protection, ditching, sumps, dewatering, and other measures should be used to direct water away from excavations to prevent ponding near or in the excavation. Construction dewatering requirements depend on the time of year, river level, irrigation, recent rainfall and other factors.

Detailed dewatering recommendations are beyond our scope of work for this project. We anticipate that dewatering wells or a well-point dewatering system will be required. Because the excavations will extend at least 5 feet below ground water, sumps and trash pumps are unlikely to handle influent flows.

Dewatering should be accomplished in advance of construction, as necessary, so that excavation and placement of foundations, pipe, pipe bedding and backfill materials are completed in relatively dry conditions. Dewatering should be performed such that the groundwater level around nearby existing structures is unaffected, as lowering the water level around existing structures could induce settlements. This lowering of groundwater will likely impact the existing pretreatment lagoon. A pre-dewatering condition and elevation survey of the adjoining structures and utilities should be completed.

Design and implementation of dewatering systems should be the responsibility of the contractor. We recommend that the contract documents require the contractor to prepare and submit a dewatering plan for review and approval by the Geotechnical Engineer. The contractor should be required to maintain groundwater at least 2 feet below the base of any temporary excavation until the structure is constructed and backfilled. In addition, the contractor should be responsible for control of surface water and should employ sloping, slope protection, ditching, sumps, and other measures as necessary.

11.3 Suitability of the Onsite Soils as Engineered Fill

The onsite sandy/silty and gravelly soils, free of organics and deleterious materials, and screened and processed to be free of oversize rocks (>4 inches), are generally suitable for reuse as engineered structural fill. Suitable onsite soil should be placed in 8-inch thick loose lifts and each lift compacted to at least 95% relative compaction (ASTM D1557) near its optimum moisture content. Compaction of onsite soils shall be performed within a range of ±2% of optimum moisture unless compaction efforts prove a higher tolerance is acceptable to meet compaction requirements. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds near-optimum moisture content and is too wet to compact to specified dry density.

11.4 Temporary Excavations

It shall be the responsibility of the contractor to maintain safe temporary slope configurations since the contractor is at the job site, able to observe the nature and conditions of the slopes, and able to monitor the encountered subsurface conditions. Unsupported vertical cuts deeper than 4 feet are not recommended if worker access is necessary. The cuts shall be adequately sloped, shored or supported to prevent injury to personnel from caving and sloughing. The contractor and subcontractors shall be aware of, and familiar with, applicable local, state and federal safety regulations including the current OSHA Excavation and Trench Safety Standards, and OSHA Health and Safety Standards for Excavations, 29 CFR Part 1929, or successor regulations.

It is our opinion the soils encountered at the site is classified as **Type C** soils. For excavation planning purposes, we recommend that temporary, unsupported, open cut slopes shall be no steeper than 1.5 feet horizontal to 1.0 feet vertical (1.5H:1V) in Type C soils. No heavy equipment

should be allowed near the top of temporary cut slopes unless the cut slopes are adequately braced. Final (permanent) fill slopes should be graded to an angle of 2H:1V or flatter.

The onsite relatively clean underlying sandy/gravelly soils, particularly at or below groundwater elevation, are very highly prone to significant caving and sloughing in open excavations. The contractor shall employ adequate measures to dewater and control groundwater seepage to maintain stability of open excavations. Excavations extending to or below groundwater elevation will require active dewatering along with appropriate shoring during excavation and construction.

Excavation stability can be achieved by sloping excavation banks or widening shallow excavations in the anticipation of caving. Deeper excavations will require external support such as shoring or bracing to provide excavation bank stability.

11.5 Utility Excavation, Pipe Bedding and Trench Backfill

To provide appropriate support and bedding for the pipe, we recommend the utilities be founded on suitable bedding material consisting of clean sand and/or sand & gravel mixture. Pipe bedding should provide a firm uniform cradle for support of the pipes. A minimum 4-inch thickness of bedding material beneath the pipe should be provided. Prior to installation of the pipe, the pipe bedding should be shaped to fit the lower part of the pipe exterior with reasonable closeness to provide uniform support along the pipe. Pipe bedding material should be used as pipe zone backfill and placed in layers and tamped around the pipes to obtain complete contact. To protect the pipe, bedding material should extend at least 6 inches above the top of the pipe, however initial lift thickness could be increased to levels recommended by the manufacturer to protect utilities from damage by compacting equipment.

Placement of bedding material is particularly critical where maintenance of precise grades is essential. Backfill placed within the first 12 inches above utility lines should be compacted to at least 90% of the maximum dry density (ASTM D1557), such that the utility lines are not damaged during backfill placement and compaction. In addition, rock fragments greater than 1 inch in maximum dimension should be excluded from this first lift. The remainder of the utility excavations should be backfilled and compacted to 95% of the maximum dry density as determined by ASTM D1557.

Suitable backfill for the pipe bedding, pipe zone material and trench backfill shall meet the specifications of Section 9-03.12(3) of the 2024 Washington State Department of Transportation Standard Specifications (WSS). Trench backfill placed beneath, adjacent to, and for at least 12 inches above utility lines (i.e., the pipe zone) should consist of well graded granular material with a maximum particle size of 1 inch and should meet the specifications provided in WSS 9-03.12(3) – Gravel Backfill for Pipe Zone Bedding and the pipe manufacturer. Within pavement and slab subgrades, the remainder of the trench backfill up to the subgrade elevation can consist of the above 1-inch material or of granular material with a maximum particle size of 2.5 inches, less than 10 percent by dry weight passing the U.S. Standard No. 200 Sieve, and meeting the specifications provided in WSS 9 03.19 – Bank Run Gravel for Trench Backfill.

All excavations should be wide enough to allow for compaction around the haunches of pipes. We recommend that utility trenching, installation, and backfilling conform to all applicable federal, state, and local regulations such as OSHA for open excavations.

In areas where the subgrade soils in the trench excavation consist of fine-grained silt soils, a geotextile separator fabric may be required over the native soils prior to placement of pipe bedding. We recommend that the geotextile meet the requirements of WSS 9-33.2(1), Table 3 for Separation. We recommend that a representative of the GER observe subgrade conditions during construction and determine if and where a separator fabric is necessary, in addition to providing fulltime monitoring of all backfilling operations.

Compaction of backfill material should be accomplished with soils within ±2% of their optimum moisture content in order to achieve the minimum specified compaction levels recommended in this report. Backfill operations shall be observed and tested to monitor compliance with these recommendations.

11.6 Imported Granular Fill Soil

Imported fill material should consist of clean, non-plastic, freely-draining sand and gravel, free of organic matter or other deleterious materials. Such materials should contain particles no larger than 4 inches in maximum dimension, with less than 7 percent fines (based on the ¾-inch fraction) meeting the gradation specification of WSS 9-03.14(1) – Gravel Borrow.

11.7 Imported Crushed Rock Structural Fill

Imported Structural Fill shall consist of a well graded 1¼" minus crushed aggregate conforming to WSS 9-03.9(3) - Crushed Surfacing Base Course. Imported fill should be placed in 8-inch thick loose lifts and each lift compacted to 95% of the maximum relative density as determined by ASTM D1557 at near optimum moisture content. A sample of the imported fill material shall be collected by GNN personnel prior to placement to ensure required gradation and establish a moisture-density relationship (proctor curve).

11.8 Compaction Requirements for Engineered Structural Fill

All fill or backfill shall be approved by a representative of the GER, placed in uniform lifts, and compacted to a minimum 95% of the maximum dry density as determined by ASTM D1557. The compaction effort must be verified by a representative of the GER in the field using a calibrated nuclear density gauge in accordance with ASTM D6938. The onsite gravel soils contain oversize fraction and compaction with conventional methods may not be applicable. Therefore, proof-compaction in the presence of a representative of the GER is considered acceptable (see Section 11.9). The thickness of the loose, non-compacted, lift of structural fill shall not exceed 8 inches for heavy-duty compactors or 4 inches for hand operated compactors.

11.9 Compaction Control of Backfill Material with Over-sized Material

When a coarse granular fill material contains more than 30% over-size fraction (material retained on the ¾ in. sieve), the material is considered non-proctor testable per ASTM D1557 and compaction testing using a nuclear density testing per ASTM D6938 or sand cone density method per ASTM D1556 is not applicable to verify field compaction. In such case a performance specification to control the compaction is considered an appropriate alterative to verify densification of the placed fill material. Components of a performance specification typically contain the type and size of compaction equipment to be used, the lift thickness, acceptable range of water content, and sufficient compactive efforts.

We recommend that the subgrade or placed fill material shall be densified with a minimum 30-ton steel drum roller or a hoe-pack. Proof-roll the subgrade or fill material with a loaded tandem axle dump truck, observe deflections and rutting for indications of inadequate subgrade performance. Permanent rutting in excess of ¾" should be considered unsatisfactory compaction. In addition,

elastic movement in excess of ¾" with substantial cracking or substantial lateral movement should also be considered a sign of unsatisfactory compaction. A representative of the GER shall verify and approve the subgrade prior to placing the crushed rock.

Hoe-pack for densification - minimum 18,000 lbs excavator and hoe-pack with minimum 5,500 lbs of impulse force at 2,000 cycles per minute, compact the subgrade by applying steady and uniform pressure until a dense and non-yielding state is achieved. The depth of hoe-pack penetration shall be monitored for additional indications of sufficient compaction.

Using a ½ inch diameter steel T-probe, a representative of GER shall probe the subgrade soils or compacted fill layer at several locations across the surface of the compacted layer. If the T-probe readily penetrates the subgrade or placed fill material it indicates unsatisfactory compaction.

Adjust the lift thickness and moisture content, as recommended by the GER until the subgrade or placed fill layer exhibits firm, unyielding conditions. Continue the same process in placing each lift of fill material up to the planned elevation. Placement of fill material shall be observed and verified on a continuous basis (full time) by a representative of the GER.

11.10 Foundation Options for New Improvements

Based on preliminary information provided by HLA, we understand that a FFE of 1100' is planned for the operations/lab building, mechanical building, and UV building, which will result in raising these building pad areas by about 5 feet. The following table summarizes the preliminary design elevations, depth to competent bearing stratum, groundwater elevations, and the recommended foundation types for each planned improvement:

Table 7: Structure-Specific Subgrade Conditions

Proposed Structures	Preliminary FFE*	Competent Bearing Strata	Groundwater Elevation**	Recommended Foundation Type
Operations/Lab Building	1100.0'	±1093.0'	±1091.7'	Spread Footing
Headworks	*unknown*	±1092.0'	±1090.6'	Spread Footing/Piers
Mechanical Building	1100.0'	±1087.0'	±1090.6'	Spread Footing with Structural Slab/Mat
Aeration Basins and Aerobic Digestors	1092.0'	±1080.0'	±1090.2'	Rammed Aggregate Piers

UV and WAS/RAS Building	1100.0'	±1088.0'	±1088.0'	Spread Footing
Post-Aeration Basin	1090.0'	±1090.5'	±1088.5'	Spread Footing/Mat Foundation
Secondary Clarifiers	1092.0' to 1088.0'	±1089.0'	±1089.4'	Mat Foundation
Solids Handling Bldg. Extension	±1098.0'	±1085.0'	±1091.8'	Rammed Aggregate Piers

*elevations provided by HLA; **measured at time of drilling/excavation

11.11 Shallow Spread Foundations

In our opinion, the proposed operations/lab building, headworks, the mechanical building and the UV & WAS/RAS building structures may be supported on conventional spread foundations bearing on a layer of imported crushed rock structural fill placed atop compacted engineered structural fill placed on a recompacted competent native subgrade as recommended herein. Continuous wall and isolated spread footings should be at least 18 and 24 inches wide, respectively. The minimum footing depth shall be 24 inches below adjacent exterior finished grade for frost heave protection and bearing capacity considerations.

While loose onsite soils across these building/structure areas extend to depths of about 5 to 8 feet BGS, we understand that the planned FFE for these improvements will result in about 3 feet of engineered fill under the foundations. In order to bridge over the loose native in-place soils, we recommend a minimum over-excavation of 2 feet below existing grades and replacement with compacted engineered fill material consisting of suitable onsite sourced soils or imported granular fill material. Foundations shall be supported on a 12 inch layer of imported 1¼-inch minus crushed rock structural fill placed on the engineered fill section.

Foundations constructed in accordance with these recommendations may be designed for an allowable bearing capacity of **2,000 pounds per square foot (psf)**. The allowable bearing pressure may be increased by 1/3 for short-term, transient loading conditions. We estimate the total settlement for footings constructed on structural fill as recommended herein to be less than 1-inch, with differential settlement less than half that magnitude.

Lateral forces on foundations from short term wind and seis mic loading would be resisted by friction at the base of foundations and passive earth pressure against the buried portions. We

recommend an allowable passive earth pressure for the compacted onsite backfill of **275 pcf**. This lateral foundation resistance value includes a factor of safety of 1.5. We recommend a coefficient of friction of **0.45** be used between cast-in-place concrete and imported crushed rock fill. An appropriate factor of safety should be used to calculate sliding resistance at the base of footings.
Footings, foundations, and masonry walls should be reinforced as necessary to reduce the potential for distress caused by differential movement. The use of joints at opening or other discontinuities in masonry walls is recommended.

The footings should be founded below an imaginary line projecting at a 1-horizontal to 1-vertical (1H:1V) slope from the base of any adjacent parallel utility trenches.

The base of all foundation excavations should be free of water and loose soil. Excessively wet or any loose/disturbed material in the bottom of the footing excavations should be removed before foundation concrete is placed. If foundation subgrades become disturbed, or are otherwise deemed unsuitable by the GER, over-excavation of the unsuitable material and replacement (backfill) with compacted granular structural fill should be performed up to the footing base elevation per the recommendations of this report.

11.12 Slab-on-Grade Floors

The use of conventional concrete slabs-on-grade is considered feasible for use as building floors for operations/lab building, headworks, UV & WAS/RAS building structures; however, care shall be taken to properly prepare the slab subgrade due to the presence of loose native soils. We understand that FFE for the operations/lab building, headworks, and the UV & WAS/RAS building pads will be raised 5 feet above the existing grades. With approximately 4 feet of granular structural fill, satisfactory subgrade support for concrete slabs supporting up to 175 psf areal loading can be obtained.

Place a minimum 6-inch layer of crushed aggregate fill beneath the slabs. The material shall meet the WSS 9-03.9 (3), “Crushed Surfacing Top Course”, with less than 5 percent passing the No. 200 sieve (fines). The crushed rock material shall be compacted to at least 95% of the maximum dry density as determined by the ASTM D1557 method. Slabs should be reinforced according to their proposed use and per the structural engineer’s recommendations. We recommend that a

representative of the GER observe exposed floor subgrade areas during construction to confirm suitable floor support conditions, or to recommend appropriate measures to improve unsuitable slab subgrade conditions, if needed.

The architect and design team should evaluate whether a vapor barrier is needed under the new slab areas receiving moisture sensitive resilient flooring/VCT. A vapor barrier will reduce the potential for moisture transmission through and efflorescence growth on the floor slabs. Additionally, flooring manufacturers require vapor barriers to protect flooring and flooring adhesives and will warrant their product only if a vapor barrier is installed according to their recommendations. Actual selection and design of an appropriate vapor barrier should be based on discussions between the architect and members of the design team. The slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder. The architect shall determine the need and use of a vapor barrier.

11.13 Structural Slab/Mat for Mechanical Building

With the anticipation that the mechanical building will house conveyors, pumps, etc., we recommend the slab for the mechanical building be designed as a structural slab/mat with a minimum 12 inches of crushed aggregate fill placed beneath the slab. For load bearing concrete slabs designed as beams-on-an-elastic-foundation, a vertical modulus of subgrade reaction of **200 pounds per cubic inch (pci)** can be used for the compacted granular fill subgrade. The subgrade modulus value is measured for a 1-foot-square plate and can be adjusted for scaling effects using an appropriate formula, such as:

$$K_S = K_{V1} (B+1)^2 / (4B^2)$$

Where: K_S = coefficient of subgrade reaction
K_{V1} = vertical modulus of subgrade reaction
B = slab width in feet

Slab thickness, reinforcement and joint spacing shall be determined by the structural engineer based on the intended use and loading. If floor slabs are design and constructed as noted above, then we anticipate settlements of the slabs will be less than 1 inches over a 50-foot span.

11.14 Foundations Supported by Rammed Aggregate Piers

Due to the presence of near-surface relatively loose native soils to depths of about 7 to 15 feet BGS, relatively shallow groundwater conditions and to minimize the risk of induced settlement to the existing pretreatment lagoon from dewatering, we recommend supporting the aeration basin and aerobic digester structures on an intermediate foundation system such as an engineered Rammed Aggregate Pier (RAP) foundation system. Additionally, the solids handling expansion building location also includes very soft and highly compressible soils to depths of approximately 13 to 13.5 feet BGS and shall therefore also be supported on a RAP foundation system.

An engineered RAP foundation system, also referred to as stone columns, shall be utilized for support of foundations and floor slabs for these structures. Engineered aggregate piers for soil reinforcement is a Design-Build foundation system constructed by a Specialty Geotechnical Contractor. The design shall utilize the subsurface information and soil parameters presented in this report and structural loading provided by the Structural Engineer-of-Record.

The Geopier soil reinforcement is designed to reinforce and stiffen the upper portion of the soil profile beneath the planned subgrade elevation. The upper reinforced zone will support the building loads and minimize differential settlement. The RAP elements helps reduce pore pressure generation during a seismic event due to increased lateral stress and the higher permeability of the RAP element.

Based on the presence of relatively shallow groundwater conditions, along with relatively loose native and fill soils that exhibit a measurable risk for excess settlement, a “displacement process” is recommended for installation of the piers. Displacement process consists of a hollow mandrel with an internal compaction surface which is driven into the ground using a powerful static down force augmented by dynamic vertical impact energy. After driving to the design depth, the hollow mandrel serves as a conduit for aggregate placement. As the mandrel is raised and re-driven downward, thin lifts of compacted aggregate are formed and compacted both vertically and laterally. The process is repeated until the RAP is constructed. The displacement system can typically be installed to significant depths below the groundwater table, while eliminating the need for casing.

The aggregate pier elements shall extend to a minimum depth of 15 feet BGS to the underlying dense gravel stratum unit, or refusal, whichever is reached first. Practical refusal is typically considered as less than 1 foot of mandrel advancement in 60 seconds. The RAP system shall be designed to reinforce and stiffen the upper portion of the soil profile beneath the planned subgrade elevation. The upper reinforced zone shall support the loads and minimize differential settlement.

The bottom of the pier excavation shall be rammed prior to the placement of aggregate. The engineered aggregate pier design shall meet the following criteria:

- Allowable End Bearing Pressure for Footings supported by Aggregate Pier Reinforced Soils: **3,000 psf** (increase by 1/3 for short duration loadings)
- Estimated Total Long-Term Settlement for Footings: ≤ 1-inch
- Estimated Long-Term Differential Settlement of Adjacent Footings: ≤ ½-inch

The layout, diameter, and spacing of the aggregate pier elements shall be dictated by the structural loading. The installation of the aggregate pier reinforcement including a downward modulus test shall be completed in accordance with the engineered aggregate pier design specifications.

The aggregate pier reinforcement design shall utilize a minimum 16-inch drill diameter. Aggregate pier elements shall be founded on, and socketed a minimum 12 inches into, the underlying gravel stratum unit at depth. Aggregate pier design should be completed by a qualified design/build geotechnical specialty contractor. The engineered aggregate pier installer shall provide design submittal package including pier layout, drawings, specifications and calculations, sealed by a Washington State Professional Engineer, to the GER and the Structural Engineer for review at least 2 weeks prior to mobilization.

The center of each constructed aggregate pier element shall be within 6 inches of the design location. Foundation elements installed outside of the above tolerance and deemed unacceptable, shall be either rebuilt or other remedial measures shall be taken as approved by the aggregate pier system designer.

The downward modulus test shall consist of loading the pier element in increments to 150% of the design load while measuring deflection to verify the design parameters. The modulus test shall also

incorporate a creep test at 115% of the design load. The installation and the modulus test will be conducted under the supervision of an experienced geotechnical engineer.

The aggregate pier installer shall provide a full time Quality Control (QC) representative on-site during pier construction to observe the drilling and construction of all engineered aggregate piers and document the pier installation. A daily aggregate pier installation report shall be completed by the installer's QC representative each day of installation and shall be furnished by the installer to the general contractor and the GER.

A representative of the GER shall be retained by the Owner to conduct Quality Assurance (QA) services during pier installation. Representative of the GER shall monitor installation procedures and confirm that subsurface conditions across the installation area as revealed by the pier drilling are in substantial conformance with the findings of the geotechnical explorations.

Aggregate for the piers shall consist of material meeting the gradation and quality requirements of WSDOT Standard Specifications 9-03.9(3), Crushed Surfacing. Wet weather and fine grained soil conditions (subgrade soil condition) at the site may require that the aggregate contain less than 5% fines (percent passing the No. 200 sieve size). We recommend a suitable washed, open graded aggregate be used as initial lifts due to wet conditions and potential soft soils present at the bottom of the aggregate pier. The aggregate pier system designer and installer shall make the final determination of acceptable materials to be used in pier construction.

The general contractor is responsible for the layout of the building pad, footings, grade beams, floor slabs and staking of all aggregate pier locations prior to aggregate pier installation. The layout and pier staking shall be conducted by a licensed surveyor. Information shall include existing ground surface elevations (±3 inches) within 50 feet of each aggregate pier element. All above and below ground utilities shall be located, clearly marked, and relocated as necessary prior to installation of aggregate pier elements. Proper grading, moisture migration control, surface drainage and BMPs shall be implemented by the general contractor.

Foundations shall be constructed at minimum 30 inches below finished exterior grade, or as prescribed by the local jurisdiction, for frost protection. Foundation excavations to expose the tops of aggregate piers shall be made with care and shall be protected until concrete placement, with

procedures and equipment best suited to (1) preventing softening of the soil matrix between and around aggregate piers prior to pouring structural concrete, and (2) achieving suitable contact between the dense, undisturbed aggregate piers and the concrete footing.

Design of RAP elements are typically performed as a design-build process by a Specialty Geotechnical Contractor. The project structural engineer should provide foundation design that accommodates the noted level of estimated settlement/distortion following the recommended ground improvement.

11.15 Mat Foundations for Secondary Clarifiers

Mat foundation is a suitable option for support of the new secondary clarifiers and post-aeration basin to minimize the potential for long-term settlements related these structures. Mat foundations shall be supported on a 36-inch thick improved section consisting of an 18-inch thick layer of imported crushed rock structural fill section placed atop an 18-inch thick section of suitable onsite sourced soils placed as compacted engineered fill. An allowable bearing capacity of **3,000 pound per square foot (psf)** may be used for design purposes. This value represents net bearing pressures; the weight of the footings and overlying backfill can be ignored in calculating footing sizes. The allowable bearing pressure may be increased by one-third for short-term, transient loading conditions (i.e., seismic and/or wind loads).

Where a concrete mat is designed as beams-on-an-elastic-foundation, a modulus of subgrade reaction of **200 pci** should be used for the compacted crushed rock/granular fill subgrade.

We estimate the total settlement for mat foundation constructed per the recommendations of this report to be less than 1-inch, with differential settlement less than half that magnitude. We expect elastic settlements to generally occur as loads are applied.

Lateral loads on footings can be resisted by passive earth pressure on the sides of the structure and by friction on the base of the footings. An allowable passive resistance may be calculated as a triangular equivalent fluid pressure distribution using an equivalent fluid density of **275 pcf**, provided the footings are cast directly against properly placed and compacted granular structural fill. A safety factor of 1.5 has been applied to the recommended passive pressure. A coefficient of base friction of **0.45** (concrete poured directly over crushed rock fill) may be used for the frictional

resistance against sliding. An appropriate factor of safety shall be used to calculate sliding resistance at the base of footings.

11.16 Sunken Caisson for Lift Station

Given the proximity of existing treatment plant structures and utilities, dewatering is not a feasible option for construction of the new lift station as lowering the water level around existing structures could induce settlements. A sunken caisson construction should be employed for the lift station to facilitate its installation below the groundwater level.

The new lift station may be constructed using the sunken caisson method to facilitate installation below the groundwater level. Subsurface exploration at the site indicates very loose silty sand extending to depths of approximately 8 to 9 feet, underlain by very dense gravel (may contain cobble and boulder stones) to a depth of at least 35 feet BGS. The static groundwater level was encountered at an approximate depth of 6 feet BGS. The sunken caisson method provides a practical alternative to open-cut excavation and dewatering for construction of the new lift station.

The construction sequence should consist of initially excavating to near the groundwater level, setting the reinforced concrete caisson in position, and then excavating soils from within the caisson using a clamshell bucket, excavator, or similar equipment. As excavation progresses, the caisson will sink under its own weight. Localized high-pressure water jetting or limited pumping from inside the caisson may be employed to loosen soils at the cutting edge and facilitate penetration through the underlying very dense gravel stratum. When the bottom of the caisson reaches the design elevation, excavation and pumping should be terminated. The base should then be cleaned of loose materials and a tremie concrete plug placed under water. The plug should be of sufficient thickness and strength to resist hydrostatic uplift prior to any internal dewatering.

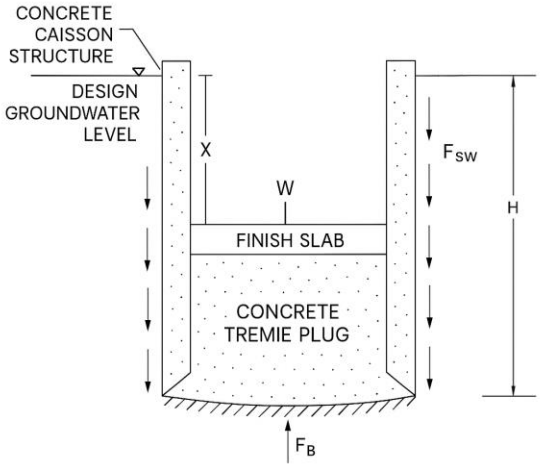
The differential hydrostatic pressure from the groundwater level within the retained soils should be balanced by maintaining a sufficient head of water or slurry within the interior of the caisson during excavation. At all times during construction by the wet method, the level of water or slurry within the caisson should be maintained above external water level.

Due to the presence of very dense gravel soils below depths of 15 feet, constructing caissons may require specialized techniques and equipment. To counter the challenges posed by dense gravel,

the contractor shall be experienced and prepared to utilize specialized drilling equipment with rock-cutting capabilities to penetrate the dense layers and break up any larger rocks.

The following equation may be used for calculating the uplift and resisting forces associated with the sunken caisson method, assuming the design groundwater level at the existing ground surface:

$$\text{Factor of Safety} = \frac{W + F_{SW} * L}{F_B}$$



Where:

W = Structure weight in kips

F_B = Buoyant force in kips (Unit weight of water x volume of structure below groundwater)

L = Perimeter around base of wall in feet

F_{SW} = Shearing resistance of soil-wall contact in kips per foot of wall

Buoyancy and Uplift

The lift station structure will be subject to buoyant forces whenever the external groundwater level exceeds the internal fluid level. The structure and tremie plug should be designed to resist these hydrostatic uplift forces with an appropriate factor of safety, not less than 2.0. The design should consider the groundwater level at or near the ground surface as the design condition. Because the caisson will penetrate into the very dense silty sandy gravel stratum, resistance to uplift will be provided primarily by the self-weight of the structure and tremie plug, as well as by side friction along the caisson walls. The structure should be detailed to ensure a watertight connection between the base slab and wall section to prevent internal leakage or uplift separation.

Lateral Earth Pressures

The below-grade walls of the lift station should be designed for an equivalent at-rest lateral earth pressure of **57 pounds per cubic foot (pcf) above the groundwater level** and **86 pcf below the groundwater level.** These values account for the presence of granular backfill and full hydrostatic

conditions. Due to the existing treatment plant facility, vehicle and equipment surcharges are anticipated adjacent to the structure. For design purposes, a rectangular distributed surcharge load of 120 psf should be added to the lateral pressures to account for a 250-psf vertical surface surcharge. Because the walls will be designed for at-rest conditions, incremental seismic lateral loads are not considered necessary for this project.

11.17 Lateral Earth Pressures

Recommended lateral earth pressures, in terms of equivalent fluid pressure, for design of retaining walls or below-grade structures above groundwater are presented in Table 8. These values are for retained soils and engineered structural backfill consisting of imported granular fill and are valid for static loading cases only and assume that the structural wall backfill is adequately drained to avoid saturation and introduction of hydrostatic pressures. The recommended design lateral earth pressures do not include a factor of safety.

In order to develop an active condition, the wall must rotate about base, with top lateral movements of 0.002 H to 0.004 H. For at-rest pressure, no movement is assumed; use at-rest pressures for restrained or braced walls. For passive earth pressure, walls must move horizontally to mobilize resistance. The horizontal resultant force (pressure x H/2, where H = height of buried wall) should be applied at an H/3 distance from the base of the wall.

Table 8: Lateral Earth Pressure Design Parameters

Retained Soil	Equivalent Fluid Unit Weight for Level Backfill, (pcf)			Wet Density, (pcf)	Internal Friction Angle (Drained)
	At-rest	Active	Passive		
Onsite Silty/Sandy Soils	53	35	315	105	30°
Granular Structural Backfill / Drain Rock Material	56	35	520	135	36°

1. No safety factor is included in these values
2. Retained material may include engineered structural backfill or undisturbed native soil. Structural wall backfill should consist of imported free draining granular material. Backfill should be prepared and compacted to at least 95 percent of maximum dry density as determined by the modified Proctor test (ASTM D1557).
3. The granular backfill must extend out and up from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively.
4. The upper 6 inches of soil should be neglected in passive pressure calculations. If exterior grade from top or toe of retaining wall is sloped, GNN should be contacted to provide location-specific lateral earth pressures
5. For sloped backfill conditions, GNN should be contacted for additional analysis and recommendations.

If any surface, surcharge loads are closer than one-half of the wall height (horizontal distance) to the edge of the below-grade and/or retaining wall, increase the design wall pressure by *q*/2 over the

whole area of the retaining wall. In this expression, *q* is the surface surcharge load in psf. GNN should review anticipated surcharge loading to confirm that the appropriate design values are considered. The horizontal surcharge resultant force (pressure x H, where H is height of buried wall) should be applied at an H/2 distance from the base of the wall.

Wall Drainage: Retaining structures should include adequate back drainage to avoid build-up of hydrostatic pressures. Positive drainage for retaining walls should consist of a vertical layer of permeable material (chimney drain), such as a pea gravel or crushed rock (typically ¼- to ¾-inch crushed), at least 18 inches thick, positioned between the back of wall and the backfill and extend up to within 12 inches of finished grade where it should be capped with compacted low permeability fill to reduce infiltration of surface water into the drain system.

We recommend the select granular wall backfill be separated from general fill and/or native soil using an appropriate drainage geotextile filter fabric. A non-woven filter fabric such as Mirafi 140N is typically used for this application.

A 4-inch perforated rigid PVC drainpipe shall be embedded at the base of the drain rock. The drainpipe should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 3 percent passing the No. 200 sieve. The free-draining aggregate should be encapsulated in a filter fabric.

Backfill and Subgrade Compaction: Compaction on the retained side of the wall within a horizontal distance equal to 5 feet should be performed by hand-operated or other lightweight compaction equipment. This is intended to reduce potential locked-in lateral pressures caused by compaction with heavy grading equipment. Retaining wall foundation subgrade improvements and design shall be constructed in accordance with the recommendations of this report.

11.18 External Loads and Pipe Support

External loads caused by the trench backfill and surface restoration and live loads are supported by the combination of pipe strength (pipe stiffness) and the strength of the pipe zone material. For rigid pipe design, a backfill unit weight of 115 and 135 pcf should be used for the onsite soils and imported granular fill, respectively. A trench width of pipe diameter plus 36 inches minimum is

recommended. In a flexible "pipe-soil" system, the pipe deflection is the same as the soil deflection under the load of the trench backfill material and surface loads. Compressibility of the soil envelope (pipe base plus pipe zone) is measured by the soil modulus, E', which is the ratio of soil pressure to soil deflection at a given soil compaction density. On the basis of correlations with the SPT blow counts in cohesionless soils, GNN recommends that E' value for soils in Table 8 be used for pipeline design.

Table 9: Values of E' for Pipeline Design

Material	E' (psi)	Condition
Native soil (ML/SM/SP-SM)	3,000	In situ (trench wall)
Native soil (ML/SM/SP-SM)	1,000	Compacted pipe zone
Imported, clean, well-graded sand or gravel	2,000	Compacted pipe zone
Imported, clean, compacted crushed rock	6,000	Compacted pipe zone

Source: Howard (1996) for in situ and Howard (2006) for pipe zone.

11.19 Subgrade Inspection and Compaction Verification

GNN's geotechnical inspector shall be onsite during earthwork to inspect and test subgrade and each fill layer. Proceed with subsequent earthmoving only after inspections confirm previously completed work complies with requirements of this report. Inspections and tests include:

1. Determine prior to placement of fill that subgrade has been prepared in compliance with requirements of the Geotechnical Report.
2. Determine that fill material and maximum lift thickness and moisture comply with requirements of the Geotechnical Report.
3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements of the Geotechnical Report.

When the geotechnical inspector indicates that subgrades, and fills have not achieved subgrade acceptance criteria or degree of compaction specified, scarify, and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

11.20 Surface Drainage

With respect to surface water drainage, we recommend that the ground surface be sloped to drain away from the structure. Final exterior site grades shall promote free and positive drainage from the building areas at all times. Water shall not be allowed to pond or to collect adjacent to

foundations or within the immediate building area. We recommend that a gradient of at least 5% for a minimum distance of 10 feet from the building perimeter be provided, except in paved locations. In paved areas, a minimum gradient of 1% shall be provided unless provisions are included for collection and disposal of surface water adjacent to the structure. Catch basins, yard drains, drainage swales, ditches, or other drainage facilities shall be appropriately located as necessary. We recommend that all surface water such as that coming from roof downspouts and catch basins as well as all subsurface water coming from footing subdrains (if installed), be collected in tight drain lines and carried to a suitable discharge point, such as a storm drain system. Surface water and downspout water should not discharge into a perforated or slotted subdrain, nor should such water discharge onto the ground surface adjacent to the buildings. Cleanouts shall be provided at convenient locations along all drain lines.

11.21 Building Subdrainage Considerations

Due to the presence of shallow groundwater, subdrainage may be warranted beneath and/or around the buildings if the bottom elevations of building/foundation are at or near the groundwater elevation. The types and extent of subdrainage systems will depending upon the final building configuration and elevation.

Below Building Drainage

If the building subgrade is elevated less than 3 feet above the highest native site grades beneath the building, then a below building drain system should be installed. For buildings with concrete slab-on-floor systems, the subdrainage will likely be a sub-slab system. In general, a below building drainage system should consist of the following elements.

1. The building subgrade should be covered by a minimum 12-inch-thick layer of drain rock placed over the prepared subgrade to act as a capillary break and sub-slab drain system. The drain rock should consist of ¾- to 1-inch maximum size, free draining, uniformly graded gravel having less than 3 percent fines (material passing the No. 200 sieve) based on the minus ¾-inch fraction of the material.

2. A series of 3-inch-diameter perforated pipes should be placed directly below the drain rock layer. In general, the pipes would be spaced roughly 15- 20 feet apart with their perforations faced downward, although actual spacing and configuration can be determined

in conjunction with the design team to reduce conflicts with foundation elements. The discharge pipe(s) should not be tied directly into stormwater drain systems, unless measures are taken to prevent backflow into the wall's drainage system.

3. We strongly recommend the sub-slab drainage system also include a vapor barrier. However, selection and design of an appropriate vapor barrier should be based on discussions with the design team.

Perimeter Footing Drainage

If a below building drain is installed, then a perimeter footing drain is not required, though could be installed to provide an added level of protection. If no below building drain is installed, then a perimeter footing drain system should be installed.

The perimeter drain system should consist of a minimum 2-foot-deep by 1-foot-wide trench filled with drainage material with a 3-inch-diameter perforated collection PVC pipe. The top of the drain should extend to within 6 inches of finished grade in areas where it is covered by topsoil, or directly to the base of the subgrade for flatwork. The base of the drain should extend 18 inches below the base of the interior subgrade. The drain rock should be completely enveloped by a drainage geotextile. The discharge pipe(s) should not be tied directly into stormwater drain systems, unless measures are taken to prevent backflow into the wall's drainage system.

12.0 TRENCHLESS UTILITY CROSSING RECOMMENDATIONS

We understand that the new gravity and force main sewer lines will be installed from the new plant improvement area on the east side to the main WWTP area, which will require crossing beneath the existing BNSF railroad through either new casings or by reusing existing casings. The following provide recommendations for trenchless pipe crossing under the railroad right-of-way.

12.1 Trenchless Construction Methods

Common trenchless techniques include Auger Boring (AB), Horizontal Directional Drilling (HDD), Microtunneling (MT), Pipe Jacking (PJ) and Pipe Ramming (PR). The following table provides a summary of the capability/favorability of each method based on pipe size/type and soil/groundwater conditions.

Table 10: Comparison of Available Trenchless Techniques

Method	AB	HDD	MT	PJ	PR
Pipe Size & Type					
Pipe Diameter (inches)	12 – 48	12 – 48	12 – 168	12 – 168	12 – 168
Pipe Length (feet)	40 – 300	40 – 6000	40 – 1000	40 – 300	40 – 300
Capable of handling steel pipe?	Yes	Yes	Yes	Yes	Yes
Subsurface Soil/Groundwater Conditions					
Gravels and cobbles less than 4”	Yes	Risky	Yes	Yes	Yes
Soils with significant cobbles greater than 4”	Risky	Risky	Risky	Risky	Risky

All trenchless work must be carried out by an experienced specialty contractor employing only qualified workers skilled in their trade under the direction of an experienced foreman. Potential specialty contractors bidding to perform trenchless construction on this project must be provided a copy of this geotechnical site investigation report. The contractor’s work plan should include a method of sealing the ends of the bore/casing at the end of each work day or in case of an emergency. It should also include a procedure for compensation grouting should uncontrolled loss of ground or drilling fluid occur. It is recommended that the geotechnical aspects of the contractor’s work plan for the proposed undercrossing be reviewed by this office prior to construction. The trenchless contractor is advised to carefully expose any underground utilities which cross the undercrossing path to confirm their elevations prior to commencement of the work.

Based on the capability of these methods to install a steel pipe, along with the favorability of each method through the onsite soils, it is our opinion that options for trenchless techniques include Horizontal Directional Drilling due to the proposed span lengths. Auger Boring is also considered an acceptable option for the trenchless crossings. Based on the predominantly gravelly/cobbly nature of the onsite soils, drilling of a pilot hole and/or use of a casing may be required. The following sections provide brief discussion of the two selected trenchless methods:

<u>Auger Boring</u>

Auger Boring (AB) is a method for driving a horizontal bore hole through an embankment from a drive shaft to a reception shaft. A rotating cutting head is attached to the leading end of an

auger string. The spoil is transported back to the drive shaft area by the rotation of the helical-wound auger flights within the steel pipe casing being placed. Common practice is to jack the steel casing through the hole as it is being bored. The soil/rock material is excavated, removed, and the casing installed in one continuous operation.

The method is unguided as to line and grade unless a steering head is used. With the steering head and a water-level grade monitoring system an accuracy of 1 percent of the length can be maintained in vertical grade. Technology is providing more accurately controlled articulating cutter heads and laser sensing systems which are coming into common use. With the new improvements, auger boring can rival microtunneling accuracy for relatively short drives in stable ground conditions.

Working space is required at both ends of the casing. The drive shaft is the working shaft with its size determined by bore hole diameter and length of casing segments used. Typical casing lengths range from 10 feet to 20 feet. For a casing that is 20 feet in length the shaft size should be from 30 feet to 35 feet in length and from 10 feet to 14 feet wide.

Operator skill and experience are the key element of success with this method. Depending on soil conditions, casing diameter and length a typical advance rate would be from 3 feet to 40 feet per hour. The minimum depth of cover over the excavation should not be less than 2 feet.

Horizontal Directional Drilling

Horizontal Directional Drilling (HDD) is a method that uses steerable subsurface drilling in a two-stage process. Stage 1 involves drilling a pilot hole approximately 1-inch to 5-inches in diameter along the proposed pipe alignment centerline. Concurrent to drilling the pilot hole, the contractor may elect to run a larger diameter “wash pipe” that will encase the pilot drill string. The wash pipe acts as a conductor casing providing rigidity to the smaller diameter pilot drill string and will also save the drilled hole should it be necessary to retract the drill string for bit changes.

In Stage 2, a back-reamer is attached to the end of the drill string and pulled back through the pipe to enlarge the hole to the size necessary to pull back the new pipeline. The pipe can be pulled in behind the back-reamer or the hole can be created first then the pipe pulled through. It may require several passes on different diameter back-reamers to enlarge the bore to the diameter desired.

The drill rig itself sets on the surface and has an inclined carriage typically adjusted to an angle between 5 to 20 degrees with the ground. The drill string enters the ground at the preset angle and is then guided through the subsurface in a shallow arc. The drill path is monitored by an electronic package housed in the pilot drill string near the cutting head. Data is transmitted back to the surface where calculations are made as to the location of the cutting head.

Large volumes of drilling slurry are used to provide transport of the drilling cuttings to the surface, stabilize the hole against collapse, reduction of friction, lubrication of the cutting head, cooling and cleaning of the cutters, and providing power to the drill motor.

A workspace of approximately 120 feet x 175 feet should be provided at both the rig side and the outlet side of the project for storage and required auxiliary equipment.

Directional drilling has the fastest boring rate among all the trenchless methods. In suitable conditions, 500 feet of pipeline can be installed in one day. It can be used under water and a number of different pipe materials can be pulled into place.

12.2 Trenchless Crossings under Railroad Tracks

The following guidance is provided for design and construction of trenchless pipeline crossing under railroad tracks, based on Part 3 of the BNSF *Utility Accommodation Policy* (2011).

General Design and Construction Requirements

- All utility crossings under railroad trackage should have a minimum depth of cover of five and one-half (5-1/2) feet from base of rail. The depth of cover shall not be less than that meeting applicable industry standards.

- Underground installations may be made by open-trenching from the property line to the toe of the fill slope in fill sections and to the toe of the shoulder slope in cut sections but to no closer than thirty (30) feet of the centerline of track. The remainder will be tunneled, augured, jacked or directional-bored through the roadbed.

- Jacking/boring pits shall be located a minimum of thirty (30) feet from the centerline of track, and kept to the minimum size necessary.

- Under-track bores shall be located greater than 150 feet from the nearest bridge, culvert, track switch, building or other major structure.

Pipeline Requirements

- Pipelines carrying oil, liquefied petroleum gas, natural or manufactured gas and other flammable products shall conform to the requirements of the current AREMA, ANSI/ASME B 31.4 Code for pressure piping - Liquid Petroleum Transportation Piping Systems; ANSI B 31.8 Code for pressure piping - Gas Transmission and Distribution Piping Systems; other applicable ANSI codes and 49 C.F.R. Part 192 or Part 195 - Transportation of Hazardous Liquids by Pipeline, except that the maximum allowable stress of design of steel pipe shall not exceed the percentages of the specified minimum yield strength (multiplied by longitudinal joint factor) of the pipe as defined in the ANSI codes.

- Pipelines under railroad tracks and across railroad property shall be encased in a larger pipe or conduit called "casings." Generally, casings shall extend from right-of-way line to right-of-way line, unless otherwise approved.

- Pipelines and casing pipes shall be suitably insulated from underground conduits carrying electric wires on railroad property.

Casing and Pipeline Installation

Casing and pipeline installations should be accomplished by directional boring, jack-and-bore, tunneling or other approved methods. Tunneling construction under tracks will be permitted only under direct supervision of a BNSF Engineer. Tunneling procedures and equipment, as well as structural design, must have BNSF Engineering approval prior to starting any work on BNSF property. Generally, tunneling shall not be considered where less than six (6) feet of cover exists, or where excessively sandy, loose or rocky soils are anticipated.

Rail elevations over the work must be monitored at intervals prescribed by BNSF to detect any track movement. Movements of over one-quarter (1/4) inch vertically shall be immediately reported to the BNSF Roadmaster. Due to the danger to rail traffic that is caused by only small amounts of track movement, BNSF forces may have to be called to surface the track several times.

The following requirements shall apply to these construction methods:

1) The use of water under pressure jetting or puddling will not be permitted to facilitate boring, pushing or jacking operations. Some boring may require water to lubricate cutter and pipe, and under such conditions, is considered dry boring.
2) Where unstable soil conditions exist, boring or tunneling operations shall be conducted in such a manner as not to be detrimental to the railroad being crossed.
3) If excessive voids or too large a bored hole is produced during casing or pipeline installations, or if it is necessary to abandon a bored or tunneled hole, prompt remedial action should be taken by the Utility Owner.
4) All voids or abandoned holes caused by boring or jacking are to be filled by pressure grouting. The grout material should be sand cement slurry with a minimum of two (2) sacks of cement per cubic yard and a minimum of water to assure satisfactory placement.
5) The hole diameter resulting from bored or tunneled installations shall not exceed the outside diameter of the utility pipe, cable or casing (including coating) by more than one and one-half (1-1/2) inches for pipes with an inside diameter of twelve (12) inches or less, or two (2) inches on pipes with an inside diameter greater than twelve (12) inches.
6) Pits for boring, tunneling or jacking will not be permitted within thirty (30) feet of the centerline of track; or closer to the track than the toe of fill slopes in fill sections, or toe of shoulder slopes in ditch sections when pipes are allowed on the railroad property.

12.3 Pipeline Design Criteria

The following pipe design criteria is applicable based on the soil conditions, and anticipated loading encountered along the proposed alignment.

Surface Live Loads

Buried pipes exposed to distributed live loads, such as pipelines crossing beneath roadways and railroads, shall be designed to resist such live loads. For the segment of the pipeline crossing underneath the existing roadways and railroads, a live load transferred to the pipe (P_P) is taken as a function of the height of the soil cover above top of pipe. The live loads provided in the following table considers Cooper E-80 railroad loads (80 klf) with an impact factor 1.35 to account for bumps and irregularities in the travel surface.

Table 11: Live Loads from Railroad Traffic

Height of soil cover (feet)		***2***	***4***	***6***	***8***	***10***	***12***	***14***	***16***
P_P (psi)	**Railway E-80**	26.39	18.40	15.63	11.11	7.64	5.56	4.17	3.47

Note: NE = negligible live load

Pipe Ovality and Stress

Buried pipes tend to ovalize under the effects of earth and live loads. The modified Iowa deflection formula may be used to calculate the pipe ovality under earth and live loads. Other stress considerations for buried steel pipes include through-wall bending, crushing of side walls, ring buckling and fatigue due to large cyclic surface loads as in the case of pipe crossing under railroad tracks or highways. For buried pressure-steel pipelines, with *D/t* typically smaller than 100 (where **D** is outside diameter of pipe, and **t** is the pipe wall thickness), and a yield stress larger than 30,000 psi, crushing of the sidewall is quite unlikely. Buckling in steel pipelines typically occurs when ovality reaches about 20%.

13.0 CONTINUING GEOTECHNICAL SERVICES

The Client should maintain an adequate program of geotechnical consultation, construction monitoring, and soils testing during the final design and construction phases to ensure compliance with GNN's geotechnical recommendations. For this purpose, GNN, the Geotechnical Engineer-of-Record, shall be retained as the geotechnical consultant from beginning to end of the project to maintain continuity of services. If GN Northern, Inc. is not retained by the owner/developer and/or the contractor to provide the recommended geotechnical inspections/observations and testing services, the geotechnical engineering firm or testing/inspection firm providing tests and observations shall assume the role and responsibilities of Geotechnical Engineer-of-Record.

GNN can provide construction monitoring and testing as additional services. The costs of these services are not included in our present fee arrangement but can be obtained from our office. The recommended construction monitoring and testing includes, but is not necessarily limited to, the following:

- Consultation during the design stages of the project.
- Review of the grading and drainage plans to monitor compliance and proper implementation of the recommendations in GNN's Report.
- Observation and quality control testing during site preparation, grading, and placement of engineered fill as required by the local building ordinances.
- Geotechnical engineering consultation as needed during construction.

14.0 LIMITATIONS OF THE GEOTECHNICAL SITE INVESTIGATION REPORT

This GEOTECHNICAL SITE INVESTIGATION REPORT ("Report") was prepared for the exclusive use of the Client. GN Northern, Inc.'s (GNN) findings, conclusions and recommendations in this Report are based on selected points of field exploration, and GNN's understanding of the proposed project at the time the Report is prepared. Furthermore, GNN's findings and recommendations are based on the assumption that soil, rock and/or groundwater conditions do not vary significantly from those found at specific exploratory locations at the project site. Variations in soil, bedrock and/or groundwater conditions could exist between and beyond the exploration points. The nature and extent of these variations may not become evident until during or after construction. Variations in soil, bedrock and groundwater may require additional studies, consultation, and revisions to GNN's recommendations in the Report.

This Report's findings are valid as of the issued date of this Report. However, changes in conditions of the subject property or adjoining properties can occur due to passage of time, natural processes, or works of man. In addition, applicable building standards/codes may change over time. Accordingly, the findings, conclusions, and recommendations of this Report may be invalidated, wholly or partially, by changes outside of GNN's control. Therefore, this Report is subject to review and shall not be relied upon after a period of **three (3) years** from the issued date of the Report.

In the event that any changes in the nature, design, or location of structures are planned, the findings, conclusions and recommendations contained in this Report shall not be considered valid unless the changes are reviewed by GNN and the findings, conclusions, and recommendations of this Report are modified or verified in writing.

This Report is issued with the understanding that the owner or the owner's representative has the responsibility to bring the findings, conclusions, and recommendations contained herein to the attention of the architect and design professional(s) for the project so that they are incorporated into the plans and construction specifications, and any follow-up addendum for the project. The foregoing notwithstanding, no party other than the Client shall have any right to rely on this Report and GNN shall have no liability to any third party who claims injury due to reliance upon this Report, which is prepared exclusively for Client's use and reliance.

GNN has provided geotechnical services in accordance with generally accepted geotechnical engineering practices in this locality at this time. GNN expressly disclaims all warranties and guarantees, express or implied.

Client shall provide GNN an opportunity to review the final design and specifications so that earthwork, drainage and foundation recommendations may be properly interpreted and implemented in the design and specifications. If GNN is not accorded the review opportunity, GNN shall have no responsibility for misinterpretation of GNN's recommendations.

APPENDICES

Appendix I

Vicinity Map (Figure 1)

Site Exploration Map (Figure 2)

Geologic Map (Figure 3)

Liquefaction Susceptibility Map (Figure 4)

USGS Quaternary Fault Map (Figure 5)

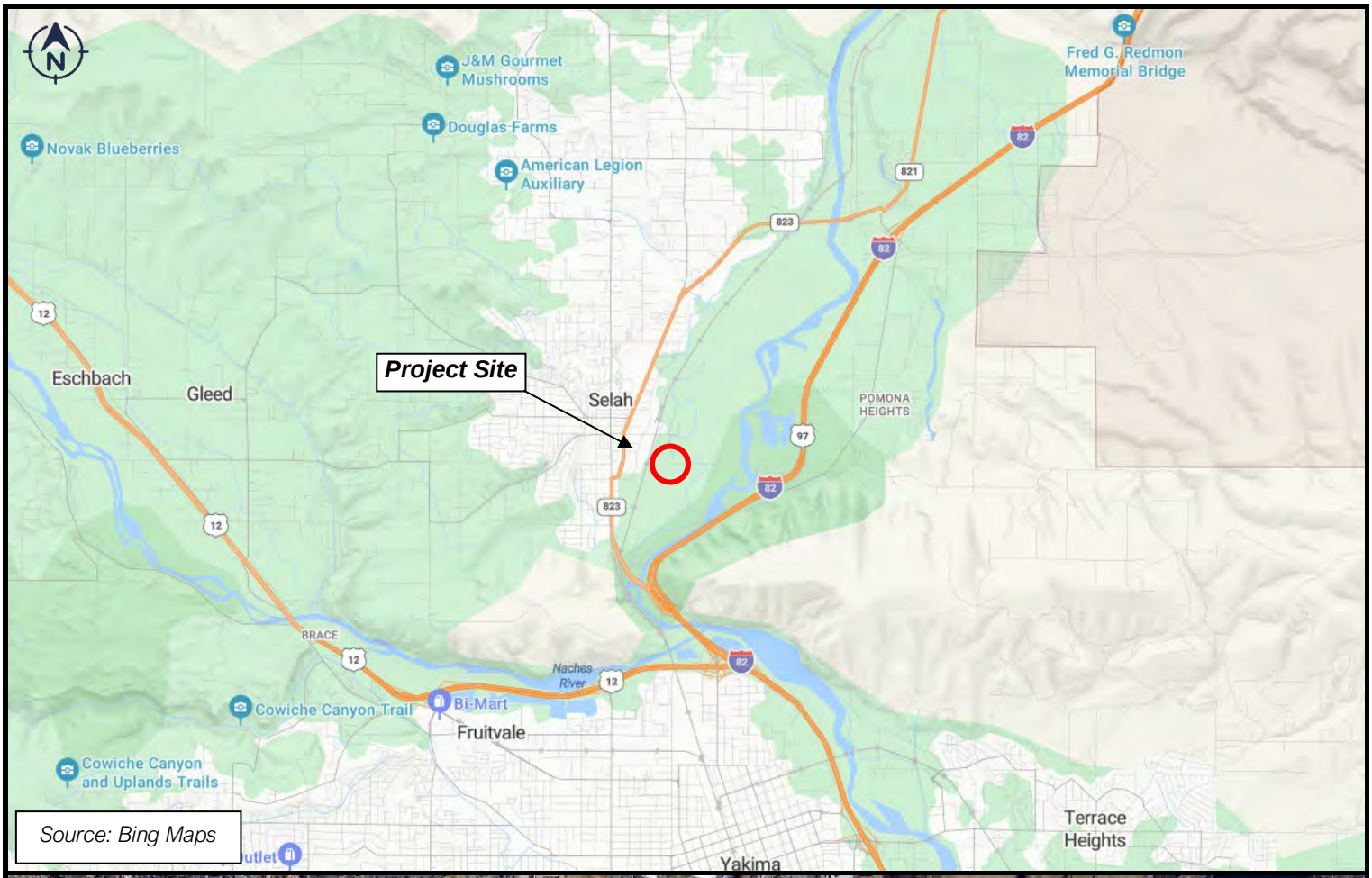




FIGURE 1: VICINITY MAP

PROJECT NO. 225-1849

LEGEND

- Exploratory Boring
- Exploratory Test-Pit

EXISTING INDUSTRIAL PRE-TREATMENT LAGOON

LAB

SOLIDS HANDLING BUILDING

HEADWORKS

MECHANICAL BUILDING

EXISTING TREATMENT PLANT

AERATION BASINS

FUTURE

PHASE 1 SOLIDS HANDLING EXTENSION

EXISTING BNSF RAILWAY

AEROBIC DIGESTER

UV AND WAS/RAS BUILDING

NEW INFLUENT LIFT STATION

EXISTING OUTFALL

POST-AERATION BASIN

SECONDARY CLARIFIERS

FUTURE CLARIFIER

B-1 B-16 B-14 B-15 B-13 B-2 B-12 B-7 B-6 B-5 B-4 B-8 B-9 B-10 B-11 B-3

TP-1 TP-2 TP-3 TP-4

MAP NOTES

- Aerial image from *Google Earth*
- Overlayed *Site Map* dated 7/28/2025 prepared by HLA

SITE MAP

0 40 80 160

N

FIGURE 2: SITE EXPLORATION MAP

PROJECT NO. 225-1849

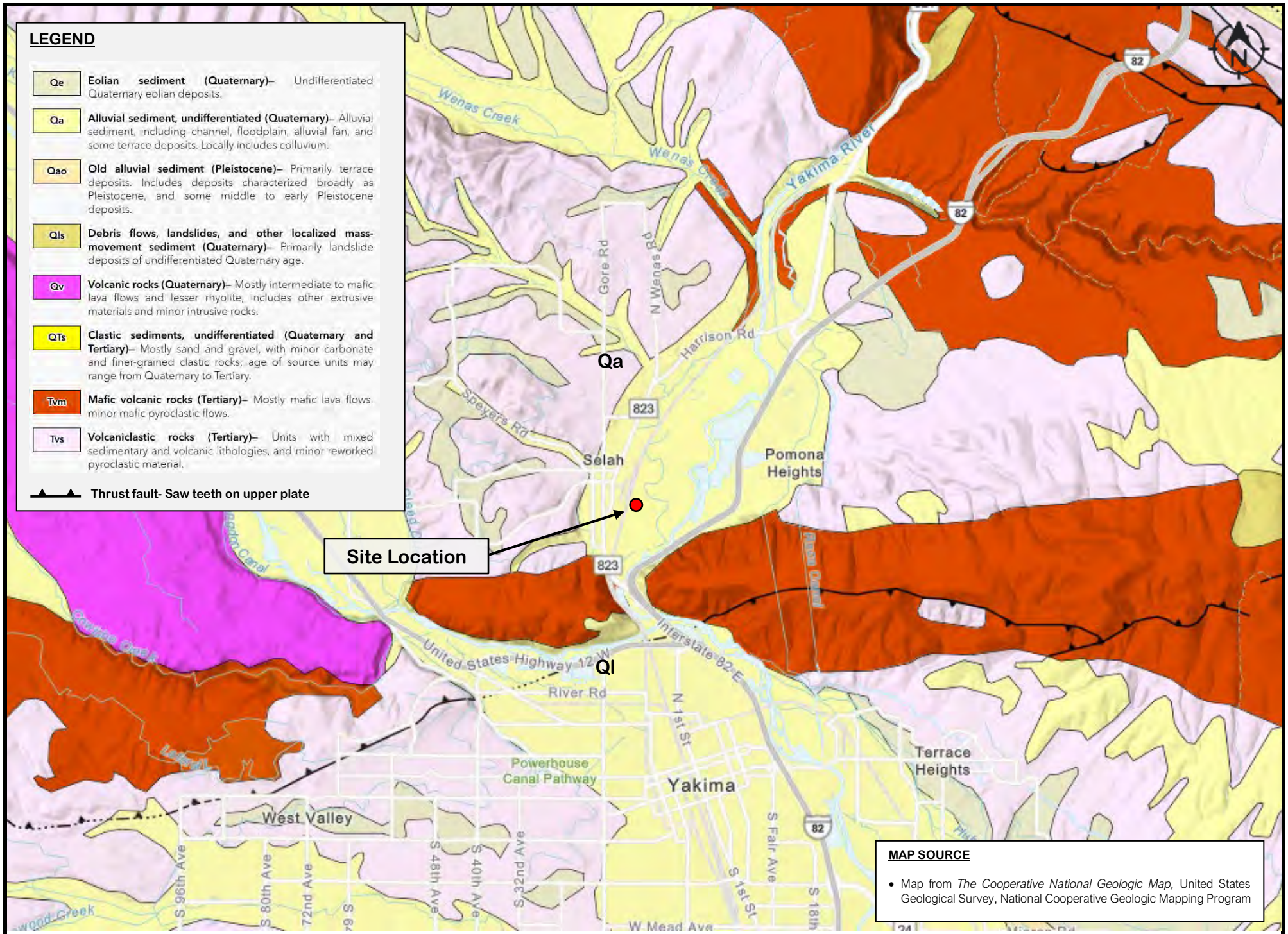


FIGURE 3: GEOLOGIC MAP

PROJECT NO. 225-1849

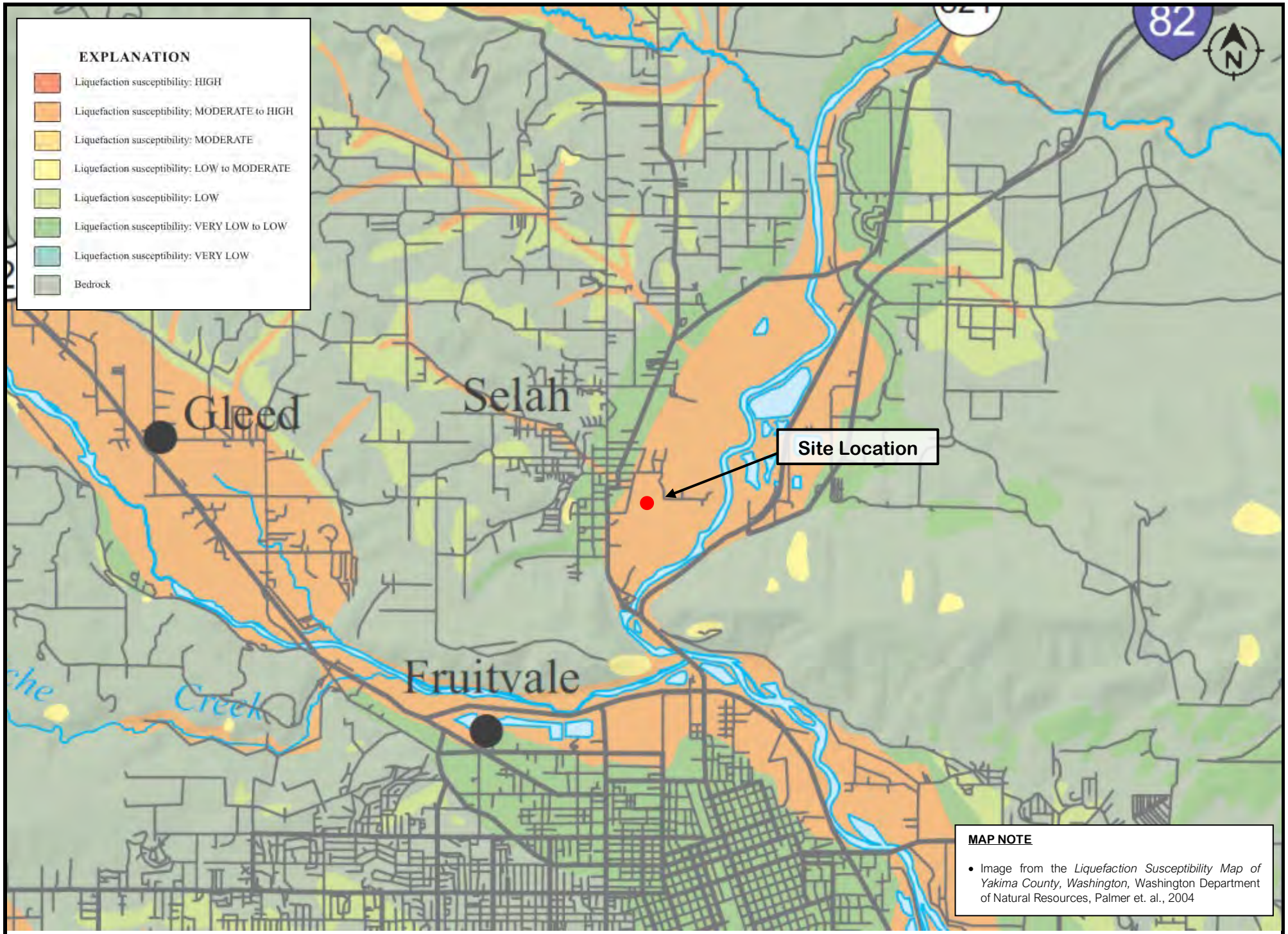


FIGURE 4: LIQUEFACTION SUSCEPTIBILITY MAP

PROJECT NO. 225-1849

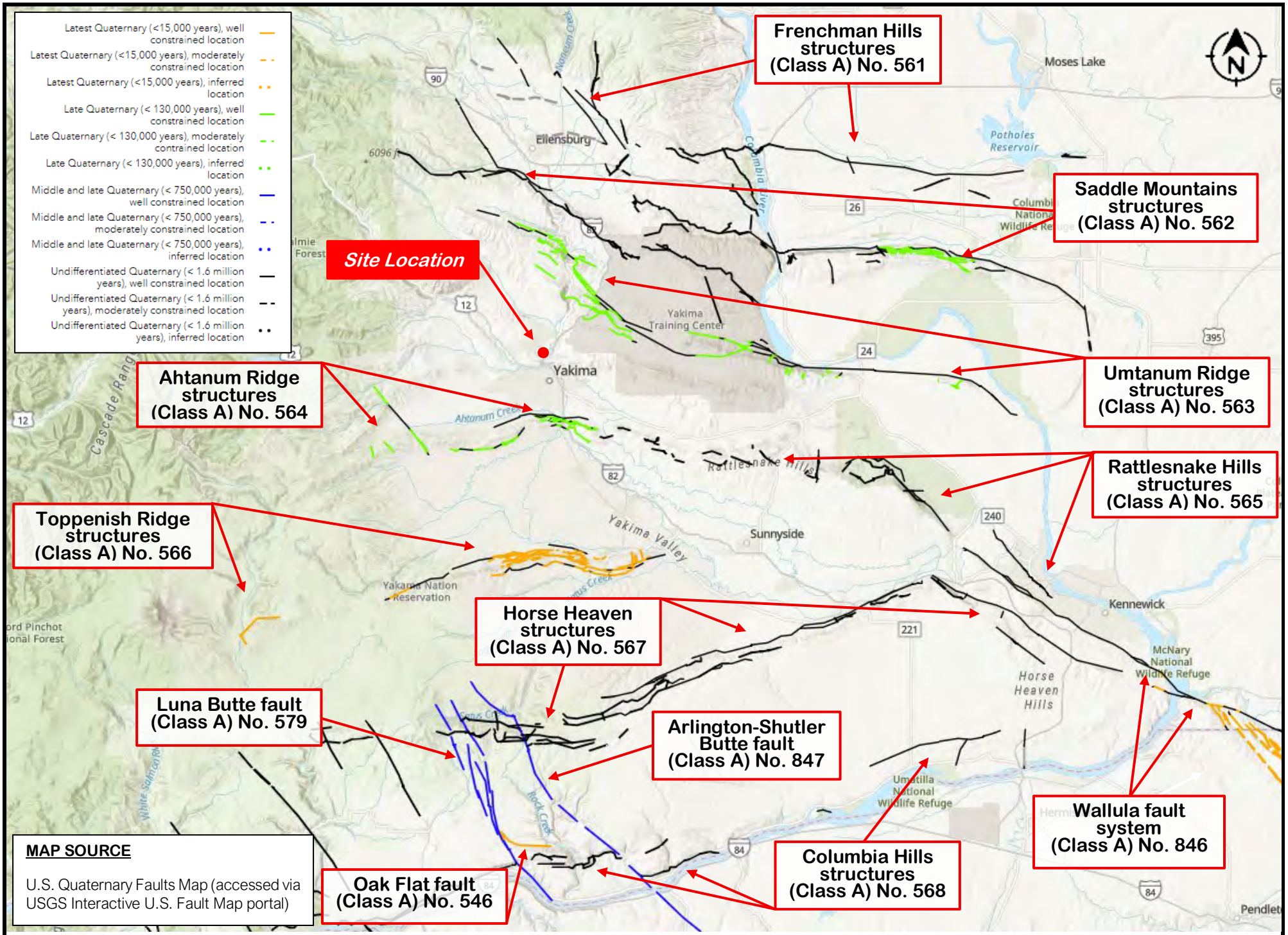


FIGURE 5: USGS QUATERNARY FAULT MAP

PROJECT NO. 224-1735

Appendix II

Exploratory Boring & Test-Pit Logs
Key Chart (for Soil Classification)

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

BORING NUMBER B-1

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 9/29/25 **COMPLETED** 9/29/25
GROUND ELEVATION 1096 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 5.60 ft / Elev 1090.40 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.650187°, -120.520509°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			ML		FILL: SANDY SILT, (ML) tan, damp, appears loose to medium dense	
					2.5	1093.5
	SPT	8-10-9 (19)	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray brown, dry to damp, medium dense	
					4.5	1091.5
5	SPT	10-11-11 (22)	GP		▽ POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, wet, medium dense	
	SPT	5-8-10 (18)				
10	SPT	5-7-10 (17)				
15	SPT	17-17-19 (36)			dense	
					18.0	1078.0
20	SPT	36-50/5"	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray, very dense	
					21.5	1074.5

- Groundwater encountered at ~5.6' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 21.5 feet.

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Fax: (509) 248-4220

BORING NUMBER B-2

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 9/29/25 **COMPLETED** 9/29/25
GROUND ELEVATION 1095 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 5.00 ft / Elev 1090.00 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.649394°,-120.520337°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0				ML		SANDY SILT, (ML) brown, damp, appears loose to medium dense
						2.5 — 1092.5
	SPT	7-7-13 (20)	MC = 7% Fines = 7%	GW-GM		WELL GRADED GRAVEL WITH SILT AND SAND, (GW-GM) gray brown, dry to damp, medium dense, some Poorly Graded Sand with Gravel (SP)
5	SPT	5-3-5 (8)				▽ partial sample
	SPT	12-21-12 (33)				
10						9.5 — 1085.5
	SPT	15-27-40 (67)				POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, very dense
	SPT	22-34-27 (61)				
15	SPT	32-35-29 (64)				
	SPT	50/4"				
20	SPT	33-42-50/4"				
	SPT	50/1"				
25	SPT	19-20-18 (38)		GP		dense
	SPT	4-6-13 (19)	Fines = 4%			olive, medium dense
30	SPT	12-32-41 (73)				gray brown, very dense
	SPT	45-50/4"				
35	SPT	28-47-50/5"				
40	SPT	50/4"				40.3 — 1054.7 no recovery

- Drilling terminated at ~40' BGS due to auger refusal
- Groundwater encountered at ~5' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 40.3 feet.

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Fax: (509) 248-4220

BORING NUMBER B-3

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 9/29/25 **COMPLETED** 9/29/25
GROUND ELEVATION 1097 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 7.90 ft / Elev 1089.10 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.648210°, -120.524229°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0						SILTY SAND, (SM) brown, moist, loose, some organics
	SPT	2-3-2 (5)		SM		
5	SPT	2-1-1 (2)	MC = 26% Fines = 19%			moist to wet, very loose
						7.0 1090.0
	SPT	5-11-27 (38)		GP-GM		▽ POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray brown, saturated, dense
10	SPT	22-32-39 (71)				very dense
						13.5 1083.5
15	SPT	7-28-25 (53)	Fines = 4%	GW		WELL GRADED GRAVEL WITH SAND, (GW) gray, very dense, interbedded with Poorly Graded Sand with Gravel (SP)
20	SPT	23-47-50/4"				21.5 1075.5

- Groundwater encountered at ~7.9' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 21.5 feet.

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Fax: (509) 248-4220

BORING NUMBER B-4

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 9/29/25 **COMPLETED** 9/29/25
GROUND ELEVATION 1093.5 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 4.90 ft / Elev 1088.60 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.648321°, -120.520111°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0				SM		SILTY SAND, (SM) brown, fine grained, damp to moist, very loose	
	SPT	3-1-2 (3)					
						3.5	1090.0
				SP		POORLY GRADED SAND WITH GRAVEL, (SP) black, fine to coarse grained, damp, very loose	
5						4.5	1089.0
	SPT	6-11-15 (26)	Fines = 7%	GW-GM		▽ WELL GRADED GRAVEL WITH SILT AND SAND, (GW-GM) gray brown, wet, medium dense	
	SPT	11-13-25 (38)				dense	
10							
	SPT	10-22-30 (52)				vey dense	
15							
	SPT	8-50-30/1"	Fines = 7%			interbedded with Poorly Graded Sand with Gravel (SP)	
20						20.0	1073.5

- Boring terminated at ~20' BGS due to heave-no sample attempted
- Groundwater encountered at ~4.9' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 20.0 feet.

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Fax: (509) 248-4220

BORING NUMBER B-5

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 9/29/25 **COMPLETED** 9/29/25
GROUND ELEVATION 1094 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 4.60 ft / Elev 1089.40 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.648568°, -120.520111°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0						POORLY GRADED SAND WITH GRAVEL, (SP) dark brown, fine to medium grained, damp, loose
	SPT	5-4-4 (8)		SP		
5						▽
	SPT	6-12-14 (26)	Fines = 3%		5.5	medium dense 1088.5
	SPT	9-14-16 (30)		GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, medium dense medium dense to dense
10	SPT	8-50/4"			11.0	very dense, partial recovery 1083.0

- Drilling terminated at ~11' BGS due to auger refusal
- Groundwater encountered at ~4.6' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 11.0 feet.

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Fax: (509) 248-4220

BORING NUMBER B-6

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 9/30/25 **COMPLETED** 9/30/25
GROUND ELEVATION 1095 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 7.00 ft / Elev 1088.00 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.648886°, -120.520111°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0				SM		SILTY SAND, (SM) brown, fine grained, damp, appears medium dense	
						2.8	1092.3
	SPT	11-5-3 (8)		GW-GM		WELL GRADED GRAVEL WITH SILT AND SAND, (GW-GM) gray brown, damp, loose	
5						▽	
	SPT	1-34-32 (66)	Fines = 9%			very dense, interbedded with Poorly Graded Sand with Gravel (GP)	
10						11.0	1084.0
	SPT	8-21-24 (45)		GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, dense	
15							
	SPT	10-33-39 (72)				very dense	
						19.0	1076.0

- Groundwater encountered at ~7' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 19.0 feet.

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Yakima, Washington 98902
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Fax: (509) 248-4220

BORING NUMBER B-7

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 9/30/25 **COMPLETED** 9/30/25
GROUND ELEVATION 1095 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 4.80 ft / Elev 1090.20 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.649118°, -120.520173°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	SPT	10-7-4 (11)	ML		SILT WITH SAND, (ML) brown, damp, medium dense
					2.5 1092.5
			GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, damp, loose
5	SPT	2-3-4 (7)			▽ partial recovery (sampler blocked)
10	SPT	6-5-5 (10)			loose to medium dense
15	SPT	9-26-27 (53)			very dense
20	SPT	9-20-32 (52)			21.5 1073.5

- Groundwater encountered at ~7.75' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 21.5 feet.

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Telephone: (509) 248-9798
Fax: (509) 248-4220

BORING NUMBER B-8

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 9/30/25 **COMPLETED** 9/30/25
GROUND ELEVATION 1098 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 7.60 ft / Elev 1090.40 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.649729°, -120.523637°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0						~4" of ASPHALTIC CONCRETE over ~10"-12" of gravel base course	1096.8
						1.3	
				ML		SILT WITH SAND, (ML) dark brown, moist, very loose to loose, trace gravel	
	SPT	2-2-2 (4)					
5						4.5	1093.5
	SPT	1-1-1 (2)				SILTY SAND, (SM) black, wet, very loose, with organics/woody debris	
						▽ gravelly from ~7.5' to 8.5' BGS	
10				SM			
	SPT	0-0-0 (0)	Fines = 21%			very loose, organic rich	
						13.0	1085.0
	SPT	0-0-17 (17)		SP-SM		13.5 POORLY GRADED SAND WITH SILT, (SP-SM) gray, very loose	1084.5
15						POORLY GRADED GRAVEL WITH SAND, (GP) gray, medium dense	
	SPT	17-50/5"				very dense	
				GP		lenses and layers of Poorly Graded Sand with Silt (SP-SM) from ~17'-19' BGS	
20							
	SPT	12-26-24 (50)				dense to very dense	
						21.5	1076.5

- Groundwater encountered at ~7.6' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 21.5 feet.

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Telephone: (509) 248-9798
Fax: (509) 248-4220

BORING NUMBER B-9

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 9/30/25 **COMPLETED** 9/30/25
GROUND ELEVATION 1098 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 6.20 ft / Elev 1091.80 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.649660°, -120.523473°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0						~2.5" of ASPHALTIC CONCRETE over ~12" of gravel base course	1096.8
						1.2	
	SPT	6-7-11 (18)		ML		FILL: SILT, (ML) dark brown, damp, medium dense, with trash and recycled pulverized concrete	
5						5.5	1092.5
	SPT	0-0-1 (1)	Fines = 33%	SC-SM		▽ SILTY, CLAYEY SAND, (SC-SM) dark olive gray, wet, very soft, with gravel, orgainc rich, with woody debris	
10						12.8	1085.3
	SPT	11-20-36 (56)		GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, very dense	
15							
	SPT	7-18-25 (43)				dense	
						19.0	1079.0

- Groundwater encountered at ~6.2' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 19.0 feet.

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BORING NUMBER B-10

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 9/30/25 **COMPLETED** 9/30/25
GROUND ELEVATION 1096 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 6.20 ft / Elev 1089.80 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.648564°, -120.526767°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0						~4.5" of ASPHALTIC CONCRETE over ~12" of gravel base course	1094.7
						1.3	
	SPT	1-0-1 (1)	MC = 40% Fines = 35%	SM		SILTY SAND, (SM) brown, moist, very loose	
5	SPT	0-0-0 (0)				▽	
	SPT	1-5-24 (29)				8.3	1087.8
				GM		SILTY GRAVEL, (GM) brown, dense	1086.5
10	SPT	9-41-22 (63)				9.5	
				GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, very dense	
15	SPT	17-40-31 (71)				13.5	1082.5
				GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, very dense	
20	SPT	24-46-50/5"				18.0	1078.0
				GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray, very dense	
25	SPT	50/5"				25.0	1071.0
				GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, very dense	
30							
35	SPT	40-50/2"				35.5	1060.5

- Groundwater encountered at ~6.2' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 35.5 feet.

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BORING NUMBER B-11

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 9/30/25 **COMPLETED** 9/30/25
GROUND ELEVATION 1096 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 7.50 ft / Elev 1088.50 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.648485°, -120.526309°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0					SILT, (ML) brown, moist, very loose	
	SPT	1-1-2 (3)	ML			
5					trace gravel	
	SPT	0-0-1 (1)			wet	
	SPT	1-2-7 (9)			▽ loose	1087.5
			SP-SM		8.5 POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, loose	1086.5
10	SPT	11-28-28 (56)			9.5 POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, very dense	
			GP-GM			
15	SPT	9-24-43 (67)				
					18.5	1077.5
20			GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, very dense	
	SPT	28-21-50/3"			21.5	1074.5

- Groundwater encountered at ~7.5' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 21.5 feet.

GENERAL BH / TP / WELL - GINT STD US LAB.GDT - 10/17/25 18:00 - C:\USERS\YONG LEE\ONEDRIVE\PUBLIC\ACTIVE PROJECTS\1 - CURRENT PROJECTS\225-1849 CITY OF SELAH NEW WWTP\225-1849 LOGS.GPJ

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

BORING NUMBER B-12

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 9/30/25 **COMPLETED** 9/30/25
GROUND ELEVATION 1095 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 5.20 ft / Elev 1089.80 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.649118°, -120.520508°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0				SM		SILTY SAND, (SM) light brown, fine grained, damp, appears loose
						2.0 / 1093.0
	SPT	7-8-10 (18)	MC = 2% Fines = 8%	GW-GM		WELL GRADED GRAVEL WITH SILT AND SAND, (GW-GM) brown, fine to coarse grained, damp, medium dense, interbedded with Poorly Graded Sand with Gravel (SP)
5						5.5 ▽ / 1089.5
	SPT	9-11-10 (21)		GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, medium dense
10						
	SPT	9-24-39 (63)				very dense
						14.0 / 1081.0

- Drilling terminated at ~14' BGS due to auger refusal
- Groundwater encountered at ~5.2' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 14.0 feet.

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GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

BORING NUMBER B-13

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 10/1/25 **COMPLETED** 10/1/25
GROUND ELEVATION 1095 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 5.50 ft / Elev 1089.50 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.649698°, -120.520171°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0				SM		SILTY SAND, (SM) brown, fine grained, damp, appears loose	
						4.0	1091.0
5	SPT	4-2-3 (5)	MC = 17% Fines = 8%	SP-SM		▽ POORLY GRADED SAND WITH SILT AND GRAVEL, (SP-SM) brown, fine to medium grained, saturated, loose, interbedded with Poorly Graded Gravel with Sand (GP)	
						8.0	1087.0
10	SPT	10-16-19 (35)		GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray brown, dense	
15	SPT	18-24-24 (48)					
	SPT	36-50/5"				very dense	1077.5
						17.5	

- Drilling terminated at ~17.5' BGS due to auger refusal
- Groundwater encountered at ~5.5' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 17.5 feet.

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GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

BORING NUMBER B-14

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 10/1/25 **COMPLETED** 10/1/25
GROUND ELEVATION 1095 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 4.40 ft / Elev 1090.60 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.649873°, -120.520461°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			SM		SILTY SAND, (SM) brown, fine grained, damp, appears loose	
	SPT	5-14-18 (32)				
					3.0	1092.0
5	SPT	10-7-9 (16)	GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, damp, dense ▽ medium dense	
					8.5	1086.5
10	SPT	10-14-20 (34)	GP-GM		POORLY GRADED GRAVEL WITH SILT, (GP-GM) gray, dense	
					13.0	1082.0
15	SPT	10-15-24 (39)	GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, dense	
					17.0	1078.0
	SPT	31-50/5"	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray, very dense	
					18.5	1076.5

- Boring termnated at ~17.5' BGS due to auger refusal
- Groundwater encountered at ~4.4' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 18.5 feet.

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GN Northern, Inc.
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Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

BORING NUMBER B-15

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 10/1/25 **COMPLETED** 10/1/25
GROUND ELEVATION 1095 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 4.40 ft / Elev 1090.60 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.649698°, -120.520510°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0				SM		SILTY SAND, (SM) brown, fine grained, damp, appears loose, some gravel	1094.0
						POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray brown, damp, medium dense	
5	SPT	9-11-13 (24)	Fines = 7%			▽	
10	SPT	19-17-17 (34)		GP-GM		gray, dense	
15	SPT	9-15-14 (29)				medium dense	
	SPT	28-50/5"				very dense	1077.0
						18.0	

- Groundwater encountered at ~4.4' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 18.0 feet.

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GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

BORING NUMBER B-16

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 10/1/25 **COMPLETED** 10/1/25
GROUND ELEVATION 1096 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Ally Construction Services, LLC
GROUND WATER LEVELS:
DRILLING METHOD CME-75 s/HSA & Autohammer
▽ **AT TIME OF DRILLING** 4.30 ft / Elev 1091.70 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.650049°, -120.520229°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			ML		SILT WITH SAND, (ML) brown, damp, medium dense	
	SPT	4-8-14 (22)				
			GP-GM		3.0 POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray brown, damp, medium dense	1093.0
5	SPT	6-12-10 (22)	GP		4.5 ▽ POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, medium dense	1091.5
					8.0	1088.0
10	SPT	10-12-6 (18)	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray, medium dense possible cobbles and boulders	
15	SPT	13-9-7 (16)				
					19.0	1077.0
20	SPT	26-24-21 (45)	GM		SILTY GRAVEL, (GM) gray, dense	
					20.5	1075.5

- Groundwater encountered at ~4.2' BGS at time of drilling
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of borehole at 20.5 feet.

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GN Northern, Inc.
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Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-1

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 10/1/25 **COMPLETED** 10/1/25
GROUND ELEVATION 1093 ft **TEST PIT SIZE** 30x72 inches
EXCAVATION CONTRACTOR Glenn Lowrie Backhoe
GROUND WATER LEVELS:
EXCAVATION METHOD John Deere Backhoe
▽ **AT TIME OF EXCAVATION** 4.50 ft / Elev 1088.50 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.648745°, -120.520238°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			SM		SILTY SAND, (SM) brown, damp, appears medium dense	
	GB	MC = 13% Fines = 40%				
2.5					2.3	1090.7
			GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, moist to wet, appears dense	
	BULK	Fines = 2%			▽	
5.0					5.0	1088.0
			SP		POORLY GRADED SAND WITH GRAVEL, (SP) gray brown, appears medium dense	
					6.0	1087.0
			GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, appears medium dense	
7.5						
					8.0	1085.0

- Test-pit terminated at ~8' BGS due to severe caving
- Groundwater encountered at ~4.5' BGS at time of excavation
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of test pit at 8.0 feet.

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GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-2

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 10/1/25 **COMPLETED** 10/1/25
GROUND ELEVATION 1092.5 ft **TEST PIT SIZE** 30x72 inches
EXCAVATION CONTRACTOR Glenn Lowrie Backhoe
GROUND WATER LEVELS:
EXCAVATION METHOD John Deere Backhoe
▽ **AT TIME OF EXCAVATION** 7.00 ft / Elev 1085.50 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.648196°, -120.521005°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					SILT WITH SAND, (ML) brown, damp to moist, appears medium dense
2.5	GB		ML		
5.0				5.0	1087.5
	GB	MC = 19% Fines = 13%	SM		SILTY SAND, (SM) gray, moist, appears medium dense
				6.0	1086.5
	BULK	Fines = 2%	GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, moist, appears medium dense, with cobbles and boulders
7.5					▽
10.0					
				11.0	1081.5

- Test-pit terminated at ~11' BGS due to severe caving
- Groundwater encountered at ~7' BGS at time of excavation
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of test pit at 11.0 feet.

GENERAL BH / TP / WELL - GINT STD US LAB.GDT - 10/17/25 18:00 - C:\USERS\YONG LEE\ONEDRIVE\PUBLIC\ACTIVE PROJECTS\1 - CURRENT PROJECTS\225-1849 CITY OF SELAH NEW WWTP\225-1849 LOGS.GPJ

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-3

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 10/1/25 **COMPLETED** 10/1/25
GROUND ELEVATION 1092.5 ft **TEST PIT SIZE** 30x72 inches
EXCAVATION CONTRACTOR Glenn Lowrie Backhoe
GROUND WATER LEVELS:
EXCAVATION METHOD John Deere Backhoe
▽ **AT TIME OF EXCAVATION** 4.00 ft / Elev 1088.50 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.648209°, -120.522022°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		ML		SILT WITH SAND, (ML) brown, dry, appears medium dense, with gravel, with roots
2.5	BULK			
3.0				1089.5
		GP		POORLY GRADED GRAVEL WITH SAND, (GP) dark brown, moist to wet, appears dense, with roots
				▽
5.0				gray
7.5				
8.0				1084.5

- Test-pit terminated at ~8' BGS due to sever caving
- Groundwater encountered at ~4' BGS at time of excavation
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of test pit at 8.0 feet.

GENERAL BH / TP / WELL - GINT STD US LAB.GDT - 10/17/25 18:00 - C:\USERS\YONG LEE\ONEDRIVE\PUBLIC\ACTIVE PROJECTS\1 - CURRENT PROJECTS\225-1849 CITY OF SELAH NEW WWTP\225-1849 LOGS.GPJ

GN Northern, Inc.
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TEST PIT NUMBER TP-4

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah Wastewater Treatment Plant Improvements
PROJECT NUMBER 225-1849
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 10/1/25 **COMPLETED** 10/1/25
GROUND ELEVATION 1094 ft **TEST PIT SIZE** 30x72 inches
EXCAVATION CONTRACTOR Glenn Lowrie Backhoe
GROUND WATER LEVELS:
EXCAVATION METHOD John Deere Backhoe
▽ **AT TIME OF EXCAVATION** 4.50 ft / Elev 1089.50 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.648224°, -120.523019°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			ML		SILT WITH SAND, (ML) brown, dry, appears loose, with roots
				1.0	1093.0
			GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, moist, appears medium dense, with roots
2.5				2.5	1091.5
	GB	MC = 1% Fines = 2%	GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, moist, appears medium dense ▽
5.0					
7.5					
				8.0	1086.0

- Test-pit terminated at ~8' BGS due to sever caving
- Groundwater encountered at ~4.5' BGS at time of excavation
- Referenced surface elevations are approximate and based on topography provided by HLA

Bottom of test pit at 8.0 feet.

GENERAL BH / TP / WELL - GINT STD US LAB.GDT - 10/17/25 18:00 - C:\USERS\YONG LEE\ONEDRIVE\PUBLIC\ACTIVE PROJECTS\1 - CURRENT PROJECTS\225-1849 CITY OF SELAH NEW WWTP\225-1849 LOGS.GPJ

Northern, Inc.
Kennewick, Yakima, Spokane, Hermiston (OR)

KEY CHART

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N-VALUE

COARSE-GRAINED SOILS			FINE-GRAINED SOILS		
DENSITY	N (BLOWS/FT)	FIELD TEST	CONSISTENCY	N (BLOWS/FT)	FIELD TEST
Very Loose	0 – 4	Easily penetrated with ½-inch reinforcing rod pushed by hand	Very Soft	0 – 2	Easily penetrated several inches by thumb
Loose	4 – 10	Difficult to penetrate with ½-inch reinforcing rod pushed by hand	Soft	2 – 4	Easily penetrated one inch by thumb
Medium -Dense	10 – 30	Easily penetrated with ½-inch rod driven with a 5-lb hammer	Medium-Stiff	4 – 8	Penetrated over ½-inch by thumb with moderate effort
Dense	30 – 50	Difficult to penetrate with ½-inch rod driven with a 5-lb hammer	Stiff	8 – 15	Indented about ½-inch by thumb but penetrated with great effort
Very Dense	> 50	penetrated only a few inches with ½-inch rod driven with a 5-lb hammer	Very Stiff	15 – 30	Readily indented by thumb
			Hard	> 30	Indented with difficulty by thumbnail

USCS SOIL CLASSIFICATION

MAJOR DIVISIONS				GROUP DESCRIPTION
Coarse-Grained Soils <50% passes #200 sieve	**Gravel** and **Gravelly Soils** <50% coarse fraction passes #4 sieve	**Gravel** (with little or no fines)	GW	Well-graded **Gravel**
			GP	Poorly Graded **Gravel**
		Gravel (with >12% fines)	GM	Silty **Gravel**
			GC	Clayey **Gravel**
	Sand and **Sandy Soils** >50% coarse fraction passes #4 sieve	**Sand** (with little or no fines)	SW	Well-graded **Sand**
			SP	Poorly graded **Sand**
		Sand (with >12% fines)	SM	Silty **Sand**
			SC	Clayey **Sand**
Fine-Grained Soils >50% passes #200 sieve	**Silt** and **Clay** Liquid Limit < 50		ML	**Silt**
			CL	Lean **Clay**
			OL	Organic **Silt** and C**lay** (low plasticity)
	Silt and **Clay** Liquid Limit > 50		MH	Inorganic **Silt**
			CH	Inorganic **Clay**
			OH	Organic **Clay** and **Silt** (med. to high plasticity)
Highly Organic Soils			PT	**Peat**
				Top Soil

LOG SYMBOLS

	2S	2" OD Split Spoon (SPT)
	3S	3" OD Split Spoon
	NS	Non-Standard Split Spoon
	ST	Shelby Tube
	CR	Core Run
	BG	Bag Sample
	TV	Torvane Reading
	PP	Penetrometer Reading
	NR	No Recovery
	GW	Groundwater Table

MODIFIERS

DESCRIPTION	RANGE
Trace	<5%
Little	5% – 12%
Some	>12%

MOISTURE CONTENT

DESCRIPTION	FIELD OBSERVATION
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but not visible water
Wet	Visible free water

SOIL CLASSIFICATION INCLUDES

1. Group Name
2. Group Symbol
3. Color
4. Moisture content
5. Density / consistency
6. Cementation
7. Particle size (if applicable)
8. Odor (if present)
9. Comments

MAJOR DIVISIONS WITH GRAIN SIZE

SIEVE SIZE						
12"	3"	3/4"	4	10	40	200
GRAIN SIZE (INCHES)						
12	3	0.75	0.19	0.079	0.0171	0.0029

Boulders	Cobbles	Gravel		Sand			Silt and Clay
		Coarse	Fine	Coarse	Medium	Fine	

Conditions shown on boring and testpit logs represent our observations at the time and location of the fieldwork, modifications based on lab test, analysis, and geological and engineering judgment. These conditions may not exist at other times and locations, even in close proximity thereof. This information was gathered as part of our investigation, and we are not responsible for any use or interpretation of the information by others.

Appendix III

Laboratory Testing Results

GRAIN SIZE DISTRIBUTION

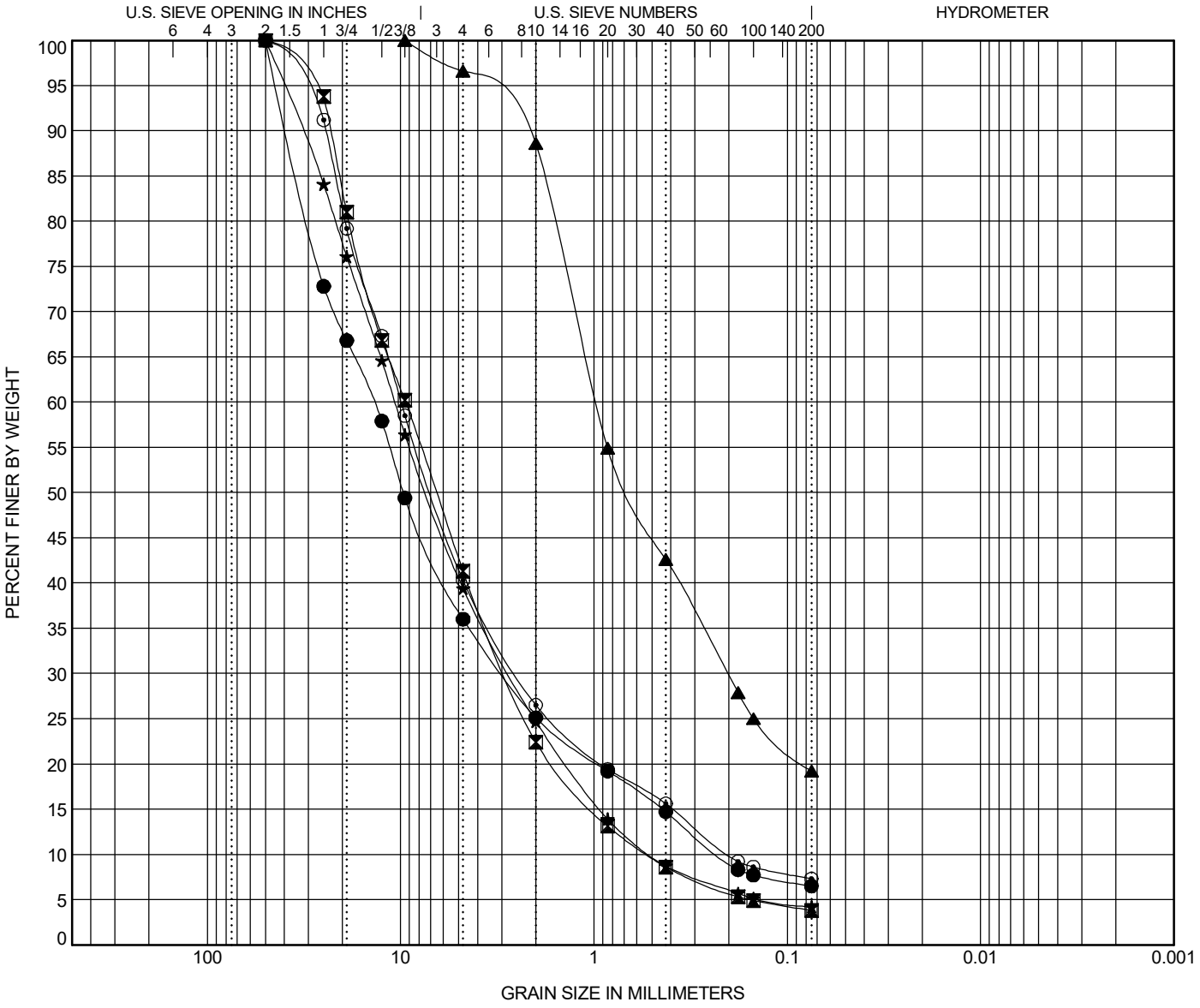
GN Northern, Inc
722 N. 16th Ave Suite 31
Yakima, WA 99802
Telephone: (509) 248-9798

CLIENT HLA Engineering and Land Surveying, Inc.

PROJECT NAME City of Selah Wastewater Treatment Plant Improvements

PROJECT NUMBER 225-1849

PROJECT LOCATION 260 S. Rushmore Road, Selah, WA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LOCATION		DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-2	2.5	WELL-GRADED GRAVEL with SILT and SAND(GW-GM)				2.79	61.01
⊠	B-2	27.5	WELL-GRADED GRAVEL with SAND(GW)				1.61	17.89
▲	B-3	5.0	SILTY SAND(SM)					
★	B-3	15.0	WELL-GRADED GRAVEL with SAND(GW)				1.38	21.20
⊙	B-4	5.0	WELL-GRADED GRAVEL with SILT and SAND(GW-GM)				3.11	49.67

LOCATION		DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-2	2.5	50	13.798	2.951	0.226	64.0	29.5	6.5	
⊠	B-2	27.5	50	9.431	2.832	0.527	58.7	37.5	3.8	
▲	B-3	5.0	9.5	0.968	0.204		3.4	77.4	19.2	
★	B-3	15.0	50	10.716	2.732	0.505	60.6	35.2	4.2	
⊙	B-4	5.0	50	9.955	2.491	0.2	59.7	33.0	7.3	

GRAIN SIZE - TEMPLATE_JESSE.GDT - 10/14/25 11:23 - C:\USERS\KHARM\ONEDRIVE\PUBLIC\ACTIVE PROJECTS\1 - CURRENT PROJECTS\225-1849 CITY OF SELAH NEW WWTP\225-1849 LOGS.GPJ

GRAIN SIZE DISTRIBUTION

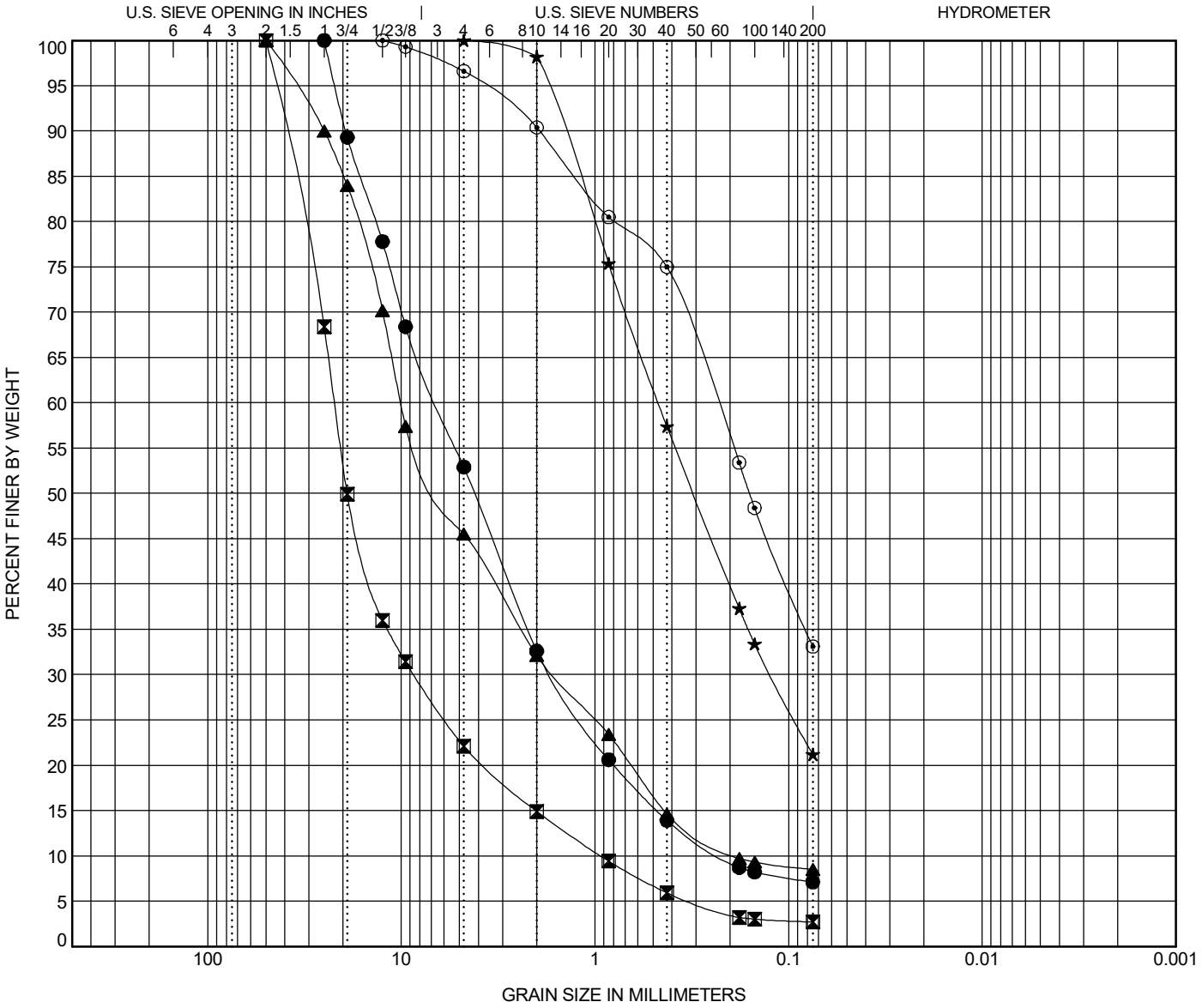
GN Northern, Inc
722 N. 16th Ave Suite 31
Yakima, WA 99802
Telephone: (509) 248-9798

CLIENT HLA Engineering and Land Surveying, Inc.

PROJECT NAME City of Selah Wastewater Treatment Plant Improvements

PROJECT NUMBER 225-1849

PROJECT LOCATION 260 S. Rushmore Road, Selah, WA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	LOCATION	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-4	15.0	WELL-GRADED GRAVEL with SILT and SAND(GW-GM)				1.90	29.24
⊠	B-5	5.0	POORLY GRADED GRAVEL with SAND(GP)				3.56	23.65
▲	B-6	7.5	WELL-GRADED GRAVEL with SILT and SAND(GW-GM)				1.39	52.94
★	B-8	10.0	SILTY SAND(SM)					
⊙	B-9	7.5	SILTY SAND(SM)					

	LOCATION	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-4	15.0	25	6.525	1.662	0.223	47.1	45.8	7.1	
⊠	B-5	5.0	50	22.071	8.559	0.933	77.9	19.4	2.7	
▲	B-6	7.5	50	10.045	1.627	0.19	54.5	37.0	8.5	
★	B-8	10.0	4.75	0.47	0.124		0.0	78.8	21.2	
⊙	B-9	7.5	12.5	0.234			3.4	63.5	33.1	

GRAIN SIZE - TEMPLATE_JESSE.GDT - 10/14/25 11:23 - C:\USERS\KHARMON\EDRIVE\PUBLIC\ACTIVE PROJECTS\1 - CURRENT PROJECTS\225-1849 CITY OF SELAH NEW WWTP\225-1849 LOGS.GPJ

GRAIN SIZE DISTRIBUTION

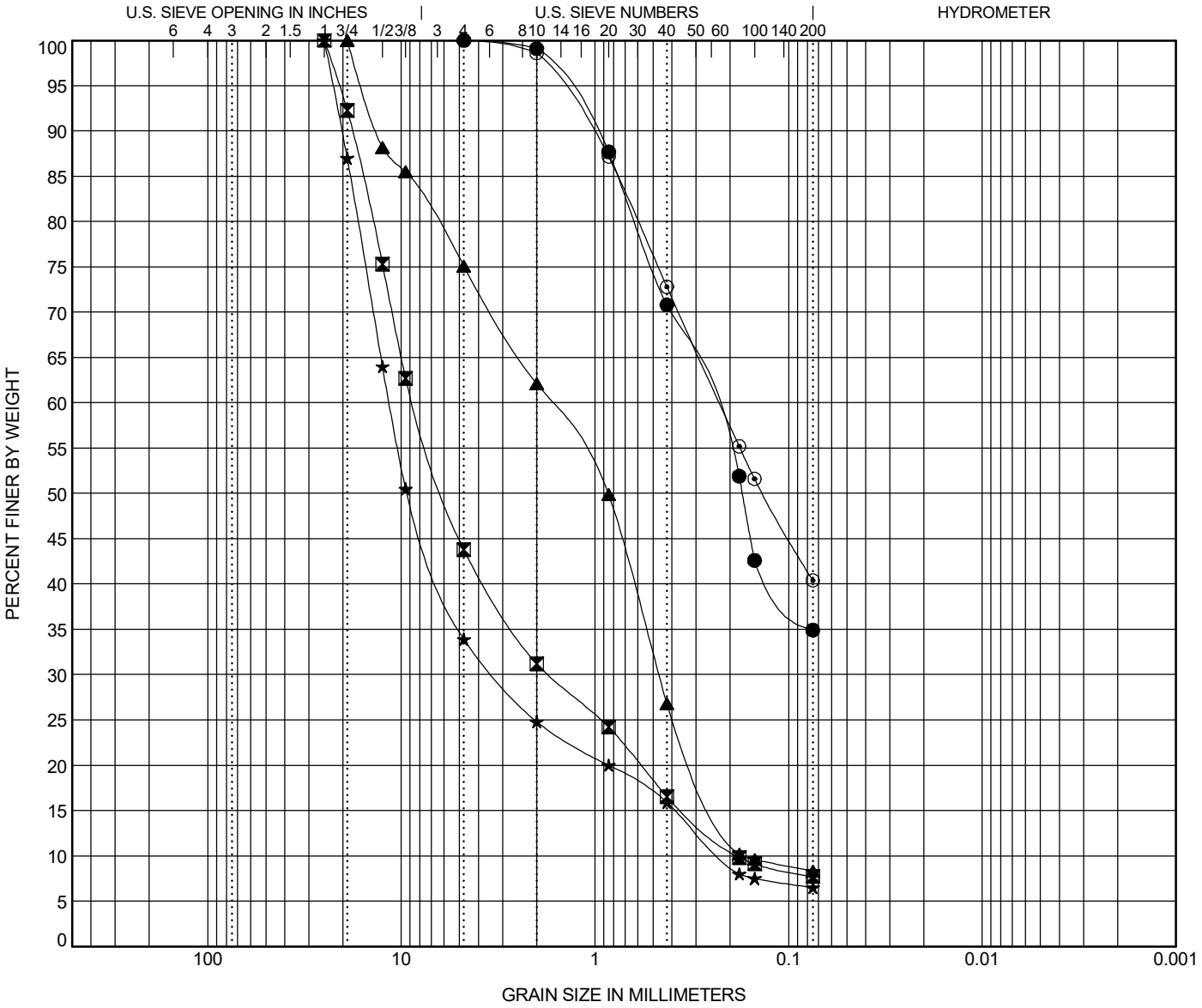
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Telephone: (509) 248-9798

CLIENT HLA Engineering and Land Surveying, Inc.

PROJECT NAME City of Selah Wastewater Treatment Plant Improvements

PROJECT NUMBER 225-1849

PROJECT LOCATION 260 S. Rushmore Road, Selah, WA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	LOCATION	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-10	2.5	SILTY SAND(SM)					
⊠	B-12	2.5	WELL-GRADED GRAVEL with SILT and SAND(GW-GM)				1.88	46.59
▲	B-13	5.0	POORLY GRADED SAND with SILT and GRAVEL(SP-SM)				0.75	10.19
★	B-15	5.0	POORLY GRADED GRAVEL with SILT andSAND(GP-GM)				4.17	51.51
⊙	TP-1	1.5	SILTY SAND(SM)					

	LOCATION	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-10	2.5	4.75	0.26			0.0	65.1	34.9	
⊠	B-12	2.5	25	8.604	1.727	0.185	56.2	36.1	7.7	
▲	B-13	5.0	19	1.726	0.468	0.169	24.9	66.8	8.3	
★	B-15	5.0	25	11.524	3.279	0.224	66.1	27.4	6.5	
⊙	TP-1	1.5	4.75	0.228			0.0	59.6	40.4	

GRAIN SIZE - TEMPLATE_JESSE.GDT - 10/14/25 11:23 - C:\USERS\KHARM\ONEDRIVE\PUBLIC\ACTIVE PROJECTS\1 - CURRENT PROJECTS\225-1849 CITY OF SELAH NEW WWTP\225-1849 LOGS.GPJ

GRAIN SIZE DISTRIBUTION

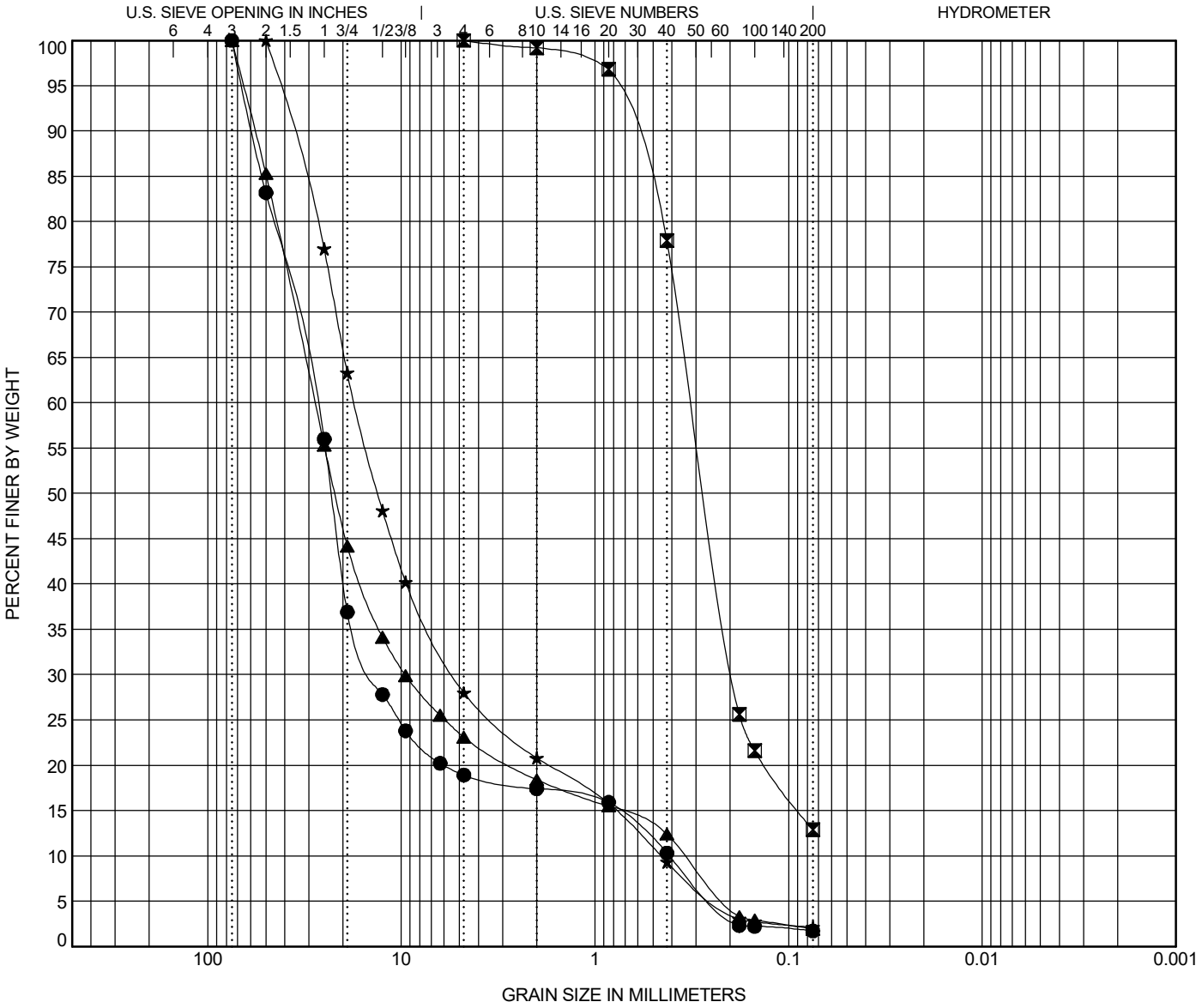
GN Northern, Inc
722 N. 16th Ave Suite 31
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Telephone: (509) 248-9798

CLIENT HLA Engineering and Land Surveying, Inc.

PROJECT NAME City of Selah Wastewater Treatment Plant Improvements

PROJECT NUMBER 225-1849

PROJECT LOCATION 260 S. Rushmore Road, Selah, WA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	LOCATION	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	TP-1	4.0	POORLY GRADED GRAVEL with SAND(GP)				16.79	67.27
⊠	TP-2	5.0	SILTY SAND(SM)					
▲	TP-2	6.0	POORLY GRADED GRAVEL with SAND(GP)				9.68	82.25
★	TP-4	2.5	POORLY GRADED GRAVEL with SAND(GP)				3.56	37.88

	LOCATION	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-1	4.0	75	27.683	13.832	0.412	81.1	17.2	1.7	
⊠	TP-2	5.0	4.75	0.317	0.193		0.0	87.1	12.9	
▲	TP-2	6.0	75	27.868	9.562	0.339	76.9	21.2	1.9	
★	TP-4	2.5	50	17.349	5.322	0.458	72.0	25.9	2.1	

GRAIN SIZE - TEMPLATE_JESSE.GDT - 10/14/25 11:23 - C:\USERS\KHARM\ONEDRIVE\PUBLIC\ACTIVE PROJECTS\1 - CURRENT PROJECTS\225-1849 CITY OF SELAH NEW WWTP\225-1849 LOGS.GPJ

Northwest Agricultural Consultants
2545 West Falls Ave Kennewick, WA 99336
509.783.7450 www.nwag.com lab@nwag.com

Report: 75018-1
Date: 2025-10-16
Project Name:
Project Number: 225-1849

GN NORTHERN INC
722 N. 16TH AVE #31
YAKIMA, WA 98902

Sample ID	Sulfate mg/kg	pH s.u.	Resistivity ohm-m	OM %	CEC meq/100g	Chloride mg/kg	Moisture %	Sand %	Silt %	Clay %	Class
B-3 @ 2.5'	918.0	6.4	3.0			57					
B-6 @ 2.5'	11.7	8.2	41.7			18					
B-11 @ 5.0'	21.9	8.4	35.7			14					

Analyte Method	Sulfate SM-4500 SO4 E	pH SM 4500-H+ B	Resistivity SM 2510 B	OM ASTM D2974	CEC EPA 9081	Chloride ASTM D512	Moisture Gravimetric	Sand Hydrometer	Silt Hydrometer	Clay Hydrometer	Class Hydrometer

Northwest Agricultural Consultants
2545 West Falls Ave Kennewick, WA 99336
509.783.7450 www.nwag.com lab@nwag.com

Report: 75056-1
Date: 2025-10-20
Project Name:
Project Number: 225-1849

GN NORTHERN INC
722 N. 16TH AVE #31
YAKIMA, WA 98902

Sample ID	Sulfate mg/kg	pH s.u.	Resistivity ohm-m	OM %	CEC meq/100g	Chloride mg/kg	Moisture %	Sand %	Silt %	Clay %	Class
TP-1 @ 1.5'	75.9	8.0	6.5			553					
TP-2 @ 2.5'	9.6	8.5	37.0			30					
TP-4 @ 2.5'	7.2	7.6	111.1			10					

Analyte Method	Sulfate SM-4500 SO4 E	pH SM 4500-H+ B	Resistivity SM 2510 B	OM ASTM D2974	CEC EPA 9081	Chloride ASTM D512	Moisture Gravimetric	Sand Hydrometer	Silt Hydrometer	Clay Hydrometer	Class Hydrometer

Appendix IV

Site & Exploration Photographs



Drilling boring B-1, looking west



Drilling boring B-2, looking east



Drilling boring B-3, looking northwest



Drilling boring B-3, looking west



Drilling boring B-4, looking southeast



Drilling boring B-6, looking northwest

PLATE 1: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 225-1849**



Drilling boring B-8, looking west



Soil sample obtained from boring B-8 from 12.5' BGS



Drilling boring B-9, looking northwest



Soil sample obtained from boring B-9 from 12.5' BGS



Drilling boring B-10, looking southwest



Drilling boring B-11, looking southeast

PLATE 2: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 225-1849**



Soil sample obtained from boring B-11 from 7.5' BGS



Drilling boring B-12, looking northwest



Drilling boring B-15, looking north



Drilling boring B-16, looking northeast



Exposed soil and groundwater condition within test-pit TP-1



Excavation at test-pit TP-2, looking north-northeast

PLATE 3: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 225-1849**



Exposed soil and groundwater condition within test-pit TP-2



Excavation at test-pit TP-3, looking east-southeast



Exposed soil and groundwater condition within test-pit TP-3



Excavated soil from test-pit TP-3



Excavation at test-pit TP-4, looking west



Exposed soil and groundwater condition within test-pit TP-4

PLATE 4: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 225-1849**

Appendix V

Refraction Microtremor (ReMi) Survey Results

Geophysical Survey LLC
711 S Tacoma Street
Kennewick, Washington 99336

October 7, 2025

Imran Magsi, PE, GE
GN Northern, Inc
722 N 16th Avenue, Suite #31
Yakima, WA 98902

Re: ***Seismic Evaluation***
WWTP
Selah, Washington

Mr. Magsi:

Geophysical Survey LLC performed a seismic site classification evaluation for the City of Selah Waste Water Treatment Plant property located near S Rushmore Road in Selah, Washington on September 30, 2025. Seismic surface wave data was collected along one alignment. The objective of the study was to estimate Vs100 for proposed construction activities at the project site.

Methodology

Seismic Surface Wave Evaluation

Microtremor Array Measurements

The Microtremor Array Measurements (MAM) method is based on the change in phase velocity with frequency of seismic surface waves. Shear wave velocity (Vs) is calculated by mathematical inversion of the dispersive phase velocity of surface waves. There are multiple types of surface waves, MAM utilizes Rayleigh waves which are the dominant component of ground roll. MAM utilizes a 'passive source' for seismic energy, also referred to as 'microtremor surveying'. The sources of seismic energy are wind, wave motion or cultural noise. The seismic energy creates Rayleigh waves which are recorded over a line of receivers in a linear array linked to a seismograph.

Surface wave energy decays exponentially with depth beneath the surface. Longer wavelength data (longer period and lower frequency) surface waves travel deeper and contain more information about deeper velocity structure. MAM data is most useful for lower frequency, deeper velocity structure.

Multi-channel Analysis of Surface Waves

The Multi-channel Analysis of Surface Wave (MASW) method is based on the change in phase velocity with frequency of seismic surface waves. Shear wave velocity (Vs) is calculated by mathematical inversion of the dispersive phase velocity of surface waves. There are multiple types of surface waves, MASW utilizes Rayleigh waves which is the dominant component of ground roll. MASW utilizes an 'active source' for seismic energy that is generated at a specific location and recording begins when source energy is imparted into the ground. The seismic

energy creates Rayleigh waves which are recorded over a line of receivers in a linear array linked to a seismograph.

Surface wave energy decays exponentially with depth beneath the surface. Longer wavelength data (longer period and lower frequency) surface waves travel deeper and contain more information about deeper velocity structure. MASW data is most useful for higher frequency, shallow velocity structure.

FIELD SURVEY

Mapping Control

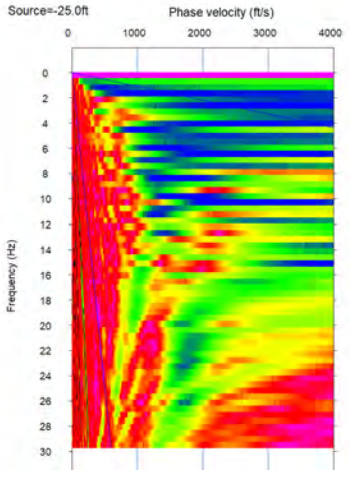
Geophone locations were mapped with a Trimble Pro6H GNSS (Global Navigation Satellite System) receiver with decimeter accuracy (<10cm).

Seismic Surface Wave Acquisition

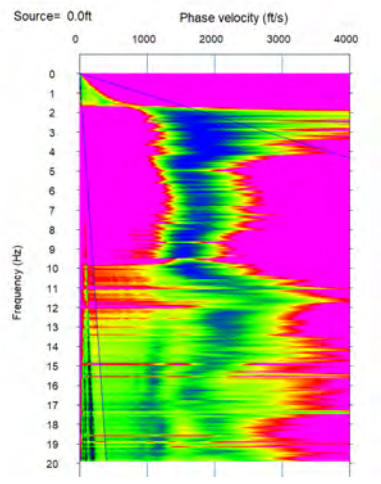
MASW data were recorded on a linear array of twenty-four 4.5Hz geophones spaced 10 feet apart using a Geometrics ES-3000 seismic controller. The array was orientated along a northwest-southeast alignment (Figure 1). Three records, each 2 seconds long with a 0.5 milli-second sample interval were collected from 25 feet off the end of the line. When necessary, the seismic array was reorientated and recollected to improve data quality and minimize noise from the adjacent facility.

MAM data were recorded on twenty-four 4.5Hz geophones spaced 10 feet apart using a Geometrics ES-3000 seismic controller. 30 records, each 32 seconds long with a 2.0 millisecond sample interval, were recorded at the same location as the MASW array.

A phase velocity-frequency plot was made from MASW and MAM wave forms and phase velocities were picked on amplitude. MAM and MASW phase velocity dispersion curves were combined and used to create an initial 1-D Vs model with depth. The initial model was inverted using a least squares method to determine the best fit of the model to the data. The MASW-MAM models (Figure 2) are an average of values over the total length of the 230-foot line.



MASW Phase Velocity-Frequency Plot



MAM Phase Velocity-Frequency Plot

RESULTS AND INTERPRETATION

Seismic Surface Wave Acquisition

The average Vs to a depth of 100 feet is 1,303.1 feet/second. This corresponds to a Seismic Site Classification of CD, in accordance with ASCE 7-22.

Site Class	$\bar{v}_s$ Calculated Using Measured or Estimated Shear Wave Velocity Profile (ft/s)
A. Hard rock	>5,000
B. Medium hard rock	>3,000 to 5,000
BC. Soft rock	>2,100 to 3,000
C. Very dense sand or hard clay	>1,450 to 2,100
CD. Dense sand or very stiff clay	>1,000 to 1,450
D. Medium dense sand or stiff clay	>700 to 1,000
DE. Loose sand or medium stiff clay	>500 to 700
E. Very loose sand or soft clay	≥500
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.2.1

Note: For SI: 1 ft = 0.3048 m; 1 ft/s = 0.3048 m/s.

CLOSURE

Geophysical surveys performed as part of this survey may or may not successfully detect or delineate any or all subsurface objects or features present. Locations, depths and scale of buried objects or subsurface features mapped as a result of this survey are a result of geophysical interpretation only, and should be considered as confirmed, actual, or accurate only where recovered by excavation or drilling.

Geophysical Survey LLC performed this work in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No warranty, express or implied, beyond exercise of reasonable care and professional diligence, is made. This report is intended for use only in accordance with the purposes of the study described within.

Respectfully,

Geophysical Survey LLC

Andrew Baird

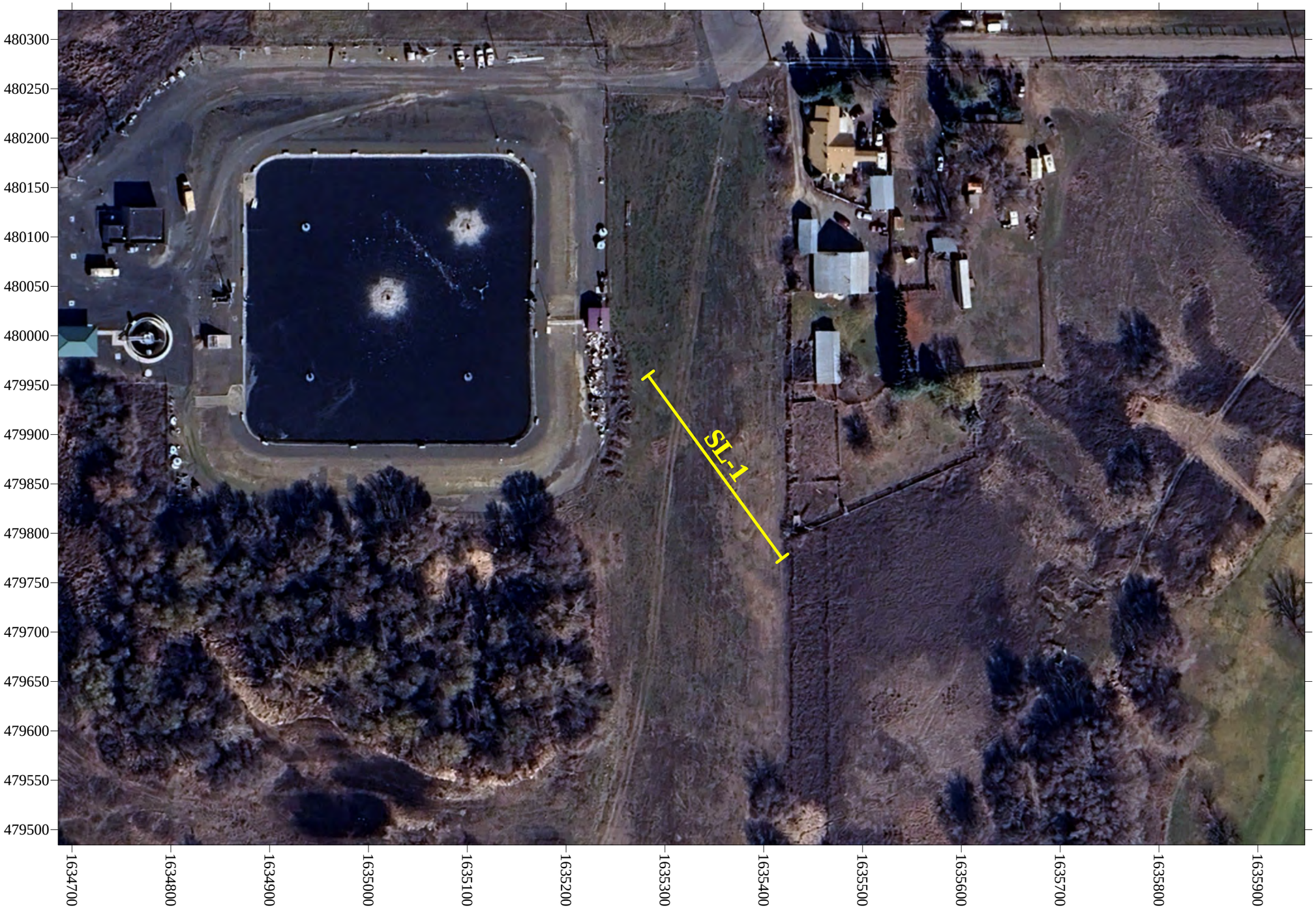
Andrew Baird, R.G.

Seismic Evaluation
WWTP
Selah, Washington

LIST OF FIGURES

Figure 1 Site Map

Figure 2 Surface Wave Data



N

0ft 50ft 100ft

Washington State Plane
NAD83

Legend

Seismic traverse SL-1

GEOPHYSICAL SURVEY LLC

FIGURE 1
Site Map
WWTP
Selah, Washington

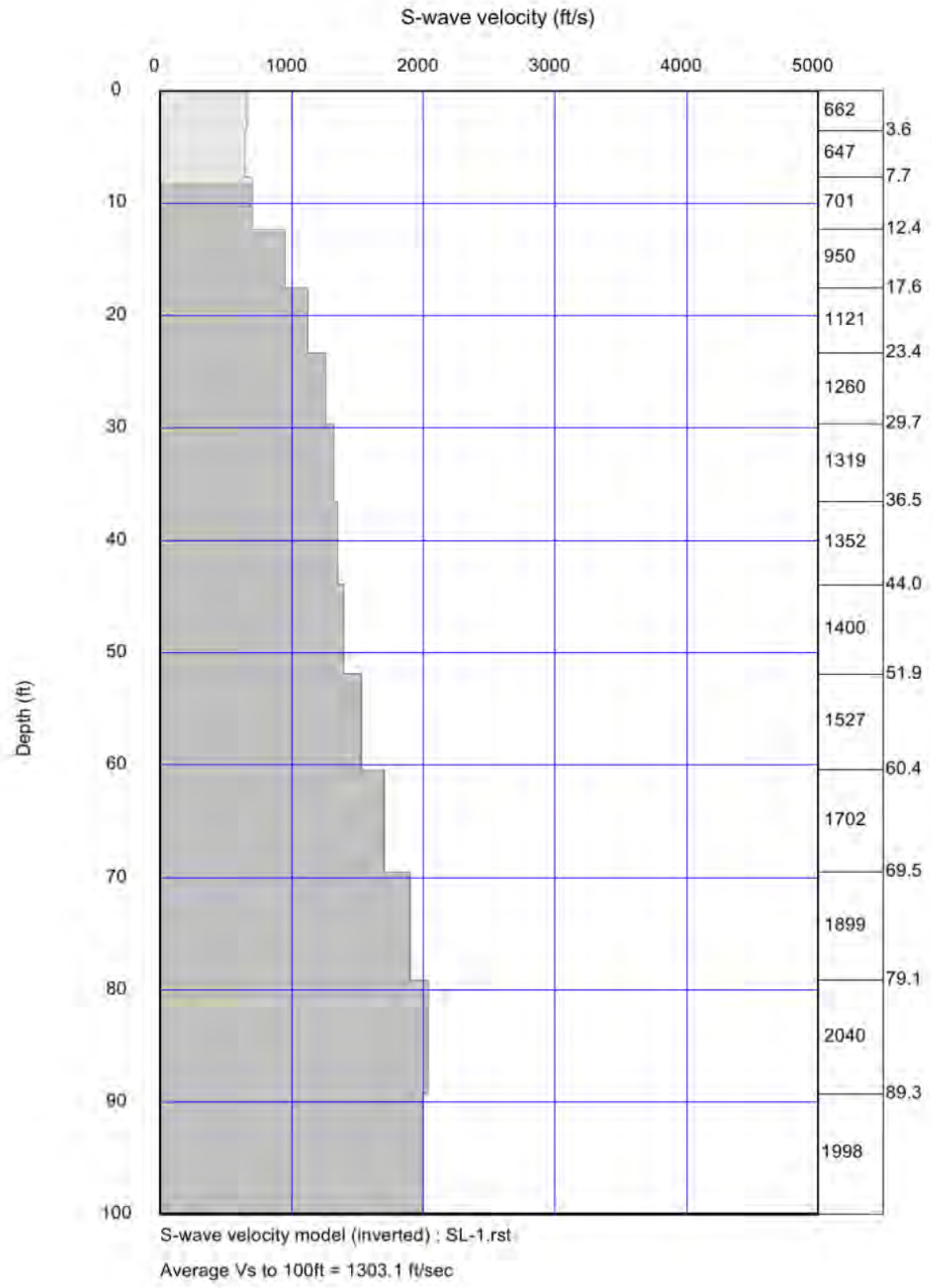


FIGURE 2

Shear Wave Profile
WWTP
Selah, Washington

GEOPHYSICAL SURVEY LLC

Appendix VI

Soil Liquefaction Analysis

LIQUEFY-v 2.3.XLS - A SPREADSHEET FOR EMPIRICAL ANALYSIS OF LIQUEFACTION POTENTIAL AND INDUCED GROUND SUBSIDENCE

Coryright & Developed 2007 by Shelton L. Stringer, PE, GE, PG , EG - Earth Systems Southwest

Project: Selah WWTP Improvements
Job No: 225-1849
Date: 9/30/2025
Boring: B-2 Data Set: 1

Methods: **Liquefaction Analysis using 1996 & 1998 NCEER workshop method (Youd & Idriss, editors)**
Journal of Geotechnical and Enviromental Engineering (JGEE), October 2001, Vol 127, No. 10, ASCE
Settlement Analysis from Tokimatsu and Seed (1987), JGEE,Vol 113, No.8, ASCE
Modified by Pradel, JGEE, Vol 124, No. 4, ASCE

EARTHQUAKE INFORMATION:

Magnitude: **6.8** 7.5
PGA, g: **0.29** 0.23
MSF: 1.28
GWT: **4.0** feet
Calc GWT: **4.0** feet
Remediate to: **0.0** **feet**

SPT N VALUE CORRECTIONS:

Energy Correction to N60 (C_E): 1.50 Automatic Hammer
Drive Rod Corr. (C_R): 1 Default
Rod Length above ground (feet): 3.0
Borehole Dia. Corr. (C_B): 1.00
Sampler Liner Correction for SPT?: 0 No
Cal Mod/ SPT Ratio: 0.63

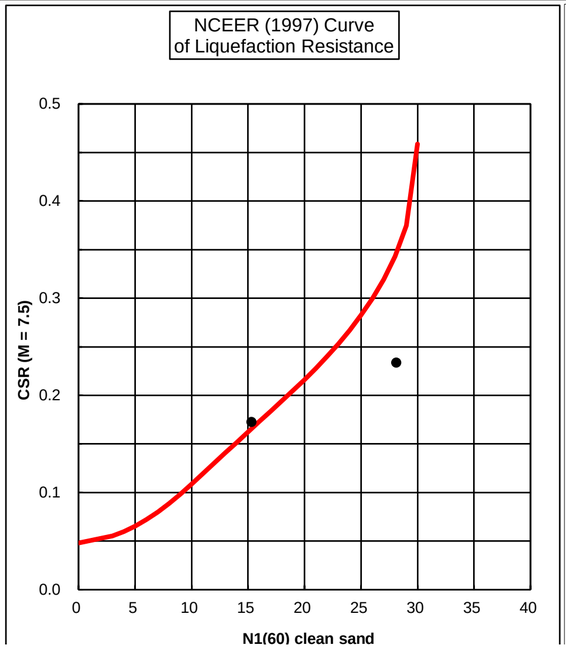
Total (ft) Liquefied Thickness	Total (in.) Induced Subsidence
2.5	0.3

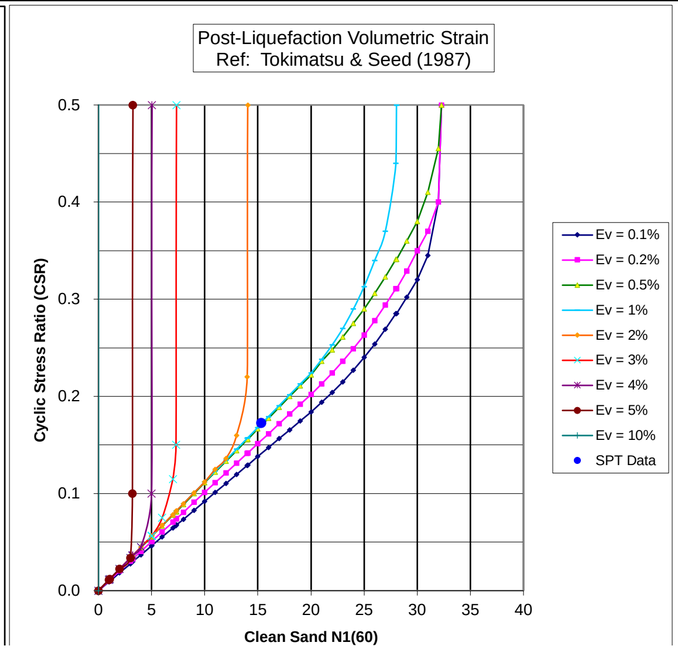
Threshold Acceler., g: 0.28 **Required SF:** 1.25
Minimum Calculated SF: 0.96

SETTLEMENT (SUBSIDENCE) OF DRY SANDS

Nc = 9.3

Base Depth (feet)	Cal Mod N	SPT N	Liquef. Suscept. (0 or 1)	Total Unit Wt. (pcf)	Fines Content (%)	Depth of SPT (feet)	Rod Length (feet)	Tot.Stress at SPT po (tsf)	Eff.Stress at SPT p'o (tsf)	rd	C_N	C_R	C_S	$N_{1(60)}$	Rel. Dens. Dr (%)	*Trigger FC Adj.* $\Delta N_{1(60)}$	*Equiv. Sand* $N_{1(60)CS}$	Kσ	M = 7.5 Available CRR	M =7.5 Induced CSR*	**Liquefac. Safety Factor**	*Post FC Adj.* $\Delta N_{1(60)}$	$N_{1(60)CS}$	Volumetric *Strain (%)*	**Induced Subsidence (in.)**	p (tsf)	G_{max} (tsf)	τ_{av} (tsf)	Shear Strain γ	Strain E_{15}	Strain Enc	**Dry Sand Subsidence (in.)**
								0.000																								
4.5		**20**	1	130	2	3.5	6.5	0.228	0.228	0.99	1.70	0.75	1.00	38.3	74	0.0	38.3	1.00	1.200	0.146	**Non-Liq.**	0.0	38.3	0.00	**0.00**	0.152	588	0.043	9.9E-05			
7.0		**8**	1	130	2	6.0	9.0	0.390	0.328	0.99	1.70	0.75	1.00	15.3	47	0.0	15.3	1.00	0.165	0.173	**0.96**	0.0	15.3	1.05	**0.31**	0.261	567	0.073	2.1E-04			
10.0		33	1	130	2	8.5	11.5	0.553	0.412	0.98	1.60	0.75	1.00	59.5	92	0.0	59.5	1.00	1.200	0.193	**6.21**	0.0	59.5	0.00	**0.00**	0.370	1,062	0.102	1.2E-04			
24.0		50	1	130	2	11.0	14.0	0.715	0.497	0.98	1.46	0.78	1.00	85.8	100	0.0	85.8	1.00	1.200	0.206	**5.81**	0.0	85.8	0.00	**0.00**	0.479	1,364	0.132	1.2E-04			
27.0		38	1	130	2	26.0	29.0	1.690	1.004	0.94	1.03	0.99	1.00	58.0	91	0.0	58.0	1.02	1.200	0.227	**5.29**	0.0	58.0	0.00	**0.00**	1.132	1,842	0.299	2.0E-04			
30.0		19	1	130	2	28.5	31.5	1.853	1.088	0.93	0.99	1.00	1.00	28.1	63	0.0	28.1	0.99	0.346	0.234	**1.48**	0.0	28.1	0.00	**0.00**	1.241	1,514	0.324	2.9E-04			
50.0		50	1	130	2	31.0	34.0	2.015	1.173	0.92	0.95	1.00	1.00	71.2	100	0.0	71.2	0.96	1.200	0.240	**4.99**	0.0	71.2	0.00	**0.00**	1.350	2,153	0.348	1.9E-04			





$N_{1(60)}$ = C_N*C_E*C_B*C_R*C_S*N
C_R = 0.75 for Rod lengths < 3m, 1.0 for > 10m
= min(1,max(0.75,1.4666-2.556/(z(ft))$^{0.5}$))
C_N = (1 atm/p'o)$^{0.5}$, max 1.7
C_S = max(1.1,min(1.3,1+$N_{1(60)}$/100)) for SPT without liners
MSF = $10^{2.24}/M^{2.56}$
z = Depth (m)
pa = 1 atm = 101 KPa = 1.058 tsf

p = 0.67*po
τ_{av} = 0.65*PGA*po*rd
G_{max} = 447*$N_{1(60)CS}^{(1/3)}$*$p^{0.5}$
a = 0.0389*(p/1)+0.124
b = 6400*(p/1)$^{(-0.6)}$
γ = [1+a*EXP(b*τ_{av}/G_{max})]/[(1+a)*τ_{av}/G_{max}]
E_{15} = γ*($N_{1(60)CS}$/20)$^{-1.2}$
E_{nc} = (Nc/15)$^{0.45}$*E15

Nc = $(MAG-4)^{2.17}$
S = 2*H*E_{nc}

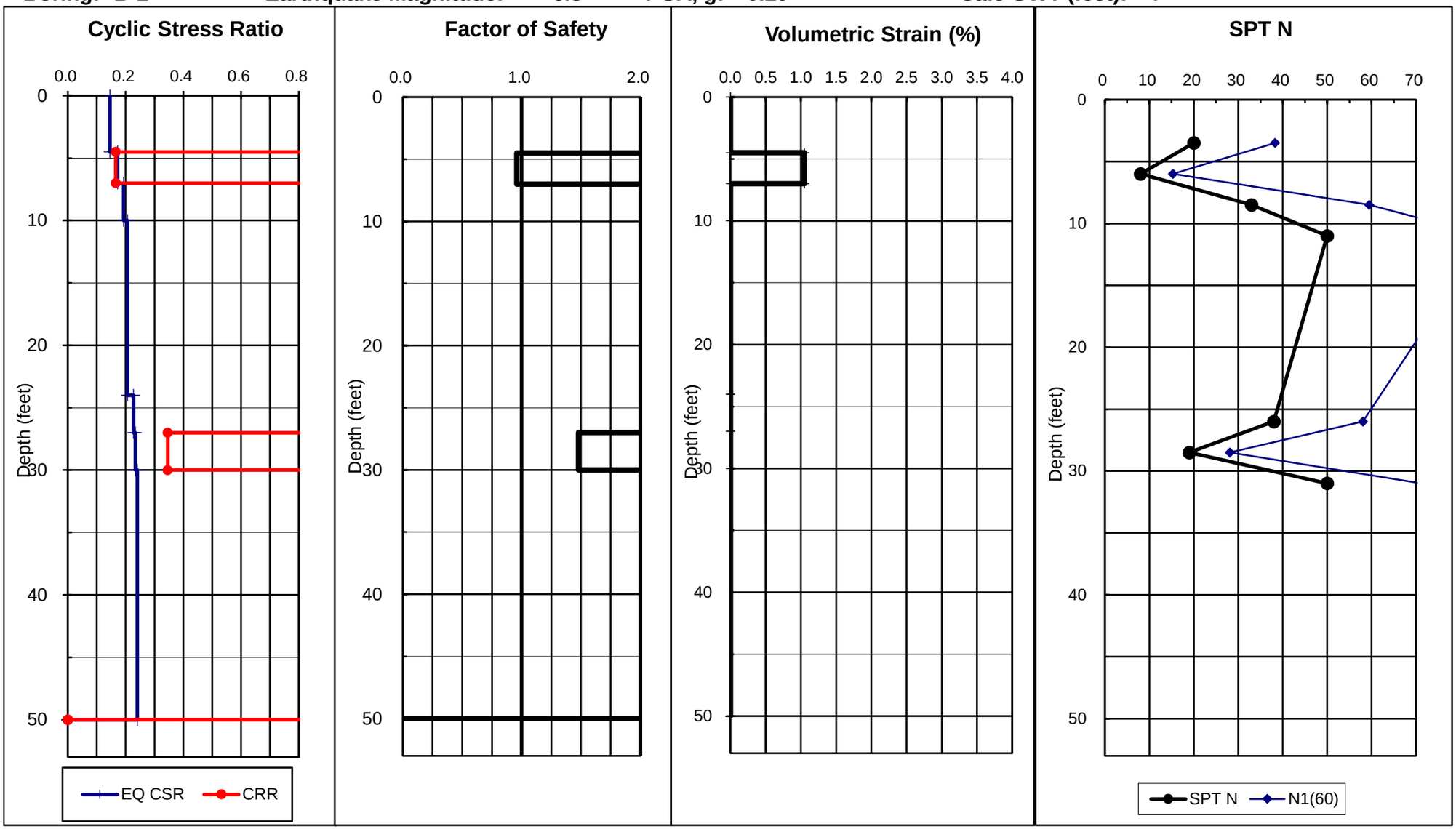
rd = (1-0.4113*z^0.5+0.04052*z+0.001753*z^1.5)/(1-0.4177*z^0.5+0.05729*z-0.006205*z^1.5+0.00121*z^2))
$\Delta N_{1(60)}$ = min(10,IF(FC<35,exp(1.76-(190/FC^2)),5)+IF(FC<=5,1,IF(FC<35,0.99+(FC^1.5/1000),1.2))*N1(60) - N1(60)
$N_{1(60)CS}$ = $N_{1(60)CS}$ + $\Delta N_{1(60)}$
Kσ = min of 1.0 or (p'o/1.058)$^{(IF(Dr>0.7,0.6,IF(Dr<0.5,0.8,0.7))-1)}$
Dr = ($N_{1(60)}$/70)$^{0.5}$
CSReq = 0.65*PGA*(po/p'o)*rd
CSR* = CSReq/MSF/Kσ
$CRR_{7.5}$ = (0.048-0.004721*N+0.0006136*N^2-0.00001673*N^3)/(1-0.1248*N+0.009578*N^2-0.0003285*N^3+0.000003714*N^4))
N = $N_{1(60)CS}$

SF = $CRR_{7.5,1atm}$/CSR*

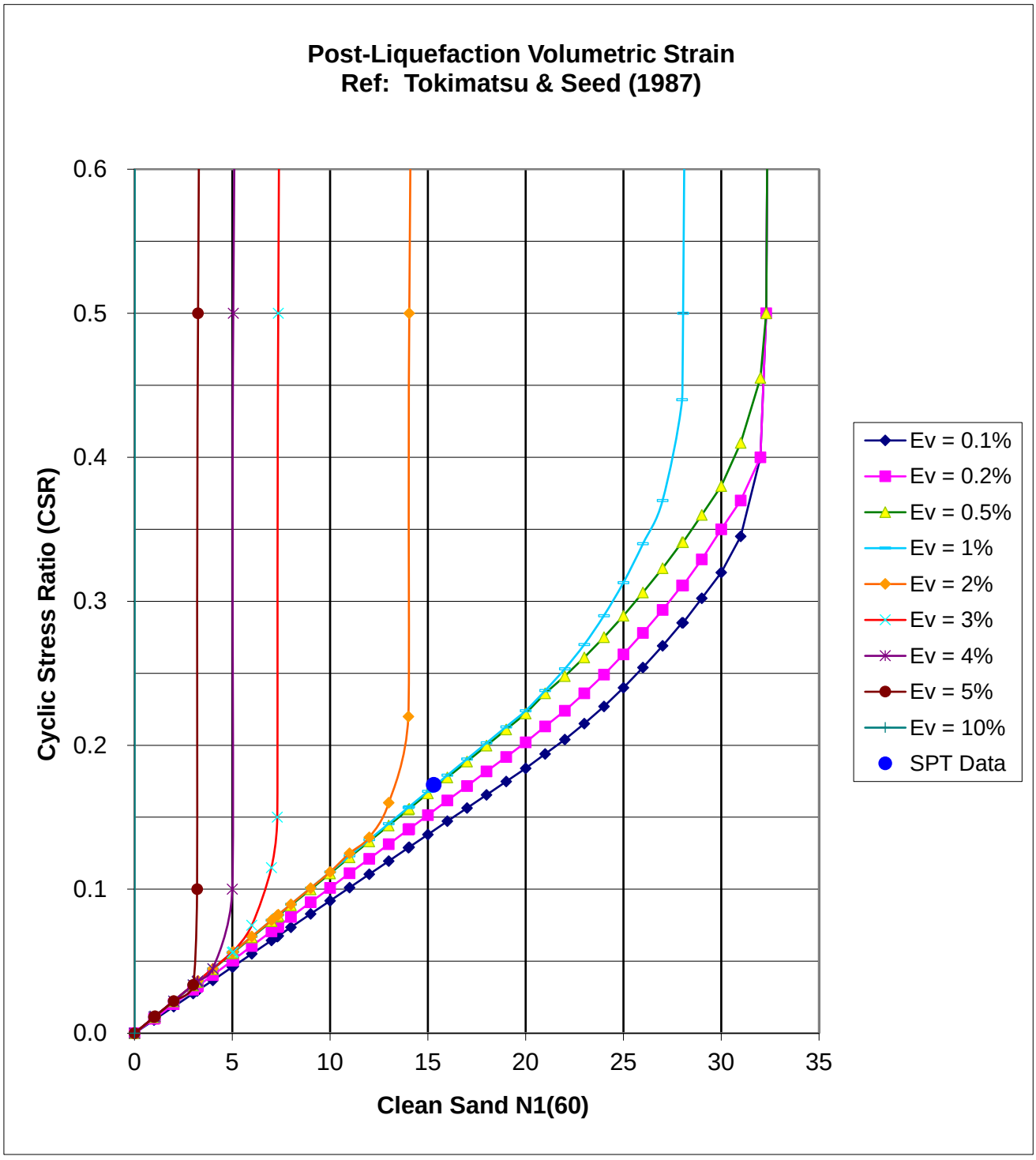
GN NORTHERN - EVALUATION OF LIQUEFACTION POTENTIAL AND INDUCED SUBSIDENCE

Selah WWTP Improvements **Project No: 225-1849** 1996/1998 NCEER Method

Boring: B-2 **Earthquake Magnitude: 6.8** **PGA, g: 0.29** **Calc GWT (feet): 4**



Total Thickness of Liquefiable Layers: 2.5 feet **Estimated Total Ground Subsidence: 0.3 inches**


Post-Liquefaction Volumetric Strain
Ref: Tokimatsu & Seed (1987)
Cyclic Stress Ratio (CSR)
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
5
10
15
20
25
30
35
Clean Sand N1(60)
Ev = 0.1%
Ev = 0.2%
Ev = 0.5%
Ev = 1%
Ev = 2%
Ev = 3%
Ev = 4%
Ev = 5%
Ev = 10%
SPT Data

Appendix VII

NRCS Soil Survey

United States Department of Agriculture

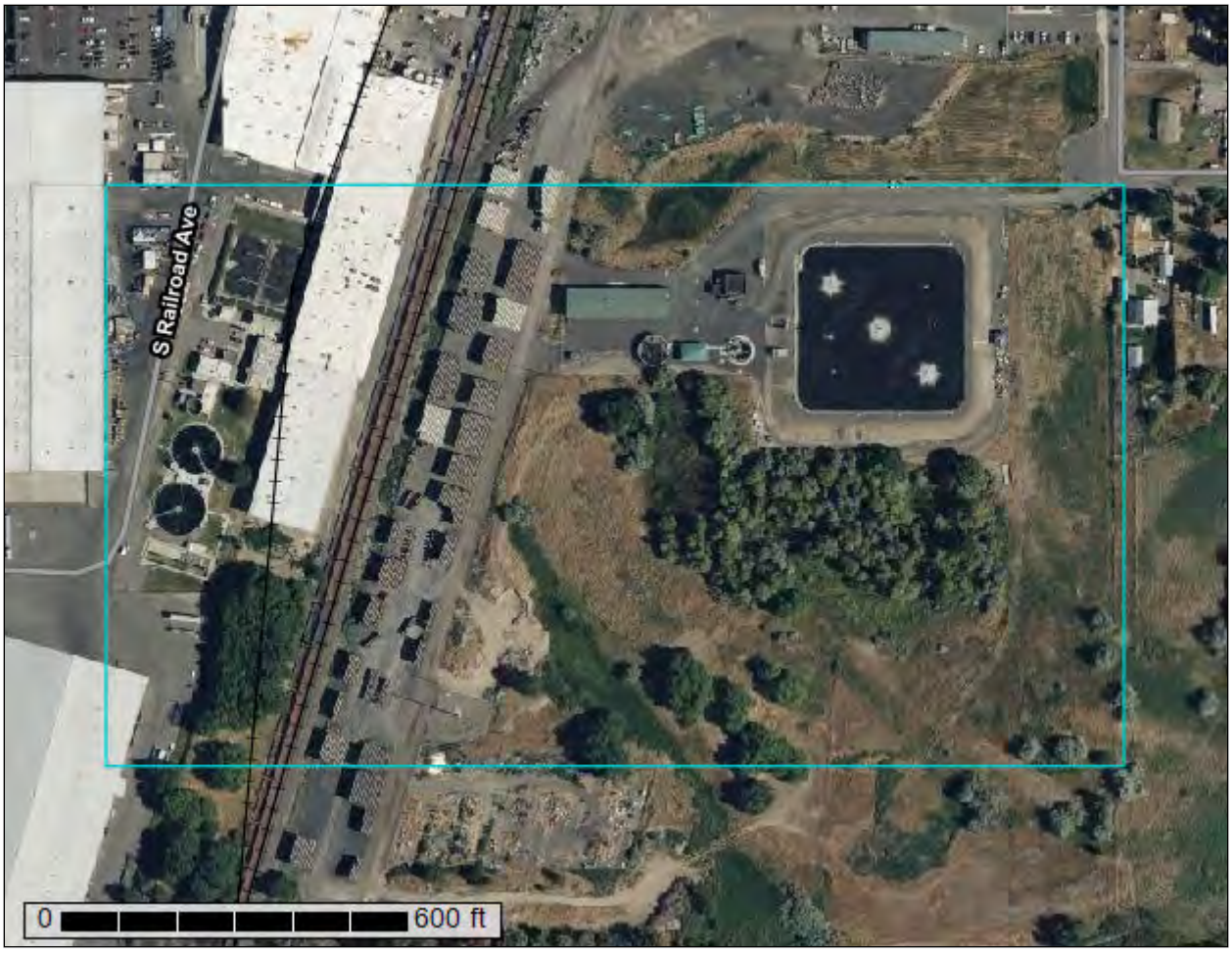
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

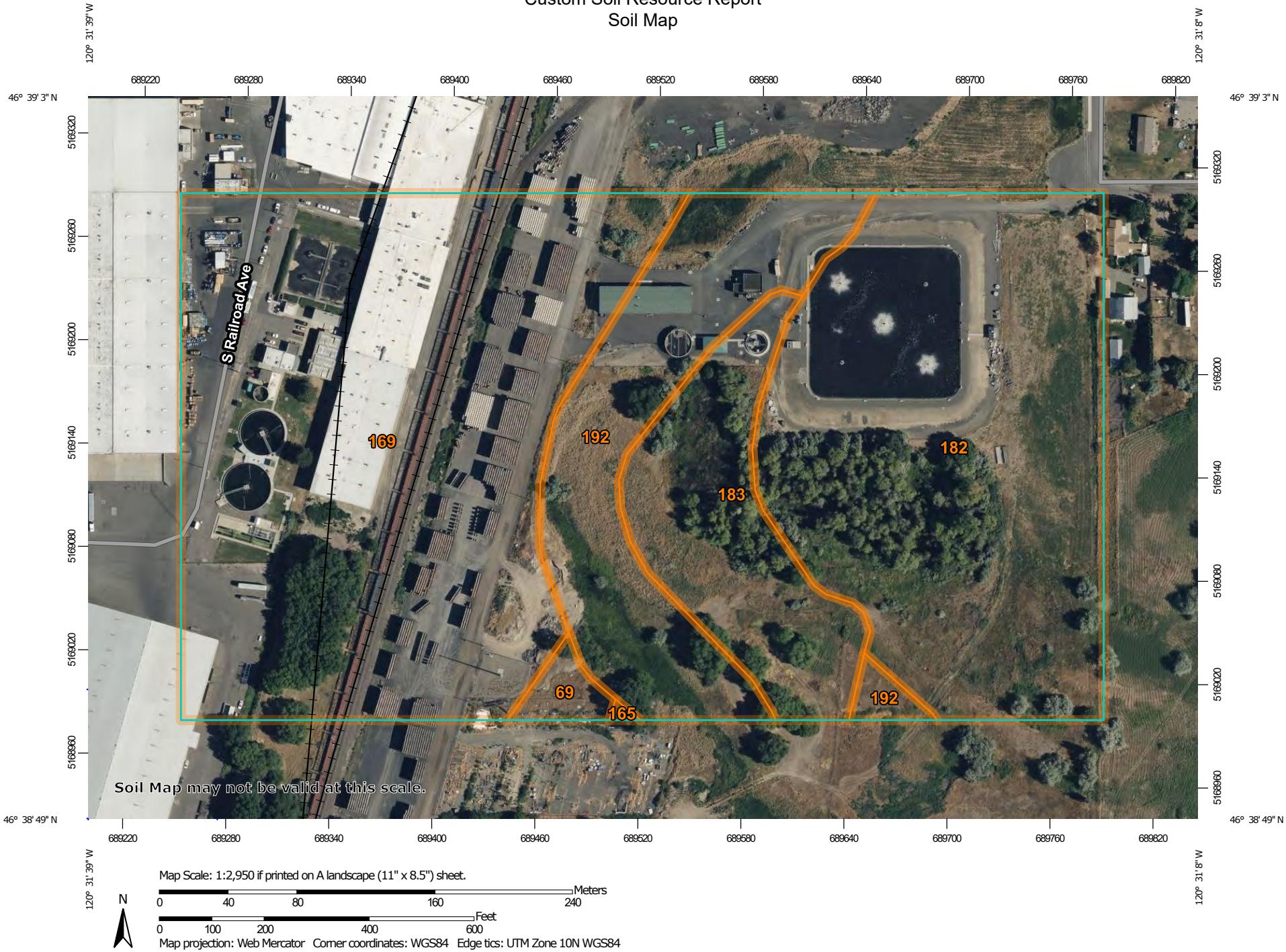
Custom Soil Resource Report for Yakima County Area, Washington

260 South Rushmore Road Selah, WA



October 6, 2025

Custom Soil Resource Report
Soil Map



Map Scale: 1:2,950 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 40 80 160 240

Feet
0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

Yakima County Area, Washington

69—Logy silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 29v2
Elevation: 690 to 2,160 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 130 to 180 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Logy and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Logy

Setting

Landform: Flood plains
Parent material: Alluvium

Typical profile

H1 - 0 to 12 inches: silt loam
H2 - 12 to 33 inches: extremely gravelly loam
H3 - 33 to 60 inches: very gravelly coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to strongly contrasting textural stratification
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B
Ecological site: R007XY930WA - Loamy Bottom
Hydric soil rating: No

Minor Components

Weirman

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

165—Track loam

Map Unit Setting

National map unit symbol: 29r9
Elevation: 700 to 1,500 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 130 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Track, drained, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Track, Drained

Setting

Landform: Flood plains
Parent material: Alluvium

Typical profile

H1 - 0 to 14 inches: loam
H2 - 14 to 26 inches: very gravelly loam
H3 - 26 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to strongly contrasting textural stratification
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 24 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: R007XY970WA - Alkali Terrace
Hydric soil rating: Yes

Minor Components

Toppenish
Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Track, undrained
Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Weirman
Percent of map unit: 3 percent
Landform: Alluvial cones
Hydric soil rating: No

Zillah
Percent of map unit: 2 percent
Landform: Alluvial cones
Hydric soil rating: No

169—Umapine silt loam, drained, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 29rf
Elevation: 250 to 3,500 feet
Mean annual precipitation: 6 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition
Umapine, drained, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Umapine, Drained

Setting
Landform: Terraces, flood plains
Parent material: Alluvium

Typical profile
H1 - 0 to 7 inches: silt loam
H2 - 7 to 60 inches: silt loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 20.0
Available water supply, 0 to 60 inches: High (about 11.9 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: R007XY970WA - Alkali Terrace
Hydric soil rating: No

Minor Components

Kittitas

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Toppenish

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

182—Weirman fine sandy loam

Map Unit Setting

National map unit symbol: 29rx
Elevation: 400 to 2,500 feet
Mean annual precipitation: 7 to 14 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Weirman and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Weirman

Setting

Landform: Terraces, flood plains
Parent material: Alluvium

Typical profile

H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 21 inches: loamy fine sand
H3 - 21 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: R007XY930WA - Loamy Bottom
Hydric soil rating: No

Minor Components

Zillah

Percent of map unit: 5 percent
Landform: Alluvial cones
Hydric soil rating: Yes

183—Weirman gravelly fine sandy loam

Map Unit Setting

National map unit symbol: 29ry
Elevation: 400 to 2,500 feet
Mean annual precipitation: 7 to 14 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Weirman and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Weirman

Setting

Landform: Terraces, flood plains
Parent material: Alluvium

Typical profile

H1 - 0 to 8 inches: gravelly fine sandy loam
H2 - 8 to 21 inches: loamy fine sand
H3 - 21 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: R007XY930WA - Loamy Bottom
Hydric soil rating: No

Minor Components

Zillah

Percent of map unit: 5 percent
Landform: Alluvial cones
Hydric soil rating: Yes

192—Zillah silt loam

Map Unit Setting

National map unit symbol: 29s8
Elevation: 600 to 1,000 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 130 to 180 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Zillah and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zillah

Setting

Landform: Flood plains

Parent material: Alluvium

Typical profile

H1 - 0 to 12 inches: silt loam
H2 - 12 to 42 inches: silt loam
H3 - 42 to 60 inches: loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 40 to 60 inches to strongly contrasting textural stratification
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R007XY930WA - Loamy Bottom
Hydric soil rating: No

Minor Components

Toppenish

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Weirman

Percent of map unit: 1 percent
Landform: Alluvial cones
Hydric soil rating: Yes

Appendix VIII

Washington Department of Ecology Well Logs

File Original and First Copy with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's copy

100936

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W149210

UNIQUE WELL I.D. # AGL 636

Water Right Permit No.

(1) OWNER: Name JEANIE HOBBS Address 493 SAGE TRAIL RD, YAKIMA, WA 98901

(2) LOCATION OF WELL: County YAKIMA - NE 1/4 NE 1/4 Sec 01 T. 13 N.,R 18 W.M.

(a) STREET ADDRESS OF WELL (or nearest address) RUSHMORE RD SELAH

TAX PARCEL NO. 181301-11003

A

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one)
[X] New Well Method: [ ] Dug [ ] Bored [ ] Deepened [ ] Cable [ ] Driven [ ] Reconditioned [ ] Rotary [ ] Jetted [ ] Decommission

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 100 feet. Depth of completed well 100 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed:
[X] Welded 6 " Diam. from +3 ft. to 97 ft.
[ ] Liner installed " Diam. from ft. to ft.
[ ] Threaded " Diam. from ft. to ft.

Perforations: [ ] Yes [X] No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: [ ] Yes [X] No [ ] K-Pac Location
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel/Filter packed: [ ] Yes [X] No [ ] Size of gravel/sand
Material placed from ft. to ft.

Surface seal: [X] Yes [ ] No To what depth? 20 ft.
Material used in seal BENTINITE
Did any strata contain unusable water? [ ] Yes [X] No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 5 ft. below top of well Date 7/17/2001
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [X] No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 50 gal./min. with stem set at 60 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analyses made? [ ] Yes [X] No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION:
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
SOIL	0	3
BOULDERS	3	8
CLAY AND GRAVEL	8	12
SAND GRAVEL	12	47
CLAY	47	54
CLAY AND GRAVEL	54	71
SHALE CLAY AND CLAY	71	90
SANDSTONE	90	100

DEPT OF ECOLOGY Received SEP 13 2001 CENTRAL REGION OFFICE

Work Started 7/17/2001 , 19 Completed 7/17/2001 , 19

WELL CONSTRUCTION CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Type or Print Name TOM MCGUIRE License No. 0357
(Licensed Driller/Engineer)
Trainee Name License No.
Drilling Company RICK POULIN WELL DRILLING
(Signed) License No. 0357
(Licensed Driller/Engineer)
Address 1301 LANCASTER RD SELAH, WA 98942
Contractor's Registration No. RICKPWD042J2 Date 7/17/2001 , 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. G1-28363P
Permit No. .....

(1) OWNER: Name City of Selah Address Contracted thru Mountain States Const

(2) LOCATION OF WELL: County YAKIMA SE ¼ SW ¼ Sec 36 T 14 N. R 18 W.M.
Bearing and distance from section or subdivision corner NE NW SE 1/13 18 C

PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 1
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 158 ft. Depth of completed well 158 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6,280" Diam. from 0 ft. to 20 ft.
Threaded ☐ .250" Diam. from 20 ft. to 148 ft.
Welded ☒ ..... " Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☒
Type of perforator used .....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Furnished by Engineer
Type Extra streng Model No .....
Diam. ..... Slot size 30 from 140 ft. to 149 ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☒ No ☐ To what depth? 25+ ft.
Material used in seal bentonite/cement
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name .....
Type: ..... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level .... 1092 ft.
Static level 6 ft. below top of well Date .....
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? .....
Yield: ..... gal./min. with ..... ft. drawdown after ..... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ..... JUN 13 1984
Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL			FROM	TO
TOP SOIL, FINE SAND			0	
GRAVEL, BOULDERS	BRN	M		20
water at 6 ft approx 50 gpm+				
HEAVY ROUND GRAVEL MIXED WTH BOULDERS AND MED, SAND, SILT,				
	BROWN	MED	to	25
HEAVY ROUND AND CRACKED BROKEN GRAVEL, SILT, FINE SAND			25	46
water decreasing at 30 ft				
HARD PAN (water shut off)			46	50
HARD PAN	BRN	S	50	55
BRKN SANDSTONE, SAND	BRN	S	55	61
water, 4gpm				
BRKN SANDSTONE	brn	S	61	72
SANDY HARD PAN	brn	S	72	74
water shut off at 72 ft.				
LIGHT GREEN CLAY	gr/wht	S	74	84
CLAY	BRN	S	84	90
BRKN SANDSTONE CLAY	BRN	S	90	108
1½ to 2 gpm water				
CLAY	brn	S	108	109
water shut off				
SANDSTONE	BRN	S	109	138
SANDY CLAY	BRN	S	138	147
SANDSTONE	BRN	S	147	158
50 gpm at 138 ft				
100 gpm at 158 ft.				
Samples taken from 40' to 50 ft To check for possible variations in sand size and silt content- silt increased at 30 ft and water decreased sand size unchanged.				

Work started ..... 19 ..... Completed 5/29/84 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Riebe Well Drilling
(Person, firm, or corporation) (Type or print)
Address 1503 East Nob Hill Yakima

[Signed] Dalton H. Riebe
(Well Driller)

License No. 0422 Date 5/30, 1984 19

CK 7/19/84

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

Fi... and First Copy with ... Ecology
... — Owner's Copy
... Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ...
Permit No. ...

(1) OWNER: Name Jessie CASSADY Address RT 3 Box 316 Selah, Wash 98942

(2) LOCATION OF WELL: County YAKIMA NE¼ SW¼ Sec 36 T 14 N. R 18 W.M.
... and distance from section or subdivision corner 25 FT S of NE corner Parcel No 181436

(3) PROPOSED USE: Domestic ☑ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☑ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☑ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well ..... inches.
Drilled ..... ft. Depth of completed well ..... ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 0 ft. to 84 ft.
Threaded ☐ ..... " Diam. from ..... ft. to ..... ft.
Welded ☑ ..... " Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☑
Type of perforator used .....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☑
Manufacturer's Name .....
Type ..... Model No. .....
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☑ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☑ No ☐ To what depth? 18 ft.
Material used in seal Grout
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name .....
Type: ..... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level .... ft.
Static level 7 ft. below top of well Date 9-10-26
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? .....
Yield: ... gal./min. with ... ft. drawdown after ... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test .....
Bailer test 30 gal./min. with 4 ft. drawdown after 1 hrs.
Artesian flow ..... g.p.m. Date 9-22-26
Temperature of water ..... Was a chemical analysis made? Yes ☑ No ☐

(10) WELL LOG:
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top soil	0	4
Boulders & large Gravel	4	18
Hard clay	18	22
Sand, Gravel & Boulders	22	30
Sand & Gravel	30	40
med sand	40	45
clay sandy soft	45	55
sandy clay med	55	63
Hard clay	63	70
Sand & Gravel	70	80
gravel	80	84

RECEIVED
OCT 26 1976
DEPARTMENT OF ECOLOGY
CENTRAL REGIONAL OFFICE

Work started 8-30, 1926. Completed 9-10, 1926

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME "A" Back Well Drilling (Person, firm, or corporation) (Type or print)
Address P.O. Box 48 Yakima, Wash
[Signed] Jerry Taylor (Well Driller)
License No. 0495 Date 9-22, 1926

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71)
ECY-070-28

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. .....
Permit No. [redacted]

(1) OWNER: Name Hurly Brook Address .....

(2) LOCATION OF WELL: County Yakima SW ¼ SE ¼ Sec. 36 T. 14 N., R. 18 W.M.
Bearing and distance from section or subdivision corner 300ft NW

(3) PROPOSED USE: Domestic ☑ Industrial ☐ Municipal ☐
Irrigation ☑ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) .....
New well ☑ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☑ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 140 ft. Depth of completed well 140 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +2 ft. to 80 ft.
Threaded ☐ ..... " Diam. from ..... ft. to ..... ft.
Welded ☑ ..... " Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☐
Type of perforator used .....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☑
Manufacturer's Name .....
Type ..... Model No. .....
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☑ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☑ No ☐ To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☑
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name .....
Type: ..... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level ..... ft.
Static level 8 ft. below top of well Date June 30 '86
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? .....
Yield: ..... gal./min. with ..... ft. drawdown after ..... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test .....
Bailer test 100 gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☑

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Topsoil	0	3
Sand + gravel + Boulders	3	17
Sand + gravel	17	38
Trace of water		
Brown Clay	38	69
Brown Clay + Sandstone	69	79
Sandstone + Dark Brown	79	92
Brown + Black Sandstone	92	138
water Bearing 110-130		
Sandstone + Basalt	138	140
Static 8ft		
Apprx 100gpm		

RECEIVED
JUL - 3 1986
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

Work started June 4, 19 86 Completed June 30, 19 86

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Columbia Drilling
(Person, firm, or corporation) (Type or print)
Address Rt 1 Box 1911 Selah Wa.
[Signed] Steve Wakefield
(Well Driller)
License No. 0991 Date June 25, 19 86

[redacted] SHEETS IF NECESSARY)

ECY 050-1-20

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

3244 Start Card No.

E Water Right Permit No.

(1) OWNER: Name City of Selah Address Treatment Plant - 219 E. 1st

(2) LOCATION OF WELL: County Yakima SW ¼ NW ¼ Sec 1 T 13 N., R 18e

(2a) STREET ADDDRESS OF WELL (or nearest address) 219 E. 1st Ave.

(3) PROPOSED USE: ☐ Domestic ☐ Irrigation ☒ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) #1

Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 18 inches.
Drilled 21 feet. Depth of completed well 21 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 18" Diam. from 0 ft. to 21 ft.
Welded ☒ 12" PVC Diam. from 0 ft. to 20 ft.
Liner installed ☒
Threaded ☐ " Diam. from ft. to ft.

Perforations: Yes ☒ No ☐ Skill saw - PVC
Type of perforator used Millknife - 18" casing
SIZE of perforations S.S. 12" by 1/8 in.
M.K. 3 by 1/4 in.
perforations from ft. to ft.
18" CASING perforations from 13' ft. to 20' ft.
12" PVC perforations from 13 ft. to 20 ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☒ No ☐ Size of gravel 1½"
Gravel placed from 0 ft. to 21 ft.

Surface seal: Yes ☐ No ☒ To what depth? ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 11 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test

Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPT

Formation: Describe by color, character, size of material and structure, and thickness of aquifers and the kind and nature of the material in each stratum penetr with at least one entry for each change of information.

MATERIAL	FROM	TO
Sandy loam	0	
Bell connector of 24" cement drainage culvert (TREE TOP apple juice culvert)	4	
Sandy loam	7	1
Cobbles & gravel	10	1
Cement gravel w/clay	15	1
Gravelly sand	16	2

ENTERED

JUN 26 1990

Work started , 19. Completed , 19.

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this w and its compliance with all Washington well construction standar Materials used and the information reported above are true to my b knowledge and belief.

NAME Bach Well Drilling Co. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 2111 Birchfield Rd. Yakima, Wa

(Signed) Jim Bach (WELL DRILLER) License No. 021

Contractor's Registration No. BACHWDC137NU Date Aug

(USE ADDITIONAL SHEETS IF NECESSARY,

ECY 050-1-20 (10/87) -1329-

e Original and First Copy with
partment of Ecology
ond Copy — Owner's Copy
rd Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. 28062

Permit No. ....

) OWNER: Name A+B PLASTICS Address 111 South RAILROAD

OCATION OF WELL: County YAKIMA SW ¼ SE ¼ Sec. 36 T. 14 N., R. 18 W.M.

aring and distance from section or subdivision corner

) PROPOSED USE: Domestic ☐ Industrial ☑ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☑ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☑ Jetted ☐

) DIMENSIONS: Diameter of well 8 inches.
Drilled 124 ft. Depth of completed well 124 ft.

) CONSTRUCTION DETAILS:
Casing installed: 8 " Diam. from +2 ft. to 109 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☑
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☑
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☑ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☑ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☑
Type of water? Depth of strata
Method of sealing strata off

) PUMP: Manufacturer's Name
Type: H.P.

) WATER LEVELS: Land-surface elevation above mean sea level .... ft.
atic level 18 ft. below top of well Date
tesian pressure lbs per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

) WELL TESTS: Drawdown is amount water level is lowered below static level
as a pump test made? Yes ☐ No ☐ If yes, by whom?
eld: 300 gal./min. with ft. drawdown after hrs.
" " "
" " "

covery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
iler test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
GRAVEL	0	3
TOP SOIL	3	6
SAND + GRAVEL	6	45
SAND + GRAVEL WITH CLAY	45	65
SANDSTONE + CLAY LAYERS	65	108
SANDSTONE + CONGLOMERATE	108	122
CLAY WHITE	122	124

RECEIVED
JAN - 5 1983
DEPARTMENT OF ECOLOGY
EASTERN REGION

Work started 9/8, 19 82 Completed 9/8, 19 82

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Poulin Drilling
(Person, firm, or corporation) (Type or print)
Address RT 3 Box 3356
[Signed] Kirk Poulin
(Well Driller)
License No. 924 Date 9/9, 19 82

(USE ADDITIONAL SHEETS IF NECESSARY) EP 1/31/83

ECY 050-1-20

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report

GN Northern, Inc.

Consulting Engineers Environmental Scientists Geologists
Construction Materials Testing Geophysical Services

SUPPLEMENTAL GEOTECHNICAL SITE INVESTIGATION REPORT

CITY OF SELAH WWTP IMPROVEMENTS - ALTERNATE PLAN

260 S. RUSHMORE ROAD / 222 S. RAILROAD AVENUE

SELAH, WASHINGTON

GNN PROJECT NO. 225-1849-1

MARCH 2026

Prepared for

HLA ENGINEERING & LAND SURVEYING, INC.
2803 RIVER ROAD
YAKIMA, WA 98902

Prepared by

GN NORTHERN, INC.
CONSULTING GEOTECHNICAL ENGINEERS
YAKIMA, WASHINGTON
(509) 248-9798

Common Sense Approach to Earth and Engineering
Since 1995



At GN Northern our mission is to serve our clients in the most efficient, cost-effective way using the best resources and tools available while maintaining professionalism on every level. Our philosophy is to satisfy our clients through hard work, dedication, and extraordinary efforts from all of our valued employees working as an extension of the design and construction team.

March 4, 2026 **GNN Project No. 225-1849-1**

HLA Engineering & Land Surveying, Inc.
2803 River Road
Yakima, WA 98902

Attn: Robert Scott, PE

Subject: **Supplemental Geotechnical Site Investigation Report**
City of Selah Wastewater Treatment Plant – Alternate Plan
260 S. Rushmore Road / 222 S. Railroad Avenue
Selah, Washington

Reference: GN Northern, Inc., *Geotechnical Site Investigation Report, City of Selah Wastewater Treatment Plant Improvements, 260 S. Rushmore Road / 222 S. Railroad Avenue, Selah, Washington*, GNN Project No.: 225-1849, dated October 22, 2025.

Dear Mr. Scott,

As requested, GN Northern (GNN) has completed this supplemental geotechnical site investigation for the proposed Alternate Plan of the City of Selah Wastewater Treatment Plant Improvements project at the existing facility located at 260 S. Rushmore Road and 222 S. Railroad Avenue in Selah, Washington.

Based on the findings of our subsurface study, we conclude that the site is suitable for the proposed construction provided that our geotechnical recommendations presented in this report are followed during the design and construction phases of the project. *This supplemental report specifically addresses the revised project site area for the planned aeration basin and associated ancillary structures as indicated on the Alternate Plan. Except as modified herein, the finding, conclusions, and recommendations of the above referenced Report remain valid.*

This report describes in detail the results of our investigation, summarizes our findings, and presents our recommendations concerning earthwork and the design and construction of foundations and infrastructure for the proposed project. ***It is important that GNN be retained by the City of Selah to provide consultation during the design phase, as well as field compaction testing and geotechnical monitoring services during the construction phase, to review and monitor the implementation of the geotechnical recommendations***.

If you have any questions regarding this report, please contact us at 509-248-9798.

Respectfully submitted,

GN Northern, Inc.

Karl A. Harmon, LEG, PE
Senior Geologist/Engineer

Imran Magsi, PE, GE
Sr. Geotechnical Engineer

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APPENDICES

Appendix I – Vicinity Map (Figure 1), Site Exploration Map (Figure 2), Depth & Elevation of Competent Stratum (Figure 2A)
Appendix II – Exploratory Boring Logs, Key Chart (for Soil Classification)
Appendix III – Laboratory Testing Results
Appendix IV – Site & Exploration Photographs

1.0 PURPOSE AND SCOPE OF SERVICES

This supplemental geotechnical engineering report has been prepared for the proposed *Alternate Plan* for the City of Selah Wastewater Treatment Plant Improvements project at the existing facility located at 260 S. Rushmore Road and 222 S. Railroad Avenue in Selah, Washington; site location is shown on the *Vicinity Map* (Figure 1, Appendix I). GNN previously completed a comprehensive geotechnical investigation for the proposed WWTP improvements (see referenced Report).

Based on the finding of our initial investigation, it was determined that the proposed layout/placement of the planned aeration basin would result in unique construction challenges and significant additional project costs due to problematic subsurface soil conditions and other related site constraints. Due to these noted challenges, a revised *'Alternate Plan'* was developed which relocates the planned aeration basin and associated ancillary structures toward the southeast portion of the City's WWTP property.

This supplemental report specifically addresses the revised project site area for the planned aeration basin and associated ancillary structures as indicated on the Alternate Plan. Except as modified herein, the finding, conclusions, and recommendations of the above referenced Report remain valid.

Based on the revised siting of the planned aeration basin facilities, GNN's second round of investigation was conducted to collect information regarding subsurface conditions and present recommendations for suitability of the subsurface materials to support the proposed improvements and allowable bearing capacity for the proposed construction within the new layout of the proposed *Alternate Plan*.

Our study was conducted in general accordance with our scope of work outlined in our *Proposal for Additional Geotechnical Services* dated November 12, 2025, along with our understanding of the proposed *Alternate Plan* project based on discussions from October 29, 2025 meeting with HLA and GNN's geotechnical engineers, along with follow-up communications. Notice to proceed was provided in the form of an authorized *Addendum No.1 Agreement for Subconsultant Services to HLA Engineering and Land Surveying, Inc.* signed by Michael T. Battler, PE, President of HLA

on December 16, 2025 and *Addendum No.2* signed by Benjamin A. Annen, PE, President of HLA on February 12, 2026.

We understand that the City/HLA is considering changing the original WWTP site plan layout based on the finding from the initial subsurface investigation (referenced GNN 10/22/2025 Report); with the intent to 1) move new structures away from existing houses and the lagoon that could be negatively impacted by induced groundwater drawdown resulting from temporary dewatering concerns at that location, and 2) to find more competent soils for building the aeration basin that would eliminate the need for Rammed Aggregate Pier foundation support system.

A revised 'Alternate layout' plan was provided by Mr. Scott via email November 4, 2025. The A*lternate Plan* includes a presumptive primary alternate location for the new aeration basin to be located further south, along with nearby clustered ancillary structures (headworks, headworks lift station, post-aeration basin, and B.U.R.N building), situated to the north of the planned aeration basin. The alternate layout plan also depicts a request to conduct additional explorations to the south and west of the primary planned revised locations, to help determine the best location moving forward depending on the actual findings and associated geotechnical recommendation from this second round of geotechnical study.

The supplemental round of field exploration, consisting of twenty (20) exploratory borings, was completed between January 30th and February 3rd, 2026. The boring locations are shown on Figure 2 (Appendix I). Detailed boring logs are presented in Appendix II, and results of laboratory testing are attached in Appendix III.

This report has been prepared to summarize the data obtained during this study and to present our recommendations based on the proposed construction and the subsurface conditions encountered at the site. Results of the field exploration and laboratory testing were analyzed to develop recommendations for earthwork and foundation bearing support. Design parameters and a discussion of the geotechnical engineering considerations related to construction are included in this report.

2.0 PROPOSED CONSTRUCTION

Based on information provided, we understand that the revised *Alternate Plan* moves the proposed location of the planned aeration basin, along with associated ancillary structures including the headworks, headworks lift station, post-aeration basin, and B.U.R.N building, toward the southeast portion of the City's WWTP property. The *Alternate Plan* includes a depicted layout of the proposed aeration basin and associated structures with what is assumed to be the 'primary' location option. Our investigation included additional points of exploration for the presumed secondary area option to the south as well as additional points of exploration to the west.

3.0 FIELD EXPLORATION

Prior to performing the additional field exploration activities, GNN's geotechnical engineer performed an initial reconnaissance of the new project site on December 22, 2025 and met with representatives from HLA to observe access constraints and pre-mark the planned boring locations for public utility locating services. Site access was coordinated by HLA. An initial attempt to perform the field drilling was performed on December 29, 2025, however the prevailing very soft and wet surface conditions prevented the completion of any work at that time.

After allowing surface conditions to dry-out and improve somewhat over-time, a second attempt to complete the field exploration activities began in late January using a track-mounted drill rig. A total of twenty (20) additional exploratory borings were completed from January 30 to February 3, 2026 at locations shown on the *Site Exploration Map* (Figure 2, Appendix I). Borings were drilled by Haz-Tech Drilling using a CME-850 track-mounted drill rig with auto-hammer to depths ranging from approximately 20.5 to 31.5 feet below existing ground surface (BGS). Borings were logged and overseen by a GNN senior geologist/engineer. Upon completion, the boreholes were backfilled in accordance with Washington State guidelines.

Samples were obtained from the test borings using a Standard Penetration (SPT) sampler. The SPT sampler has a 2-inch outside diameter and a 1.38-inch inside diameter. Samples were obtained by driving the sampler with a 140-pound automatic hammer, dropping 30 inches in general accordance with ASTM D1586. The number of blows required to advance the samplers through each 6-inch increment is recorded in the field. The SPT resistance, or N-value, is defined as the number of blows required to drive the sampler from 6 inches to 18 inches below the auger tip,

with the value reported as the number of blows per one foot of penetration. The SPT N-value, adjusted for hammer efficiency and sampler size, provides an indication of the relative density or consistency of the soil and is indicated on the boring logs. Recovered soil samples were sealed in containers and returned to our laboratory.

The soils observed during our field exploration were classified according to the Unified Soil Classification System (USCS), utilizing the field classification procedures per ASTM D2488. A copy of the USCS Chart is included in Appendix II. Photographs of the site and exploration are presented in Appendix IV. Depths referred to in this report are relative to the existing ground surface elevation at the time of our investigation. The surface and subsurface conditions described in this report are as observed at the time of our field investigation. The following table presents the borings completed, along with GPS coordinates, surface elevations, and total depths:

Table 1: Summary of Field Exploration

ID	Approx. GPS Coords.	*Surface Elevation (ft)	Total Boring Depth BGS (ft)
B-1-A	46.647000°, -120.520027°	1090	31.5
B-2-A	46.647812°, -120.520029°	1090	28.0
B-3-A	46.647579°, -120.520885°	1090	30.8
B-4-A	46.648037°, -120.520721°	1089	20.5
B-5-A	46.647489°, -120.520029°	1089	20.8
B-6-A	46.647812°, -120.520462°	1089	25.5
B-7-A	46.647327°, -120.520364°	1089	20.5
B-8-A	46.648148°, -120.520181°	1089	22.5
B-9-A	46.647814°, -120.520881°	1090	26.0
B-10-A	46.647084°, -120.520358°	1090	21.5
B-11-A	46.647633°, -120.520314°	1090	26.5
B-12-A	46.647995°, -120.520103°	1090	23.5
B-13-A	46.647489°, -120.520592°	1089	21.5
B-14-A	46.647211°, -120.520035°	1090	21.5
B-15-A	46.647581°, -120.521613°	1090	25.5
B-16-A	46.647819°, -120.521619°	1090	21.0
B-17-A	46.647583°, -120.521252°	1089	21.5
B-18-A	46.647819°, -120.521262°	1088	21.0
B-19-A	46.646997°, -120.520894°	1090	26.5
B-20-A	46.647291°, -120.520894°	1090	20.5

**Surface elevations are approximate and based on Google Earth Topography*

4.0 LABORATORY TESTING

Representative samples of the onsite soils obtained from the borings were selected for testing to determine the index properties of the subsurface soils in general accordance with ASTM procedures. The following laboratory tests were performed:

Table 2: Laboratory Tests Performed

Test	To determine
Particle Size Distribution (ASTM D6913)	Soil classification based on proportion of sand, silt, and clay-sized particles.
Natural Moisture Content (ASTM D2216)	Soil moisture content indicative of in-situ condition at the time samples were taken.
Atterbug Limits, ASTM (ASTM D4318)	A method of describing the effect of varying water content on the consistency of fine-grained soils.

Results of the laboratory test are included on the boring logs and are also presented in graphic form in Appendix III attached to the end of the report.

5.0 SITE CONDITIONS

The revised *Alternate Plan* site location for the proposed aeration basin and associated ancillary structures is situated within the southwest portion of the City's existing WWTP property at 260 Rushmore Road in Selah, Washington. The project is situated in the northern ½ of the NW ¼ of Section 1, Township 13 North, Range 18 East of the Willamette Meridian.

The revised area is relatively flat and undeveloped. Based on topography data obtained from Google Earth, existing surface elevations across this area typically range from ±1088' to ±1090', generally sloping down towards the south. This area is typically covered with a moderate to dense growth of grass/brush and some mature trees.

6.0 SUBSURFACE CONDITIONS

Our understanding of the subsurface conditions across the *Alternate Plan* project site is based on several points of exploration across areas of the proposed improvements. Based on the findings of both our previous and recent investigations, subsurface soils generally consist of an upper variably-thick layer of fine-grained silty/sandy soils typically underlain by the prevailing coarse-grained alluvium consisting of rounded gravels and cobbles. The upper fine grained silty/sandy soils were typically observed to be *'moist'* to *'wet'* with relative densities noted to range from

'very loose' to *'loose'*. The underlying gravel units are typically classified as Poorly Graded Gravel with Silt and Sand (GP-GM), Poorly Graded Gravel with Sand (GP), and Silty Gravel (GM), ranging in in-place relative density from 'loose' to 'very dense'.

Groundwater was observed in each of the borings at depths ranging from approximately 2 to 4 feet BGS (short-term un-stabilized readings) at time of our exploration in late-January and early-February of 2026.

The following table summarizes subsurface conditions encountered at the site; refer to boring logs in Appendix II for detailed descriptions of the soil encountered:

Table 3: Generalized Subsurface Conditions

Boring	Referenced Proposed Structure Location*	Depth of Native Sand/Silt/Clay Stratum BGS (ft)	Elevation of top of Native Gravel Stratum (±ft)**	Relative Density/ Consistency of the Sand/Silt/Clay Stratum†	Relative Density of the Gravel Stratum†
B-1-A	~170' south of SE corner of Future Aeration Basin	3.0	1087.0	Loose	Loose to very dense
B-2-A	NE corner of Alternate Aeration Basin Location	2.5	1087.5	Loose	Medium dense to very dense
B-3-A	SW corner of Alternate Aeration Basin Location	2.5	1087.5	Loose	Medium dense to very dense
B-4-A	Alternate Headworks Lift Station Location	4.0	1085.0	Very loose to loose	Dense to very dense
B-5-A	SE corner of Future Aeration Basin Location	9.0	1080.0	Very loose to medium dense	Dense to very dense
B-6-A	North center of Alternate Aeration Basin Location	4.5	1084.5	Very loose	Medium dense to very dense
B-7-A	~50' South of center of Future Aeration Basin Location	7.0	1082.0	Very loose	Medium dense to very dense
B-8-A	Alternate Post-Aeration Building Location	4.8	1084.3	Very loose/soft to loose	Medium dense to very dense
B-9-A	NW corner of Alternate Aeration Basin Location	2.5	1087.5	Loose	Very loose to very dense
B-10-A	~140' South of center of Future Aeration Basin Location	8.5	1081.5	Very loose to loose	Medium dense to very dense
B-11-A	SE portion of Alternate Aeration Basin Location	3.0	1087.0	Very loose	Loose to very dense
B-12-A	Alternate B.U.R.N. Building Location	2.0	1088.0	Loose	Medium dense to very dense

B-13-A	SW portion of Future Aeration Basin Location	1.5	1087.5	Loose	Medium dense to very dense
B-14-A	~95’ south of SE corner of Future Aeration Basin	8.5	1081.5	Very loose	Medium dense to very dense
B-15-A	~175’ west of SW corner of Alternate Aeration Basin Location	2.0	1088.0	Very loose	Medium dense to very dense
B-16-A	~180’ west of NW corner of Alternate Aeration Basin Location	1.5	1088.5	Loose	Medium dense to very dense
B-17-A	~85’ west of SW corner of Alternate Aeration Basin Location	4.5	1084.5	Loose	Very loose to very dense
B-18-A	~90’ west of NW corner of Alternate Aeration Basin Location	6.5	1081.5	Very loose	Loose to very dense
B-19-A	~205’ south of SW corner of Alternate Aeration Basin Location	2.0	1088.0	Very loose	Loose to very dense
B-20-A	~100’ south of SW corner of Alternate Aeration Basin Location	4.8	1085.3	Very loose	Medium dense to very dense

*Locations are based on the *Alternate Layout* dated 11/3/2026 prepared by HLA
**Elevations are approximate and based on Google Earth topography
†Relative densities/consistencies are based on SPT blow counts of the in-situ soils
B-8-A: a very loose to loose layer of silty sand encountered at ~18.5 feet BGS

The pertinent takeaway from our investigation is that the approximate depth below the existing ground surface at each of our points of exploration and associated underlying elevations at which the native subsurface soil conditions appear to transition from *relatively loose and incompetent* to ‘competent’ for adequate support of the proposed project structures.

The table below summarizes the depth and elevations of the 'Competent Stratum' and groundwater:

Table 4: Competent Stratum & Groundwater Conditions

ID	Surface Elevation (±feet)*	Depth to Competent Stratum, BGS (feet)**	Elevation of Competent Stratum (± feet)*	Groundwater Depth, BGS (feet)	Elevation of Groundwater (±feet)*
B-1-A	1090	8.0	1082	3.5	1086.5
B-2-A	1090	4.0	1086	2.75	1087.25
B-3-A	1090	5.0	1085	2.0	1088.0
B-4-A	1089	5.0	1084	2.5	1086.5
B-5-A	1089	11.0	1078	3.0	1086.0
B-6-A	1089	7.0	1082	3.5	1085.5
B-7-A	1089	8.0	1081	2.8	1086.2
B-8-A	1089	6.0	1083	3.8	1085.2
B-9-A	1090	8.0	1082	2.0	1088.0
B-10-A	1090	9.0	1081	4.0	1086
B-11-A	1090	13.0	1077	2.5	1087.5
B-12-A	1090	4.0	1086	3.0	1087.0
B-13-A	1089	6.0	1083	2.5	1086.5
B-14-A	1090	9.0	1081	2.75	1087.25
B-15-A	1090	9.5	1080.5	3.5	1086.5
B-16-A	1090	9.5	1080.5	3.5	1086.5
B-17-A	1089	7.0	1082	3.0	1086
B-18-A	1088	8.0	1080	2.5	1085.5
B-19-A	1090	11.0	1079	4.5	1085.5
B-20-A	1090	7.0	1083	3.8	1086.2

**Surface elevations are approximate and based on Google Earth Topography*
***Depth of competent stratum determined by the Geotechnical Engineer based on relative in-place density from SPT N-values.*

Table 5: Competent Stratum *& Groundwater Conditions (Previous round)

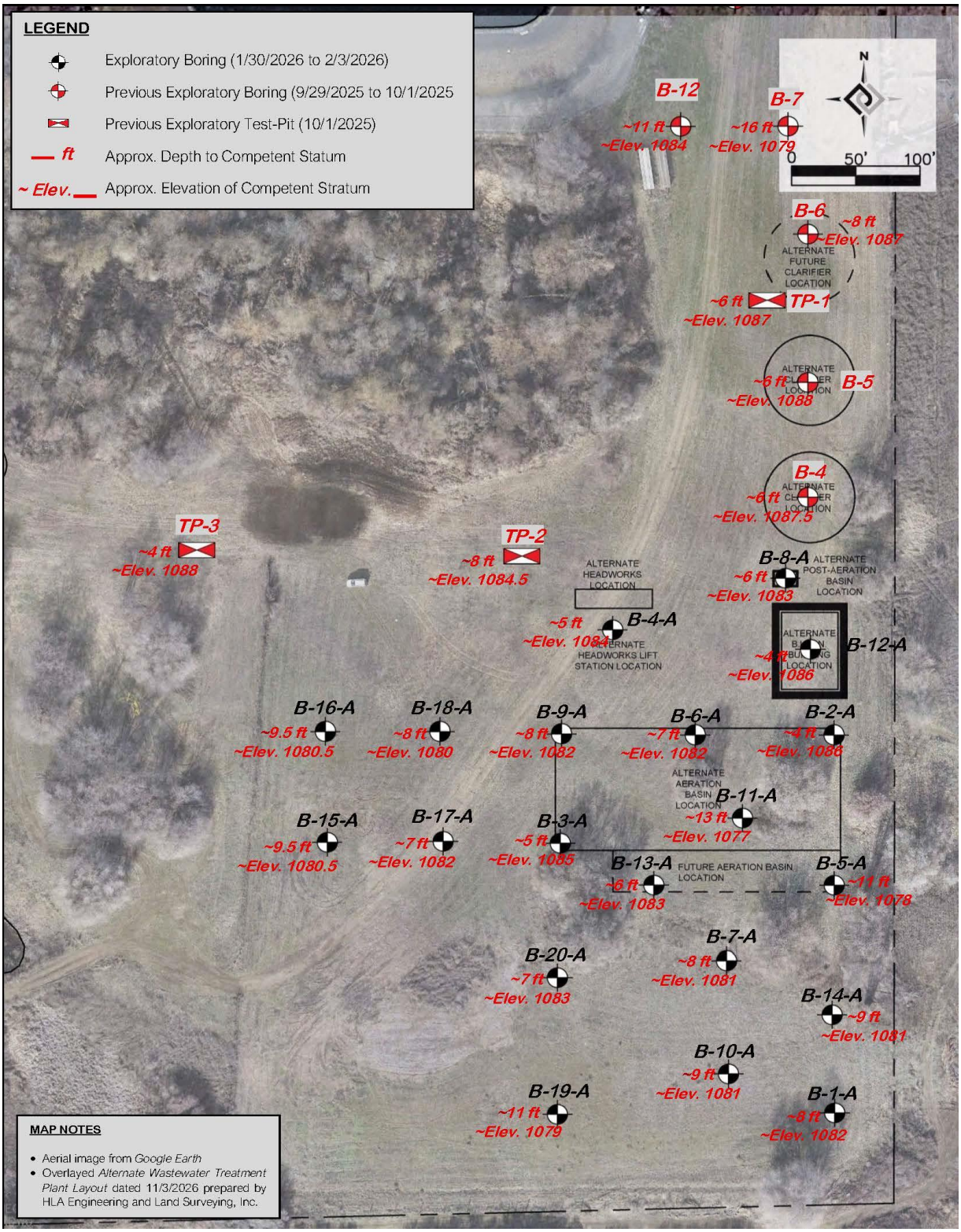
ID	Surface Elevation (±feet)*	Depth to Competent Stratum BGS (feet)**	Elevation of Competent Stratum (±feet)*	Groundwater Depth BGS (feet)†	Elevation of Groundwater (±feet)*
B-4	1093.5	6.0	1087.5	4.9	1088.6
B-5	1094	6.0	1088	4.6	1089.4
B-6	1095	8.0	1087	7.0	1088.0
B-7	1095	16.0	1079	4.8	1080.2
B-12	1095	11.0	1084	5.2	1089.8
TP-1	1093	6.0	1087	4.5	1088.5
TP-2	1092.5	8.0	1084.5	7.0	1085.5
TP-3	1092.5	4.0	1088	4.0	1088.5

**Elevations are approximate and based on Google Earth Topography.*

***Depth of competent stratum determined by the Geotechnical Engineer based on relative in-place density from SPT N-values.*

†Groundwater measured in late September and early October 2025

The following image depicts depths to competent stratum at the proposed structures, this figure is included in Appendix I attached to the report:



7.0 SUMMARY OF FINDINGS & CONCLUSIONS

Conditions imposed by the proposed development within the areas defined by the *Alternate Plan* have been evaluated on the basis of preliminary elevations and engineering characteristics of the subsurface materials encountered in the exploratory borings and their anticipated behavior both during and after construction. The following is a summary of our conclusions and professional opinions based on the data obtained from a review of selected technical literature and the site evaluation.

- This supplemental report specifically addresses the revised project site area for the planned aeration basin and associated ancillary structures as indicated on the *Alternate Plan*. Except as modified herein, the finding, conclusions, and recommendations of the above referenced Report remain valid.
- Based on this geotechnical evaluation of the surface and subsurface conditions and our understanding of the proposed project, from a geotechnical perspective, it is our opinion that the site is suitable for the proposed construction, provided the recommendations in this report and the previous report are followed in the design and construction of the project.
- Design-level grading and foundation plans for the proposed construction were unavailable at the time of this report preparation. GNN shall be provided an opportunity to review the final grading and foundation plans as they become available.
- Subsurface soils across the project areas generally consist of an upper variably-thick layer of fine-grained silty/sandy soils typically underlain by the prevailing coarse-grained alluvium consisting of rounded gravels and cobbles. The upper fine-grained soils were typically noted to be relatively loose to very loose (soft), while the underlying gravels were generally medium dense to dense. Some loose gravelly soils were noted in selected areas, typically near the groundwater table.
- Groundwater was encountered at depths ranging from approximately 2 to 4.5 feet BGS within each of the borings at the time of our field investigation. Groundwater will be a factor in design and construction at this site.

- Earthwork at the site will be difficult due to the widespread presence of soft, wet soils. These soils will be easily disturbed by construction trafficking and will require stabilization or protection in all work areas. Anticipate extensive dewatering for most excavations.
- Considering the subsurface conditions encountered, a shallow spread foundation system is considered appropriate for support of the proposed structures within the *Alternate Plan*. Foundations/building pad should bear on an engineered structural fill section extending to the competent stratum (dense native gravels). This will require removal and replacement of loose soils from beneath footing alignments and building pad.
- To minimize the risk of differential settlement, all foundation excavations should extend down to the competent stratum and that the depth of over-ex should be uniform within the building footprint extending a minimum 5 feet beyond proposed building footprints on all sides.
- We understand that the aeration basin and post-aeration basin structures will be constructed at FFE ranging from ±1092' to ±1088'. Based on the data set of exploratory borings completed, we recommend that the location of aeration basin should consider an area that will require minimum over-excavation depth for foundation/building pad improvements. We recommend that the siting of aeration basin should avoid areas where depth of competent stratum is deeper as encountered in B-5-A, B-11-A, and B-19-A. Factors such as the horizontal extent of open cut slopes tied to depth of competent stratum (H:V) and extent of construction dewatering measures to lower groundwater a minimum 2 feet below the excavation bottom should be considered. By minimizing the depth of over-ex, the stability of open excavation can generally be achieved by sloping and benching. Deeper over-excavation will require more elaborate shoring measures to maintain stability of open cuts due to cohesionless deposits, groundwater seepage, and the effect of vibratory compaction to construct the engineered structural fill section.
- However, the depth of foundation/pad over-excavation for the aeration basin structure should be based on contractor's means and methods and exposed subsurface conditions at the time of earthwork. Based on the final design FFE, GNN is available to work with the design team to further evaluate the feasibility of over-ex depth if requested.

- The underlying geologic condition for seismic design within the areas of the *Alternate Plan* remains as **Site Class C**. The *minimum* seismic design should comply with the 2021 International Building Code (IBC) and ASCE 7-16.
- The relatively clean underlying sandy/gravelly soils, particularly at or below groundwater elevation are very highly prone to severe caving and sloughing in open excavations; active dewatering during excavation and construction will be required. The contractor should monitor the stability of the temporary excavations and adjust the construction schedule and slope inclination accordingly. The contractor should be responsible for control of ground and surface water and should employ sloping, slope protection, ditching, sumps, dewatering, and other measures, as necessary, to prevent sloughing of soils and heave of the bottom of the excavation.
- Dewatering should be performed such that the groundwater level around nearby existing structures is unaffected, as lowering the water level around existing structures could induce settlements. A pre-dewatering condition and elevation survey of the adjoining structures and utilities should be completed.
- Because the groundwater is near the ground surface and the onsite fine-grained silty/sandy materials are generally non-plastic, caving or sloughing conditions should be anticipated by the earthwork contractor. The use of shoring or flattened slopes may even be required for shallow excavations, particularly in areas where groundwater seepage is uncontrolled. If temporary sloping is not feasible because of site spatial or other constraints, the excavation should be supported by a shoring system in accordance with in accordance with Washington Department of Occupational Safety and Health guidelines. The design, installation and maintenance of temporary shoring should be the responsibility of the contractor.
- Near-surface site soils can be readily cut by normal grading equipment.
- The on-site near-surface fine-grained soils are susceptible to wind and water erosion when exposed during grading operations. Preventative measures and appropriate BMPs to control runoff and reduce erosion shall be incorporated into site grading plans.

8.0 GEOTECHNICAL RECOMMENDATIONS

The following geotechnical recommendations are based on our current understanding of the proposed project as described in Section 2.0 of this report. The recommendations presented in this report are predicated upon appropriate geotechnical monitoring and testing of the site preparation and foundation and building pad construction by a representative of GNN's **Geotechnical-Engineer**. Any deviation and nonconformity from this requirement may invalidate, partially or in whole, the following recommendations. GNN shall be engaged to review grading and foundation plans in order to provide revised, augmented, and/or additional geotechnical recommendations as required.

Note that the applicability of our geotechnical recommendations is contingent upon good construction practices. Poor construction techniques may alter conditions from those on which our recommendations are based and, therefore, result in reduced foundation capacity and additional settlement, as appropriate.

All earthwork activities should be conducted in accordance with the recommendations of the previous report, this supplemental report and Washington State Department of Transportation Standard Specifications (WSS) (WSDOT 2026). Special attention will need to be paid to the control of shallow groundwater (and surface water) during earthwork activities. Because of shallow groundwater, caving or sloughing conditions should be anticipated by the earthwork contractor. The use of shoring or flattened slopes may be required for even shallow excavations, particularly in areas where groundwater seepage is uncontrolled.

We anticipate the widespread presence of soft subgrades which will require stabilization prior to the placement of fill, footings, slabs, pavements, or other improvements. Subgrade stabilization recommendations are discussed in Sections 8.6 and 8.7 below.

8.1 Foundation Options for New Improvements

The following table summarizes the recommended foundation types for planned structures:

Table 6: Recommended Foundation Types

Proposed Structures	Recommended Foundation Type
Alternate B.U.R.N Building	Spread Footing
Alternate Post-Aeration Basin	Spread Footing
Alternate Headworks Lift Station	Spread Footing with Structural Slab/Mat
Alternate Aeration Basin	Mat Foundation
Future Aeration Basin	Mat Foundation

8.2 Shallow Spread Foundations

In our opinion, the proposed aeration basin and ancillary structures may be supported on shallow spread footings bearing atop an engineered structural fill section placed over competent stratum (dense native gravel soils) as recommended herein. Continuous wall and isolated spread footings should be at least 18 and 24 inches wide, respectively. The minimum footing depth shall be 24 inches below adjacent exterior finished grade for frost protection and bearing capacity considerations.

Loose onsite soils across the proposed building/structure areas (*Alternate Plan*) extend to depths of about 4 to 13 feet BGS. We recommend over-excavating loose soils to the competent stratum and replacing them with compacted engineered fill. A minimum 12 inch layer of imported 1¼-inch minus crushed rock structural fill shall be placed on the engineered fill section directly below the foundations/building pad. Foundation subgrade preparation is further described in the following paragraphs:

All foundation excavations should extend down to the competent stratum. The depth of over-ex should be uniform within the building footprint extending a minimum 5 feet beyond proposed building footprint on all sides and then slope at 1.5H:1V.

Clean loose or disturbed soils from bottom of foundation/pad excavation prior to placing imported granular engineered fill material. Slope the ground surface away from the pad excavation footprint to direct water away and prevent ponding next to the excavation.

If necessary, based on the exposed subgrade conditions at the bottom of the over-ex, place stabilization crushed rock (ballast or quarry spalls) to bridge over any remaining soft, compressible

soils. Initial placement of the quarry spalls should entail tamping (punching) the angular spalls into the native wet subgrade soils. Densification of quarry spalls shall be observed by means of proof-rolling and hoe-pack penetration. Once a dense subgrade is confirmed, place a non-woven geotextile filter fabric such as Mirafi 140-N, or equivalent, over the unyielding and firm subgrade.

The excavation shall be backfilled with imported 1¼" minus crushed rock meeting WSS 9-03.9(3)-Crushed Surfacing Base Course or 2½" minus WSS 9-03.9 (1)- Ballast placed as engineered structural fill with each lift compacted to a minimum 95% of the maximum dry density as determined by ASTM D1557. The top of the prepared subgrade surface shall be proof-rolled using heavy vibratory equipment in the presence of a representative of the Geotechnical Engineer to verify firm and unyielding conditions. Any areas displaying deflection during proof-rolling shall be over-excavated and recompacted. Allowance should be made for a minimum 12 inches of imported 1¼-inch minus crushed rock directly under the footings and floor slabs. Crushed rock shall be compacted to a minimum 95% of the maximum dry density per ASTM D1557.

Foundations constructed in accordance with these recommendations may be designed for an allowable bearing capacity of **3,000 pounds per square foot (psf)**. The allowable bearing pressure may be increased by 1/3 for short-term, transient loading conditions. We estimate the total settlement for footings constructed on structural fill as recommended herein to be approximately 1-inch, with differential settlement less than half that magnitude.

Lateral forces on foundations from short term wind and seis mic loading would be resisted by friction at the base of foundations and passive earth pressure against the buried portions. We recommend an allowable passive earth pressure for the compacted crushed rock structural backfill of **300 pcf**. This lateral foundation resistance value includes a factor of safety of 1.5. We recommend a coefficient of friction of **0.45** be used between cast-in-place concrete and imported crushed rock fill. An appropriate factor of safety should be used to calculate sliding resistance at the base of footings.

When groundwater level outside the proposed below-grade structures is higher than the bottom of the structures, the structures will be subjected to hydrostatic uplift forces. Consequently, these structures should be designed to resist such forces.

Footings, foundations, and masonry walls should be reinforced as necessary to reduce the potential for distress caused by differential movement. The use of joints at opening or other discontinuities in masonry walls is recommended.

The footings should be founded below an imaginary line projecting at a 1.5-horizontal to 1-vertical (1.5H:1V) slope from the base of any adjacent parallel utility trenches.

The base of all foundation excavations should be free of water and loose soil. If foundation subgrades become disturbed, or are otherwise deemed unsuitable by the Geotechnical Engineer, over-excavation of the unsuitable material and replacement (backfill) with compacted granular structural fill should be performed up to the footing base elevation per the recommendations of this report.

We recommend that a representative of the Geotechnical Engineer observe all foundation excavations before placement of aggregate base to determine that bearing surfaces have been adequately prepared and that the soil conditions are consistent with those observed during our explorations. During structural fill placement and compaction, a sufficient number of in-place density tests should be completed by representative of the Geotechnical Engineer to verify that the specified degree of compaction is being achieved. For structural fill with more than 30 percent retained on the 3/4-inch sieve, GN Northern should visually verify proper compaction with a proof roll or other methods.

8.3 Modulus of Subgrade Reaction

Load bearing concrete slabs supporting mechanical equipment (conveyors, pumps, etc.) should be designed as beams-on-an-elastic-foundation. A vertical modulus of subgrade reaction of **200 pounds per cubic inch (pci)** can be used for the compacted granular fill subgrade. This modulus value is measured for a 1-foot-square plate test and can be adjusted for scaling effects using an appropriate formula, such as:

$$K_S = K_{V1} (B+1)^2 / (4B^2)$$

Where: K_S = coefficient of subgrade reaction
K_{V1} = vertical modulus of subgrade reaction
B = slab width in feet

Slab thickness, reinforcement and joint spacing shall be determined by the structural engineer based on the intended use and loading. If floor slabs are design and constructed as noted above, then we anticipate settlements of the slabs will be less than 1 inches over a 50-foot span.

8.4 Solids Handling Building Extension

The following shallow ground improvement recommendations are for the Solids Handling Building extension. Our analysis is based on subsurface soil conditions encountered in previous borings B-8 and B-9. In lieu of Rammed Aggregate Piers, the building extension may be supported on a structural slab/mat foundation constructed over an improved/dense subgrade. Mat foundation thickness should be designed by the structural engineer but should be at least 12 inches thick with edges embedded 18 inches. Structural slab/mat can be designed using the following geotechnical design parameters:

Foundation Type	Design Parameters	Embedment Depth	Bearing Subgrade (a)	Static Settlement (d)
Structural Slab/Mat*	k= 60 pci (b) q_{all} = 800 psf (c) μ =0.40 (Ultimate Coefficient of Sliding Friction	18 inches	Reinforced Structural Fill Prism	1" total ~ ¾" differential

(a) Required improvements to the bearing subgrade should be performed under the direction of the Geotechnical Engineer to ensure that the bearing subgrade conditions meet the design parameters.
(b) Subgrade Modulus value "k" assume that the structural slab/mat is supported on a dense reinforced structural fill prism.
(c) Can be increased by 1/3 for temporary loading such as seismic or wind.
(d) Differential settlement is expected to be ¾ of total settlement.
* Structural slab/mat foundation shall be designed as beams-on-an-elastic-foundation.

8.4.1 Shallow Ground Improvements

We recommend the improved subgrade, for support of structural slab/mat, should consist of a minimum 3 feet of Reinforced Structural Fill Prism. Reinforced structural fill prism is a form of ground improvement, similar to overexcavation-and-replacement method, to bridge over loose compressible fine-grained soils in turn improve the bearing capacity of subgrade soils and reducing differential settlement.

Construction of the reinforced structural fill prism will require a minimum 3-foot overexcavation below the structural slab/mat foundation bottom elevation; the lateral extent of overexcavation should be 3 feet on all sides where space allows. The reinforced fill prism should consist of a

minimum 18 inches of 6-inch minus quarry spalls (WSS 9-13.1(5)- Quarry Spalls) pushed/punched into the soft/loose silty subgrade soils. Punching of the quarry spalls should be performed with a hoe-pack and continue until a firm and dense surface is achieved. A layer of non-woven geotextile filter fabric, such as Mirafi 140-N, or equivalent, shall be placed over the quarry spalls. Then place 18 inches of imported 1¼-inch minus imported crushed rock meeting WSS 9-03.9(3) over the densified quarry spalls. The crushed rock shall be reinforced with a layer of Tensar InterAx™ NX 750 geogrid reinforcement installed 12 inches below the final rock grade. Crushed rock shall be placed in 6-inch thick loose lifts and each lift compacted to a minimum 95% of the maximum dry density as determined by ASTM D1557. The compaction effort shall be verified in the field using a nuclear density gauge in accordance with ASTM D6938. The geogrid shall be installed in accordance with manufacture's specifications and no substitution of geogrid is allowed without the approval of the Geotechnical engineer.

The prepared subgrade (top of rock) should be proof-rolled using loaded construction equipment in the presence of a representative of the Geotechnical Engineer. Areas observed to deflect greater than ½ inch should be over-excavated to a depth of 12 inches and replaced with properly moisture conditioned and compacted granular fill. These areas should be proof-rolled again to evaluate whether additional subgrade stabilization may be required at the direction of the Geotechnical Engineer.

Due to the existing building structure and shallow groundwater, excavation greater than 4 feet should be avoided so as not to undermine the existing building structure/foundation subgrade soils.

Subgrade excavations, where used, should be 'cut' using a smooth-edged excavator supported from outside the excavation to minimize disturbance and loose soils, where possible. Following excavation to the required grades, all loose soil, and particles greater than 4 inches in size should be removed from the bottom of the excavation.

Voids resulting from the removal of any underground obstructions, such as abandoned utilities extending below the proposed finished grade, should be backfilled with properly compacted granular structural fill approved by the Geotechnical Engineer. Backfilling operations for any

excavations to remove deleterious material be carried out under the observation of a representative of the Geotechnical Engineer.

8.5 Construction Dewatering

Shallow groundwater is present at the site. Summertime water levels are expected to be high due to artificial recharge from local irrigation. Control of groundwater and surface water flows will be an important part of earthwork, utility, and foundation construction at the site.

As discussed in the previous Report, the use of closely spaced wells or well points, and/or subsurface cut offs should be anticipated to adequately dewater excavations. Individual well points and sumps within excavation may be insufficient to control groundwater seepage. We recommend intercepting and diverting any potential sources of surface or near surface water within the construction zones before stripping begins. Because selection of an appropriate drainage system will depend on the water quantity, season, weather conditions, construction sequence, and contractor's methods, final decisions about drainage systems are best made in the field at the time of construction.

8.6 Subgrade Stabilization

The surface and upper site soils generally consist of very loose to loose silty sand, sand with silt and sandy clay. These materials are expected to be soft, wet, and unsuitable for support of new fill, slabs, foundations and haul routes without stabilization. Additionally, these materials are highly susceptible to becoming disturbed when they are wet or trafficked by construction equipment. If not carefully executed, site preparation, utility trench work, and pavement construction can create extensive soft areas, and significant repair costs can result.

Earthwork planning should include considerations for minimizing subgrade disturbance. We recommend the subgrade be stabilized by removal and replacement, placement of a geotextile stabilization fabric and crushed rock, or other similar measures. Based on our explorations, we anticipate all portions of the *Alternate Plan* site to be developed may require some level of stabilization prior to construction.

8.7 Stabilization Fill Material

Stabilization aggregate for haul roads, subgrade stabilization, and other general wet/saturated soil conditions should consist of a clean, angular, crushed rock such as ballast or quarry spalls. The material should have a maximum particle size of 4 inches, a nominal size between of 2 and 4 inches, less than 5 percent by dry weight passing the U.S. Standard No. 4 Sieve, and at least two mechanically fractured faces. The material should be free of organic matter and other deleterious material. Material meeting the gradations of WSS 9-03.9(2) -Permeable Ballast or WSS 9-13.1(5) - Quarry Spalls is generally acceptable for use.

If the imported granular material will be placed below the water table, it should meet the specifications of WSS 9-13.1(5)- Quarry Spalls, WSS 9-03.12(1)A - Gravel Backfill for Foundations (Class A), or WSS 9-03.9(2)- Shoulder Ballast. Once above the water table, WSS 9-03.14(1) - Gravel Borrow or other similar materials with stones no larger than 4 inches in maximum dimension with less than 7 percent fines (based on the ¾-inch fraction) may be used as approved for the intended use, provided that Shoulder Ballast or Foundation Material Class A is used to "choke" the spalls before placement of other materials. Alternately, construction geotextile for soil stabilization may be used to prevent migration of the fines into the voids spaces of the coarser underlying material.

Stabilization material should typically be placed in lifts between 12 and 18 inches thick and be compacted to a well-keyed condition with appropriate compaction equipment without using vibratory action.

Stabilization material should be underlain by a geotextile. The geotextile should meet the specifications provided in WSS 9 33.2 (Table 3) for soil stabilization. The geotextile should be installed in conformance the specifications provided in WSS 2 12- Construction Geosynthetic.

8.8 Haul Roads

The use of haul roads and staging areas are recommended to reduce disturbance to the native soft subgrade soils. The amount of staging and haul road areas as well as the required thickness of granular material will vary with the contractor's sequencing of a project and type/frequency of construction equipment. Based on our experience, between 12 and 18 inches of crushed rock is

generally required in staging areas and between 18 and 24 inches in haul roads areas. The actual thickness will depend on the material used and the contractor's means and methods, and accordingly, should be the contractor's responsibility. Additionally, a geotextile fabric should be placed as a barrier between the subgrade and imported granular material in areas of repeated construction traffic. The imported granular material and geotextile fabric should meet the specifications in Section 8.7 above.

8.9 Wet Weather Conditions

The project site soils are fine-grained and sensitive to moisture during handling and compaction. During wet weather conditions, typically associated with early spring, late fall or winter construction, severe subgrade stability problems are expected to develop. Proceeding with site earthwork operations using these soils during wet weather could add significant project costs and/or delays. The stability of exposed soils may deteriorate due to a change in moisture content. Therefore, if at all possible, complete site clearing, preparation, and earthwork during periods of warm, dry weather when soil moisture can be controlled by aeration. During or subsequent to wet weather, drying or compacting the on-site soils will be very difficult and challenging. It may be necessary to amend the on-site soils or import granular materials for use as structural fill. If earthwork takes place in wet weather or wet conditions, the following recommendations should be followed:

- Contractor should employ best management construction practices (BMPs) as well as means and methods to protect subgrade which may require importing granular materials and geosynthetic for subgrade stabilization.

- Fill material should consist of clean, granular soil, and not more than 5 percent fines (by weight) should pass the No. 200 sieve size. Fines should be non-plastic. These soils would have to be imported to the site.

- Earthwork should be accomplished in small sections and carried through to completion to reduce exposure to wet weather. Soils that become too wet for compaction should be removed and replaced with imported clean, granular material.

- The construction area ground surface should be sloped and sealed to reduce water infiltration, to promote rapid runoff, and to prevent water ponding.

- To prevent soil disturbance, the size or type of construction equipment may have to be limited.
- Work areas and stockpiles should be covered with plastic. Straw bales, straw wattles, geotextile silt fences, and/or other measures should be used as appropriate to control soil erosion.
- Where necessary install check drains, riprap, sand bags, or other methods necessary to control erosion and provide safe conditions.

Excavation and fill placement should be observed on a full-time basis by a geotechnical engineer's representative to determine that unsuitable materials are removed and that suitable compaction and site drainage is achieved.

Undercutting on the order of 12 to 18 inches below the ground surface may be necessary during wet weather conditions, if disturbed by construction traffic. Upon completion of undercutting, the use of a 12 inch thick coarse granular working mat shall be expected to develop a stable subgrade for placement of structural fill. The estimated overexcavation depth is based upon the moisture and disturbance sensitivity of the subgrade soils and the assumed effect during a wet weather grading period. If undercutting is necessary, it should be confirmed through continuous monitoring and testing by a representative of the Geotechnical Engineer.

9.0 CONTINUING GEOTECHNICAL SERVICES

The Client should maintain an adequate program of geotechnical consultation, construction monitoring, and soils testing during the final design and construction phases to ensure compliance with GNN's geotechnical recommendations. For this purpose, GNN, the Geotechnical Engineer-of-Record, shall be retained as the geotechnical consultant from beginning to end of the project to maintain continuity of services. If GN Northern, Inc. is not retained by the owner/developer and/or the contractor to provide the recommended geotechnical inspections/observations and testing services, the geotechnical engineering firm or testing/inspection firm providing tests and observations shall assume the role and responsibilities of Geotechnical Engineer-of-Record.

GNN can provide construction monitoring and testing as additional services. The costs of these services are not included in our present fee arrangement but can be obtained from our office. The recommended construction monitoring and testing includes, but is not necessarily limited to, the following:

- Consultation during the design stages of the project.
- Review of the grading and drainage plans to monitor compliance and proper implementation of the recommendations in GNN's Report.
- Observation and quality control testing during site preparation, grading, and placement of engineered fill as required by the local building ordinances.
- Geotechnical engineering consultation as needed during construction.

10.0 LIMITATIONS OF THE GEOTECHNICAL SITE INVESTIGATION REPORT

This GEOTECHNICAL SITE INVESTIGATION REPORT ("Report") was prepared for the exclusive use of the Client. GN Northern, Inc.'s (GNN) findings, conclusions and recommendations in this Report are based on selected points of field exploration, and GNN's understanding of the proposed project at the time the Report is prepared. Furthermore, GNN's findings and recommendations are based on the assumption that soil, rock and/or groundwater conditions do not vary significantly from those found at specific exploratory locations at the project site. Variations in soil, bedrock and/or groundwater conditions could exist between and beyond the exploration points. The nature and extent of these variations may not become evident until during or after construction. Variations in soil, bedrock and groundwater may require additional studies, consultation, and revisions to GNN's recommendations in the Report.

This Report's findings are valid as of the issued date of this Report. However, changes in conditions of the subject property or adjoining properties can occur due to passage of time, natural processes, or works of man. In addition, applicable building standards/codes may change over time. Accordingly, the findings, conclusions, and recommendations of this Report may be invalidated, wholly or partially, by changes outside of GNN's control. Therefore, this Report is subject to review and shall not be relied upon after a period of **three (3) years** from the issued date of the Report.

In the event that any changes in the nature, design, or location of structures are planned, the findings, conclusions and recommendations contained in this Report shall not be considered valid unless the changes are reviewed by GNN and the findings, conclusions, and recommendations of this Report are modified or verified in writing.

This Report is issued with the understanding that the owner or the owner's representative has the responsibility to bring the findings, conclusions, and recommendations contained herein to the attention of the architect and design professional(s) for the project so that they are incorporated into the plans and construction specifications, and any follow-up addendum for the project. The foregoing notwithstanding, no party other than the Client shall have any right to rely on this Report and GNN shall have no liability to any third party who claims injury due to reliance upon this Report, which is prepared exclusively for Client's use and reliance.

GNN has provided geotechnical services in accordance with generally accepted geotechnical engineering practices in this locality at this time. GNN expressly disclaims all warranties and guarantees, express or implied.

Client shall provide GNN an opportunity to review the final design and specifications so that earthwork, drainage and foundation recommendations may be properly interpreted and implemented in the design and specifications. If GNN is not accorded the review opportunity, GNN shall have no responsibility for misinterpretation of GNN's recommendations.

APPENDICES

Appendix I

Vicinity Map (Figure 1)

Site Exploration Map (Figure 2)

***Depth & Elevation of Competent Stratum** (Figure **2A**)*

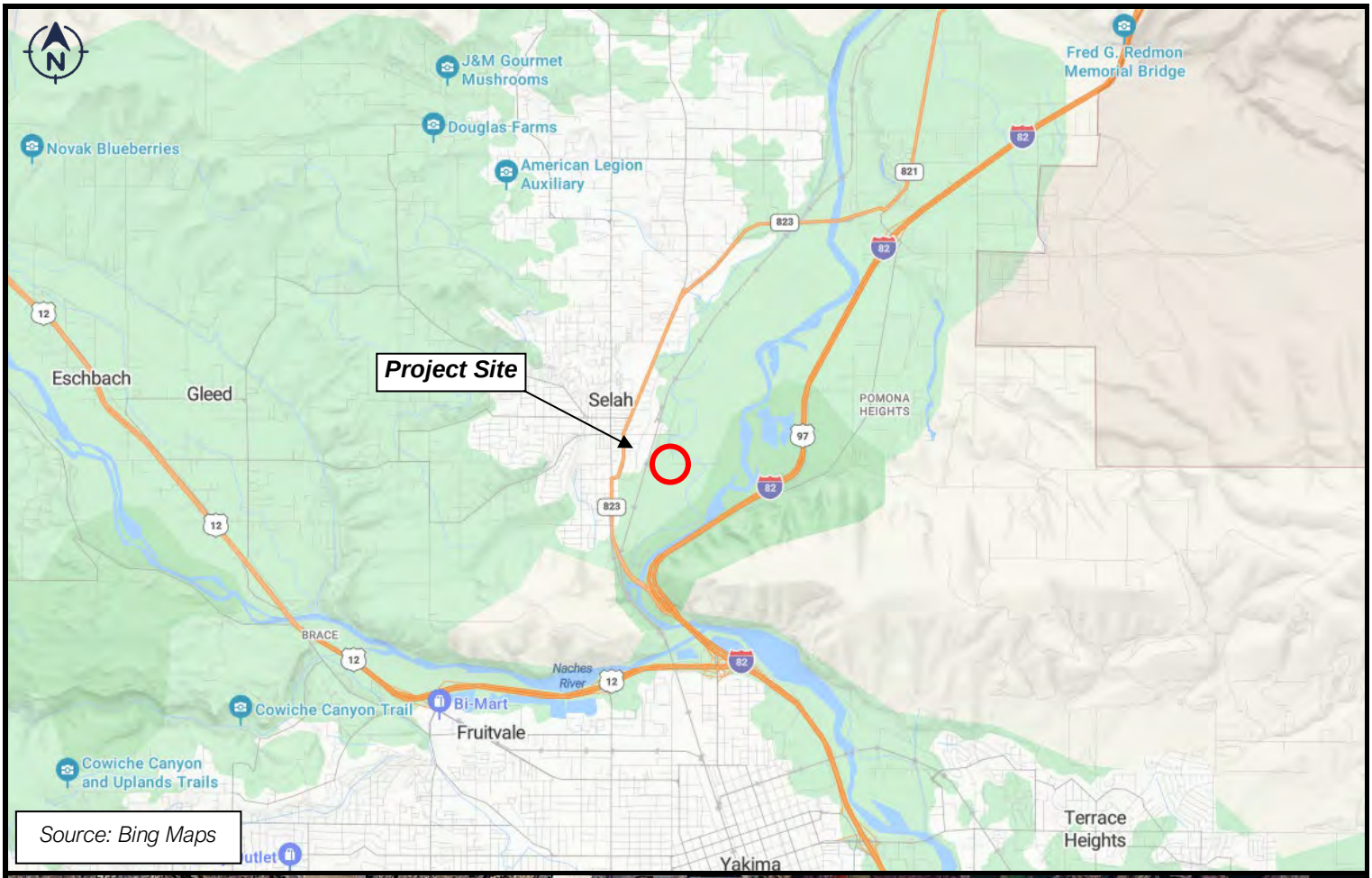




FIGURE 1: VICINITY MAP

PROJECT NO. 225-1849-1

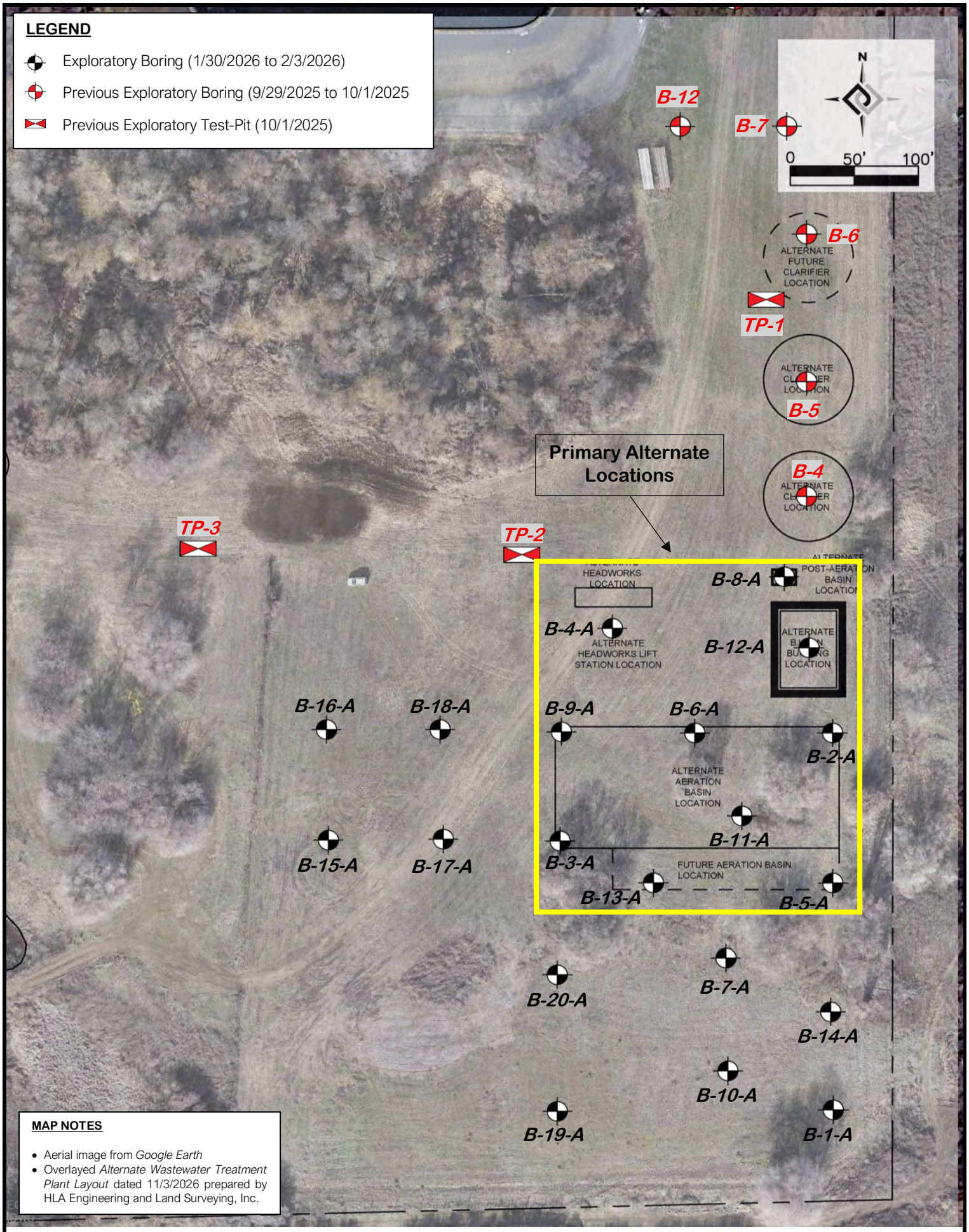


FIGURE 2: SITE EXPLORATION MAP

PROJECT NO. 225-1849-1

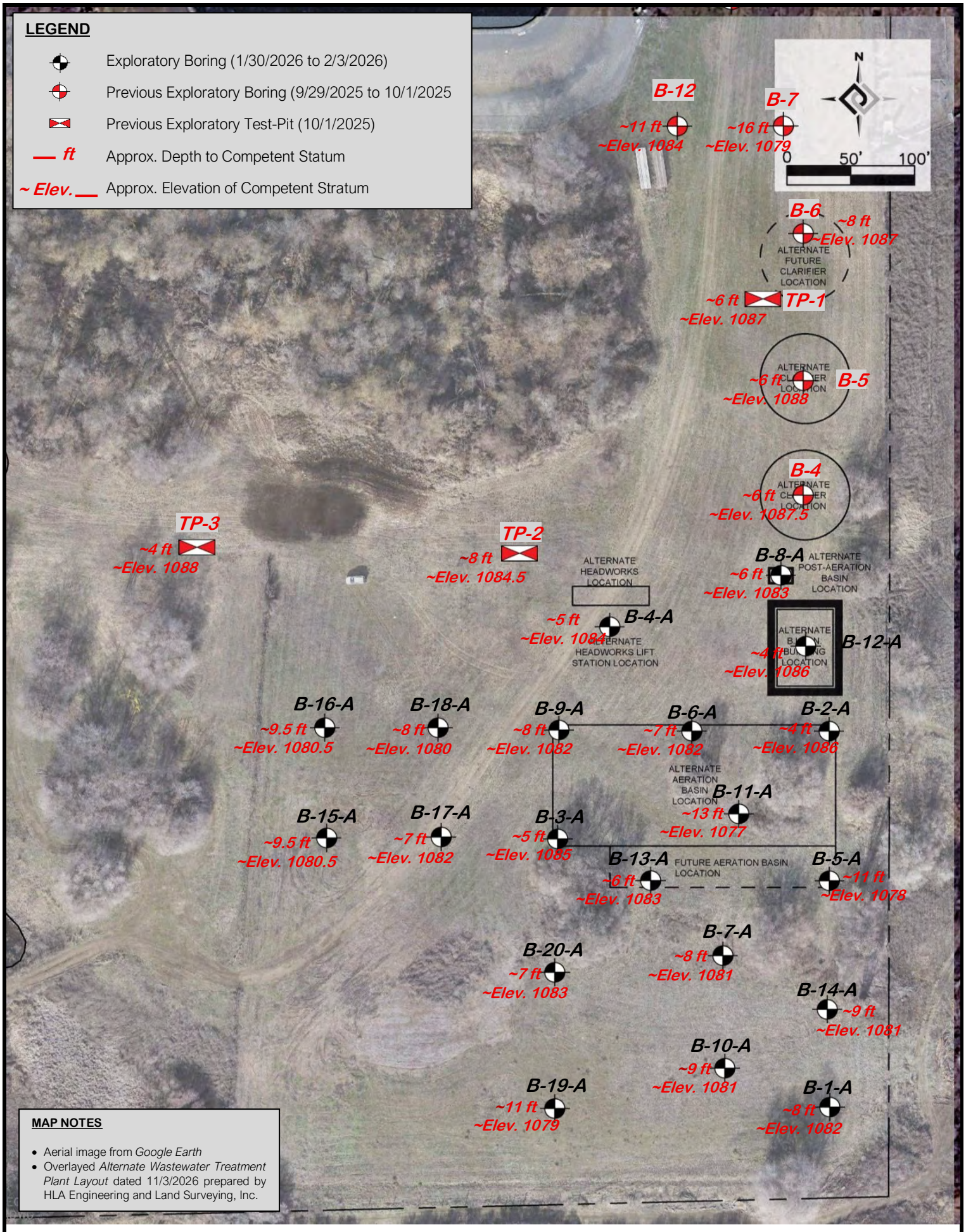


FIGURE 2A: DEPTH & ELEVATION OF COMPETENT STRATUM

PROJECT NO. 225-1849-1

Appendix II

Exploratory Boring & Test-Pit Logs
Key Chart (for Soil Classification)

GN Northern, Inc
722 N. 16th Ave Suite 31
Yakima, WA 99802
Telephone: (509) 248-9798

BORING NUMBER B-1-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 1/30/26 **COMPLETED** 1/30/26
GROUND ELEVATION 1090 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 3.50 ft / Elev 1086.50 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647000°, -120.520027°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			SP-SM		POORLY GRADED SAND WITH SILT, (SP-SM) brown, fine grained, wet, loose, limited recovery	
	SPT	4-5-3 (8)				
					3.0	1087.0
			GP		▽ POORLY GRADED GRAVEL WITH SAND, (GP) brown, loose	
5	SPT	2-3-4 (7)				
	SPT	5-8-13 (21)			medium dense	
					9.5	1080.5
10	SPT	16-22-35 (57)			POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) greenish gray, very dense	
15	SPT	18-34-36 (70)	GP-GM		brown and gray, some Silty Gravel (GM)	
20	SPT	25-50/5"				
					23.5	1066.5
			GP		POORLY GRADED GRAVEL WITH SAND, (GP) brown and gray, very dense, limited recovery	
25	SPT	28-50/3"				
					28.5	1061.5
30	SPT	15-31-50/5"	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown and gray, very dense, some Silty Gravel (GM)	
					31.5	1058.5

- Groundwater encountered at ~3.5' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 31.5 feet.

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BORING NUMBER B-2-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 1/31/26 **COMPLETED** 1/31/26
GROUND ELEVATION 1090 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
AT TIME OF DRILLING 2.75 ft / Elev 1087.25 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647812°, -120.520029°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		SILTY SAND, (SM) brown, fine grained, wet, loose
2.5					1087.5
	SPT	7-10-11 (21)	GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray and brown, medium dense
5					
	SPT	9-16-20 (36)			dense
	SPT	14-26-20 (46)			
10					
	SPT	10-31-35 (66)			very dense
15					
	SPT	17-41-48 (89)			
20					
	SPT	13-27-26 (53)			
23.0					1067.0
25					POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray brown, very dense
	SPT	49-50/3"	GP-GM		
28.0					1062.0

- Boring terminated at ~28' BGS due to auger refusal
- Groundwater encountered at ~2.75' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 28.0 feet.

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BORING NUMBER B-3-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 1/31/26 **COMPLETED** 1/31/26
GROUND ELEVATION 1090 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 2.00 ft / Elev 1088.00 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647579°, -120.520885°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		SILTY SAND, (SM) brown, fine grained, wet, loose
					▽ 2.5 1087.5
	SPT	5-7-7 (14)			POORLY GRADED GRAVEL WITH SAND, (GP) gray and brown, medium dense
5					
	SPT	9-14-15 (29)			
	SPT	10-17-20 (37)			dense
10					
	SPT	9-20-30 (50)			dense to very dense
15					
	SPT	18-45-49 (94)	GP		greenish gray, very dense
20					
	SPT	15-31-44 (75)			brown
25					
	SPT	34-50/4"			
30					
	SPT	40-50/4"			30.8 1059.2

- Groundwater encountered at ~2' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 30.8 feet.

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BORING NUMBER B-4-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 1/31/26 **COMPLETED** 1/31/26
GROUND ELEVATION 1089 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 2.50 ft / Elev 1086.50 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.648037°, -120.520721°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0				SM		SILTY SAND, (SM) brown, fine grained, wet, very loose to loose ▽
	SPT	0-0-4 (4)	Fines = 23%			
4.0						1085.0
5				GP		POORLY GRADED GRAVEL WITH SAND, (GP) dark gray, dense
	SPT	6-14-17 (31)				
	SPT	10-14-17 (31)				
10						
	SPT	14-22-26 (48)				
15						very dense
	SPT	21-45-45 (90)				
20						
20.5	SPT	50/5"				1068.5

- Boring terminated at ~20.5' BGS due to auger refusal
- Groundwater encountered at ~2.5' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 20.5 feet.

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BORING NUMBER B-5-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 2/1/26 **COMPLETED** 2/1/26
GROUND ELEVATION 1089 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 3.00 ft / Elev 1086.00 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647489°, -120.520029°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0				SM		SILTY SAND, (SM) gray brown, fine grained, wet, very loose	
	SPT	1-1-1 (2)				▽	
5						some Poorly Graded Sand with Silt (SP-SM)	
	SPT	0-0-1 (1)					
						7.0	1082.0
	SPT	1-2-8 (10)	Fines = 3%	SP		POORLY GRADED SAND WITH GRAVEL, (SP) gray, fine to coarse grained, medium dense to dense	
						9.0	1080.0
10				GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, dense	
	SPT	8-21-14 (35)					
						13.0	1076.0
15				GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) orange brown, very dense	
	SPT	27-42-42 (84)					
20							
	SPT	48-50/3"				20.8	1068.2

- Boring terminated at ~20.8' BGS due to auger refusal
- Groundwater encountered at ~3' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 20.8 feet.

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BORING NUMBER B-6-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 2/1/26 **COMPLETED** 2/1/26
GROUND ELEVATION 1089 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 3.50 ft / Elev 1085.50 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647812°, -120.520462°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0				ML		SILT WITH SAND, (ML) brown, wet, very loose, with very fine grained sand, some clay
	SPT	0-0-0 (0)	MC = 17% Fines = 82%			▽
4.5						1084.5
5	SPT	7-11-12 (23)		GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, medium dense
	SPT	7-10-10 (20)				
10	SPT	5-23-27 (50)				dense to very dense
15	SPT	11-29-28 (57)				very dense
18.5						1070.5
20	SPT	28-50/5"		GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown and gray, very dense
25	SPT	50/4"				
25.5						brown, some Silty Gravel (GM) 1063.5

- Groundwater encountered at ~3.5' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 25.5 feet.

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Telephone: (509) 248-9798

BORING NUMBER B-7-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 2/2/26 **COMPLETED** 2/2/26
GROUND ELEVATION 1089 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 2.80 ft / Elev 1086.20 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647327°, -120.520364°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0				SM		SILTY SAND, (SM) brown, fine grained, wet, very loose
	SPT	2-1-2 (3)				▽
5						
	SPT	1-0-1 (1)	Fines = 30%			some Poorly Graded Sand with Silt (SP-SM)
						7.0 1082.0
	SPT	13-20-21 (41)		GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, dense
10						
	SPT	20-18-8 (26)				medium dense, some Poorly Graded Gravel with Silt and Sand (GP-GM)
						13.5 1075.5
15				GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray brown, very dense
	SPT	20-28-45 (73)				
20						
	SPT	50/5"				20.5 some Silty Gravel (GM) 1068.5

- Groundwater encountered at ~2.8' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 20.5 feet.

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Telephone: (509) 248-9798

BORING NUMBER B-8-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 1/31/26 **COMPLETED** 1/31/26
GROUND ELEVATION 1089 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 3.80 ft / Elev 1085.20 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.648148°, -120.520181°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0						SANDY FAT CLAY, (CH) brown, wet, very soft	
	SPT	0-0-0 (0)	MC = 37% LL = 65 PL = 22 Fines = 69%	CH			
						4.0 ▽	1085.0
				SP-SM		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine grained, loose	
5						4.8	1084.3
	SPT	7-15-10 (25)				POORLY GRADED GRAVEL WITH SAND, (GP) gray, medium dense	
	SPT	21-22-26 (48)				dense	
10							
	SPT	20-22-22 (44)		GP			
15							
	SPT	24-30-25 (55)				very dense	
						18.5	1070.5
20						SILTY SAND, (SM) orange brown, fine grained, very loose to loose, trace gravel, with some Silt with Sand (ML)	
	SPT	0-1-3 (4)		SM			
						21.5	1067.5
				GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, dense	
						22.5	1066.5

- Groundwater encountered at ~3.8' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 22.5 feet.

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Yakima, WA 99802
Telephone: (509) 248-9798

BORING NUMBER B-9-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 2/1/26 **COMPLETED** 2/1/26
GROUND ELEVATION 1090 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 2.00 ft / Elev 1088.00 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647814°, -120.520881°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			SM		SILTY SAND, (SM) brown, fine grained, wet, loose	
					▽	
2.5						1087.5
	SPT	9-9-4 (13)	GP		POORLY GRADED GRAVEL WITH SAND, (GP) brown, medium dense	
5						
	SPT	1-0-1 (1)			very loose, no recovery	
	SPT	8-14-12 (26)			dark greenish gray, medium dense	
10						
	SPT	17-27-35 (62)			very dense	
15						
	SPT	10-38-50/5"				
18.5						1071.5
			GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) dark greenish gray, very dense	
20						
	SPT	18-26-47 (73)				
25						
	SPT	31-50/5"				
26.0						1064.0

- Groundwater encountered at ~2' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 26.0 feet.

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GN Northern, Inc
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Telephone: (509) 248-9798

BORING NUMBER B-10-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 2/2/26 **COMPLETED** 2/2/26
GROUND ELEVATION 1090 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 4.00 ft / Elev 1086.00 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647084°, -120.520358°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0				SM		SILTY SAND, (SM) brown, fine grained, moist to wet, very loose to loose, some Poorly Graded Sand with Silt (SP-SM)	
	SPT	1-2-2 (4)				▽	
5						gray, very loose	
	SPT	0-0-2 (2)	Fines = 19%				
	SPT	2-4-14 (18)				loose	
						8.5	1081.5
10				GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, medium dense	
	SPT	32-28-40 (68)				10.5	1079.5
				GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray brown, very dense	
15							
	SPT	50/5"				some Poorly Graded Gravel with Sand (GP)	
20							
	SPT	25-49-50/5"				some Silty Gravel (GM)	
						21.5	1068.5

- Groundwater encountered at ~4' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 21.5 feet.

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BORING NUMBER B-11-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 2/1/26 **COMPLETED** 2/1/26
GROUND ELEVATION 1090 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 2.50 ft / Elev 1087.50 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647633°, -120.520314°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			SM		SILTY SAND, (SM) brown, fine grained, wet, very loose	
	SPT	1-8-8 (16)			▽	
			GP-GM		3.0 POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray, medium dense	1087.0
5					4.5	1085.5
	SPT	5-3-5 (8)	GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, loose	
					7.0	1083.0
	SPT	3-3-4 (7)	SP		POORLY GRADED SAND WITH GRAVEL, (SP) dark gray, fine to coarse grained, loose	
10					9.5	1080.5
	SPT	9-7-7 (14)	GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, medium dense, limited recovery	
15	SPT	5-16-20 (36)			dense	
					18.0	1072.0
20	SPT	17-24-24 (48)	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, dense, some Silty Gravel (GM)	
25	SPT	20-40-50/5"			olive gray, very dense	
					26.5	1063.5

- Groundwater encountered at ~2.5' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 26.5 feet.

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BORING NUMBER B-12-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 2/1/26 **COMPLETED** 2/1/26
GROUND ELEVATION 1090 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 3.00 ft / Elev 1087.00 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647995°, -120.520103°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0				SM		SILTY SAND, (SM) brown, fine grained, wet, loose	
						2.0	1088.0
	SPT	5-10-18 (28)	MC = 17% Fines = 23%	GM		SILTY GRAVEL WITH SAND, (GM) gray brown, medium dense ▽	
						4.5	1085.5
5	SPT	9-16-17 (33)		GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray brown, dense	
						7.0	1083.0
	SPT	11-11-20 (31)		GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, dense	
10	SPT	20-22-50/6"				very dense	
						13.5	1076.5
15	SPT	15-24-38 (62)		GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, very dense	
20	SPT	17-30-50/2"					
						23.5	1066.5

- Boring terminated at ~23.5' BGS due to auger refusal
- Groundwater encountered at ~3' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 23.5 feet.

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BORING NUMBER B-13-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 2/2/26 **COMPLETED** 2/2/26
GROUND ELEVATION 1089 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 2.50 ft / Elev 1086.50 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647489°, -120.520592°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			SM		SILTY SAND, (SM) brown, fine grained, wet, loose	
					1.5	1087.5
	SPT	8-12-12 (24)	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, wet, medium dense ▽	
					4.5	1084.5
5	SPT	7-8-6 (14)	GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, medium dense	
	SPT	13-18-19 (37)			dense	
					9.5	1079.5
10	SPT	19-33-43 (76)	SW-SM		WELL GRADED SAND WITH SILT AND GRAVEL, (SW-SM) greenish gray, fine to coarse grained, very dense	
					13.5	1075.5
15	SPT	26-28-44 (72)	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray brown, very dense	
20	SPT	32-42-50/3"			21.5	1067.5

- Groundwater encountered at ~2.5' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 21.5 feet.

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BORING NUMBER B-14-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 2/1/26 **COMPLETED** 2/2/26
GROUND ELEVATION 1090 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 2.75 ft / Elev 1087.25 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647211°, -120.520035°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0				SM		SILTY SAND, (SM) gray and brown, fine grained, saturated, very loose, some Poorly Graded Sand with Silt (SP-SM)	
	SPT	1-2-1 (3)				▽	
4.5							1085.5
5				SP-SM		POORLY GRADED SAND WITH SILT, (SP-SM) gray, fine grained, very loose, some Silty Sand (SM)	
	SPT	0-1-1 (2)	Fines = 9%				
	SPT	0-4-16 (20)					
8.5							1081.5
10				GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, medium dense to dense	
9.8							1080.3
	SPT	28-43-44 (87)		GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, very dense	
15							
	SPT	21-37-50/5"					
20							
	SPT	41-43-50/5"				some Silty Gravel (GM)	
21.5							1068.5

- Groundwater encountered at ~2.75' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 21.5 feet.

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BORING NUMBER B-15-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 2/3/26 **COMPLETED** 2/3/26
GROUND ELEVATION 1090 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 3.50 ft / Elev 1086.50 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647581°, -120.521613°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			SM		SILTY SAND, (SM) brown, fine grained, moist, very loose	
					2.0	1088.0
	SPT	3-5-10 (15)	GP		POORLY GRADED GRAVEL WITH SAND, (GP) brown, moist, medium dense ▽	
5	SPT	5-2-2 (4)			very loose to loose	
	SPT	6-5-8 (13)			medium dense, limited recovery	
					9.5	1080.5
10	SPT	15-33-45 (78)	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray brown, very dense	
15	SPT	31-36-50/3"				
20	SPT	38-50/5"			some Silty Gravel (GM)	
25	SPT	50/5"				
					25.5	1064.5

- Groundwater encountered at ~3.5' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 25.5 feet.

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BORING NUMBER B-16-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 2/3/26 **COMPLETED** 2/3/26
GROUND ELEVATION 1090 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 3.50 ft / Elev 1086.50 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647819°, -120.521619°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			SM		SILTY SAND, (SM) brown, fine grained, wet, loose	
					1.5	1088.5
	SPT	5-6-6 (12)	GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, wet, medium dense ▽	
5	SPT	1-1-1 (2)			very loose, limited recovery	
	SPT	6-9-11 (20)			medium dense	
					9.5	1080.5
10	SPT	16-25-35 (60)	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray brown, very dense	
15	SPT	36-50/6"				
20	SPT	24-50/6"			21.0	1069.0

- Groundwater encountered at ~3.5' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 21.0 feet.

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BORING NUMBER B-17-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 2/2/26 **COMPLETED** 2/2/26
GROUND ELEVATION 1089 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 3.00 ft / Elev 1086.00 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647583°, -120.521252°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0				SM		SILTY SAND, (SM) brown, fine grained, wet, loose, some Silt (ML), some Poorly Graded Sand with Silt (SP-SM)
	SPT	1-2-3 (5)	MC = 24% Fines = 19%			▽
4.5						1084.5
5				GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, very loose
	SPT	1-1-1 (2)				
	SPT	22-30-33 (63)				gray brown, very dense
9.5						1079.5
10				GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, dense, limited recovery
	SPT	18-14-18 (32)				
13.5						1075.5
15				GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) olive, very dense
	SPT	16-31-49 (80)				
20						
	SPT	24-40-50/5"				some Silty Gravel (GM)
21.5						1067.5

- Groundwater encountered at ~3' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 21.5 feet.

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BORING NUMBER B-18-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 2/3/26 **COMPLETED** 2/3/26
GROUND ELEVATION 1088 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 2.50 ft / Elev 1085.50 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647819°, -120.521262°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0				SM		SILTY SAND, (SM) brown, fine grained, wet to saturated, very loose ▽	
	SPT	0-1-1 (2)	Fines = 22%				
5	SPT	1-1-1 (2)				gray, some Poorly Graded Sand with Silt (SP-SM)	
						6.5	1081.5
				GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, medium dense	
	SPT	4-9-16 (25)				9.5	1078.5
10	SPT	20-36-37 (73)		GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) greenish gray, very dense	
						13.5	1074.5
15	SPT	6-4-4 (8)		GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, loose	
						18.0	1070.0
20	SPT	36-50/6"		GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray, very dense	
						21.0	1067.0

- Groundwater encountered at ~2.5' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 21.0 feet.

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BORING NUMBER B-19-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 2/2/26 **COMPLETED** 2/2/26
GROUND ELEVATION 1090 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 4.50 ft / Elev 1085.50 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.646997°, -120.520894°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			SM		SILTY SAND, (SM) brown, fine grained, damp to moist, very loose	
					2.0	1088.0
	SPT	5-6-7 (13)	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, damp to moist, medium dense	
					4.5 ▽	1085.5
5					POORLY GRADED GRAVEL WITH SAND, (GP) gray brown, very loose, limited recovery	
	SPT	2-2-1 (3)	GP			
	SPT	1-1-5 (6)			loose	
10						
	SPT	9-14-29 (43)			medium dense	
					11.0	1079.0
					POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, dense, some Silty Gravel (GM)	
15						
	SPT	11-17-25 (42)	GP-GM			
20						
	SPT	7-10-12 (22)			medium dense	
					23.5	1066.5
25					WELL GRADED SAND WITH SILT AND GRAVEL, (SW-SM) brown, very dense	
	SPT	16-25-38 (63)	SW-SM			
					26.5	1063.5

- Groundwater encountered at ~4.5' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 26.5 feet.

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BORING NUMBER B-20-A

CLIENT HLA Engineering and Land Surveying, Inc.
PROJECT NAME City of Selah WWTP Improvements-Alternate Plan
PROJECT NUMBER 225-1849-1
PROJECT LOCATION 260 S. Rushmore Road, Selah, WA
DATE STARTED 2/2/26 **COMPLETED** 2/2/26
GROUND ELEVATION 1090 ft **HOLE SIZE** 8 inches
DRILLING CONTRACTOR Haz-Tech Drilling, Inc.
GROUND WATER LEVELS:
DRILLING METHOD CME 850 Track Mounted Rig
▽ **AT TIME OF DRILLING** 3.80 ft / Elev 1086.20 ft
LOGGED BY KAH **CHECKED BY** IM
AT END OF DRILLING ---
NOTES Approx. GPS Coords.: 46.647291°, -120.520894°
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0						
	SPT	2-1-1 (2)	SM		SILTY SAND, (SM) brown, fine grained, wet, very loose, no recovery ▽	
						4.8 / 1085.3
5	SPT	6-10-10 (20)	GP		POORLY GRADED GRAVEL WITH SAND, (GP) brown, medium dense	
	SPT	10-13-50/6"			very dense	
10	SPT	15-30-50/4"				
						13.0 / 1077.0
15	SPT	25-23-22 (45)	GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray, dense, some Poorly Graded Sand (SP)	
						18.5 / 1071.5
20	SPT	50/5"	GP		POORLY GRADED GRAVEL WITH SAND, (GP) gray, very dense	20.5 / 1069.5

- Groundwater encountered at ~3.8' BGS at time of drilling
- Referenced elevations are approximate and based on Google Earth topography

Bottom of borehole at 20.5 feet.

GENERAL BH / TP / WELL - GINT STD US LAB.GDT - 3/2/26 14:33 - C:\USERS\KHARMON\EDRIVE\PUBLIC\ACTIVE PROJECTS\1 - CURRENT PROJECTS\225-1849 CITY OF SELAH NEW WWTP\ADDITIONAL INVESTIGATION\225-1849-1 LOGS.GPJ

Northern, Inc.
Kennewick, Yakima, Spokane, Hermiston (OR)

KEY CHART

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N-VALUE

COARSE-GRAINED SOILS			FINE-GRAINED SOILS		
DENSITY	N (BLOWS/FT)	FIELD TEST	CONSISTENCY	N (BLOWS/FT)	FIELD TEST
Very Loose	0 – 4	Easily penetrated with ½-inch reinforcing rod pushed by hand	Very Soft	0 – 2	Easily penetrated several inches by thumb
Loose	4 – 10	Difficult to penetrate with ½-inch reinforcing rod pushed by hand	Soft	2 – 4	Easily penetrated one inch by thumb
Medium -Dense	10 – 30	Easily penetrated with ½-inch rod driven with a 5-lb hammer	Medium-Stiff	4 – 8	Penetrated over ½-inch by thumb with moderate effort
Dense	30 – 50	Difficult to penetrate with ½-inch rod driven with a 5-lb hammer	Stiff	8 – 15	Indented about ½-inch by thumb but penetrated with great effort
Very Dense	> 50	penetrated only a few inches with ½-inch rod driven with a 5-lb hammer	Very Stiff	15 – 30	Readily indented by thumb
			Hard	> 30	Indented with difficulty by thumbnail

USCS SOIL CLASSIFICATION

MAJOR DIVISIONS				GROUP DESCRIPTION
Coarse-Grained Soils <50% passes #200 sieve	**Gravel** and **Gravelly Soils** <50% coarse fraction passes #4 sieve	**Gravel** (with little or no fines)	GW	Well-graded **Gravel**
			GP	Poorly Graded **Gravel**
		Gravel (with >12% fines)	GM	Silty **Gravel**
			GC	Clayey **Gravel**
	Sand and **Sandy Soils** >50% coarse fraction passes #4 sieve	**Sand** (with little or no fines)	SW	Well-graded **Sand**
			SP	Poorly graded **Sand**
		Sand (with >12% fines)	SM	Silty **Sand**
			SC	Clayey **Sand**
Fine-Grained Soils >50% passes #200 sieve	**Silt** and **Clay** Liquid Limit < 50		ML	**Silt**
			CL	Lean **Clay**
			OL	Organic **Silt** and C**lay** (low plasticity)
	Silt and **Clay** Liquid Limit > 50		MH	Inorganic **Silt**
			CH	Inorganic **Clay**
			OH	Organic **Clay** and **Silt** (med. to high plasticity)
Highly Organic Soils			PT	**Peat**
				Top Soil

LOG SYMBOLS

	2S	2" OD Split Spoon (SPT)
	3S	3" OD Split Spoon
	NS	Non-Standard Split Spoon
	ST	Shelby Tube
	CR	Core Run
	BG	Bag Sample
	TV	Torvane Reading
	PP	Penetrometer Reading
	NR	No Recovery
	GW	Groundwater Table

MODIFIERS

DESCRIPTION	RANGE
Trace	<5%
Little	5% – 12%
Some	>12%

MOISTURE CONTENT

DESCRIPTION	FIELD OBSERVATION
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but not visible water
Wet	Visible free water

SOIL CLASSIFICATION INCLUDES

1. Group Name
2. Group Symbol
3. Color
4. Moisture content
5. Density / consistency
6. Cementation
7. Particle size (if applicable)
8. Odor (if present)
9. Comments

MAJOR DIVISIONS WITH GRAIN SIZE

SIEVE SIZE						
12"	3"	3/4"	4	10	40	200
GRAIN SIZE (INCHES)						
12	3	0.75	0.19	0.079	0.0171	0.0029

Boulders	Cobbles	Gravel		Sand			Silt and Clay
		Coarse	Fine	Coarse	Medium	Fine	

Conditions shown on boring and testpit logs represent our observations at the time and location of the fieldwork, modifications based on lab test, analysis, and geological and engineering judgment. These conditions may not exist at other times and locations, even in close proximity thereof. This information was gathered as part of our investigation, and we are not responsible for any use or interpretation of the information by others.

Appendix III

Laboratory Testing Results

GRAIN SIZE DISTRIBUTION

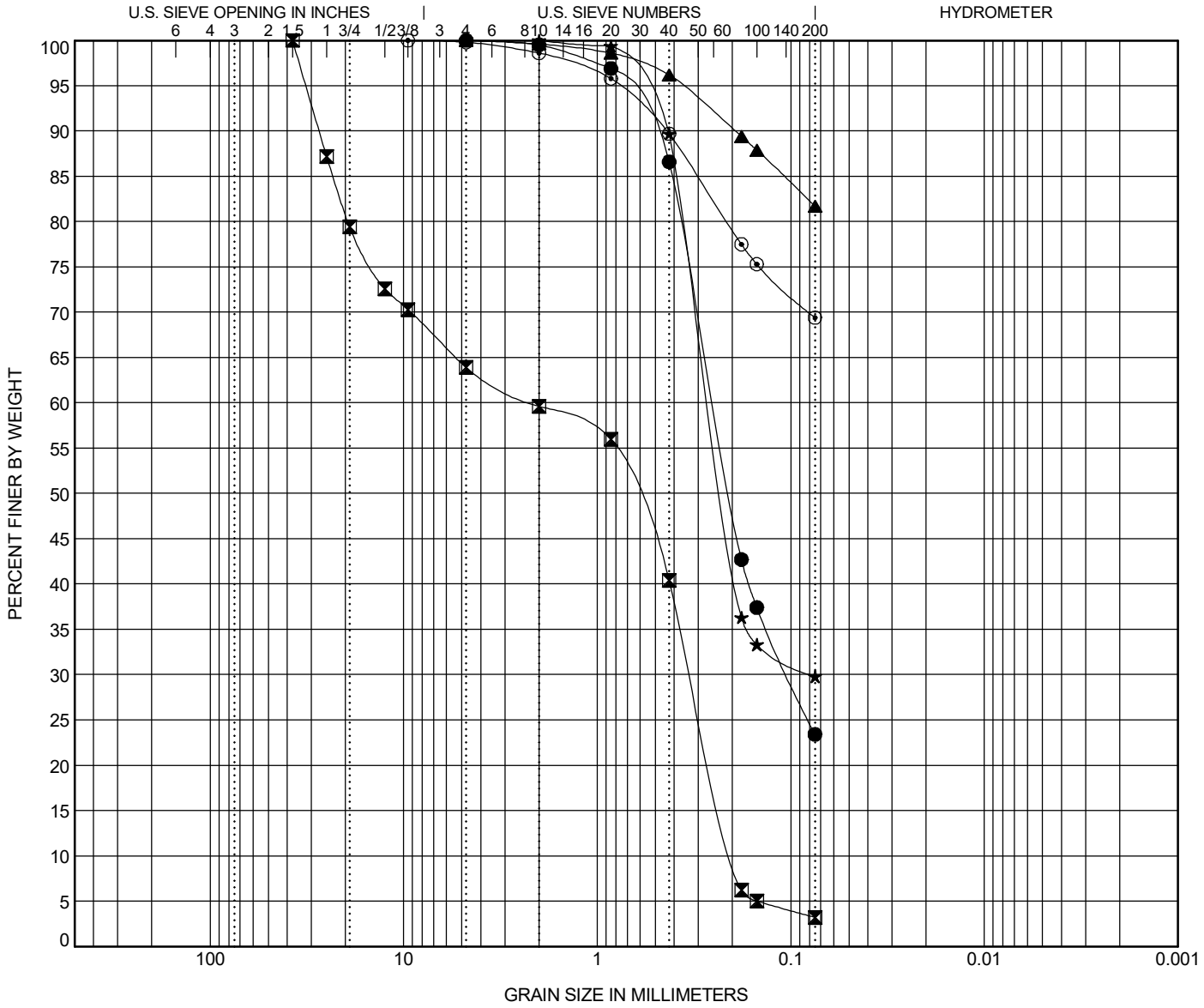
GN Northern, Inc
722 N. 16th Ave Suite 31
Yakima, WA 99802
Telephone: (509) 248-9798

CLIENT HLA Engineering and Land Surveying, Inc.

PROJECT NAME City of Selah WWTP Improvements-Alternate Plan

PROJECT NUMBER 225-1849-1

PROJECT LOCATION 260 S. Rushmore Road, Selah, WA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	LOCATION	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-4-A	2.5	SILTY SAND (SM)					
⊠	B-5-A	7.5	POORLY GRADED SAND WITH GRAVEL (SP)				0.25	10.95
▲	B-6-A	2.5	SILT WITH SAND (ML)					
★	B-7-A	5.0	SILTY SAND (SM)					
⊙	B-8-A	2.5	SANDY FAT CLAY (CH)	65	22	42		

	LOCATION	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-4-A	2.5	4.75	0.253	0.104		0.0	76.6	23.4	
⊠	B-5-A	7.5	37.5	2.168	0.327	0.198	36.1	60.7	3.2	
▲	B-6-A	2.5	4.75				0.0	18.3	81.7	
★	B-7-A	5.0	2	0.264	0.078		0.0	70.2	29.8	
⊙	B-8-A	2.5	9.5				0.2	30.4	69.4	

GRAIN SIZE - TEMPLATE_JESSE.GDT - 2/25/26 15:11 - C:\USERS\KHARM\ONEDRIVE\PUBLIC\ACTIVE PROJECTS\1 - CURRENT PROJECTS\225-1849 CITY OF SELAH NEW WWTP\ADDITIONAL INVESTIGATION\225-1849-1 LOGS.GPJ

GRAIN SIZE DISTRIBUTION

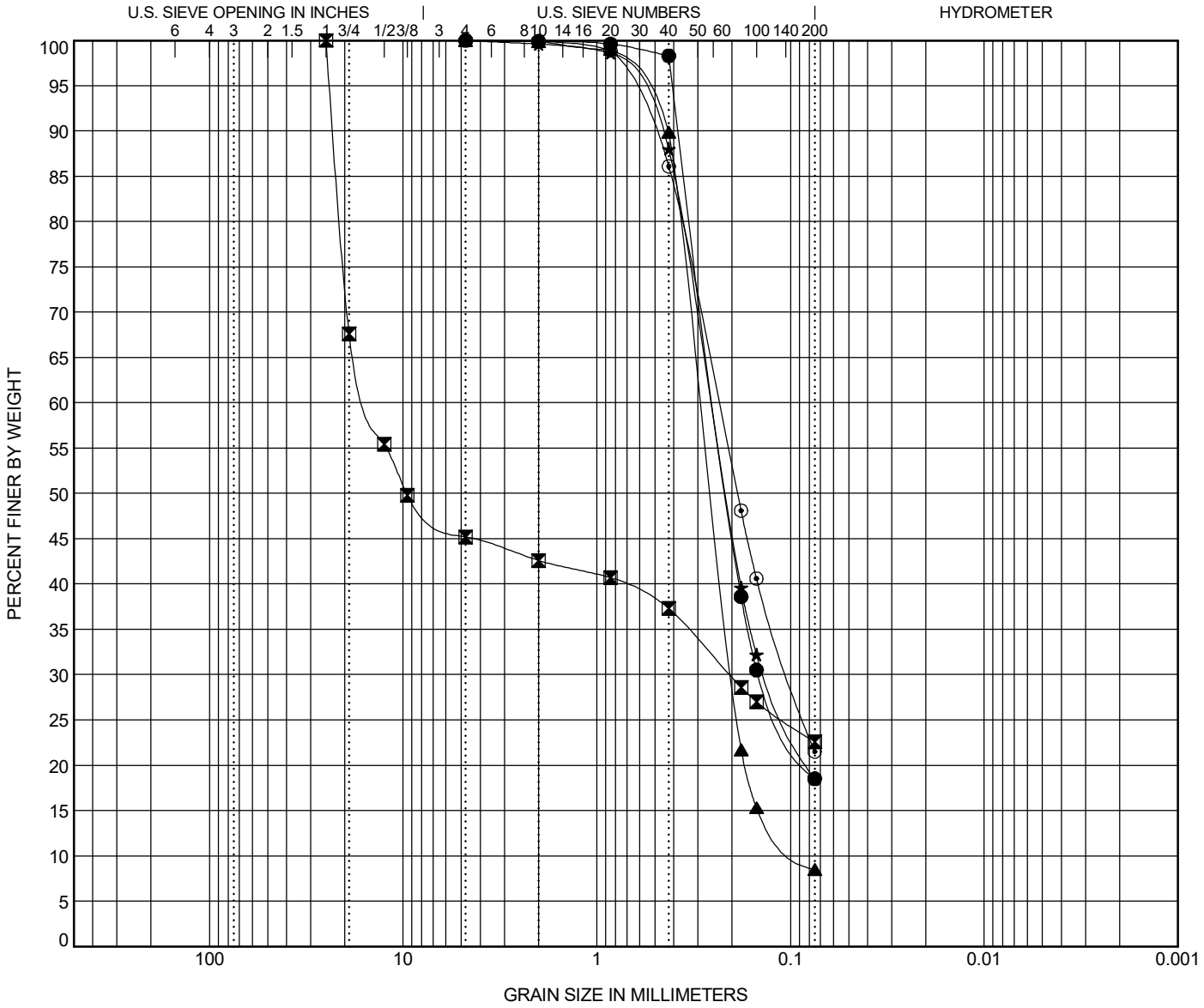
GN Northern, Inc
722 N. 16th Ave Suite 31
Yakima, WA 99802
Telephone: (509) 248-9798

CLIENT HLA Engineering and Land Surveying, Inc.

PROJECT NAME City of Selah WWTP Improvements-Alternate Plan

PROJECT NUMBER 225-1849-1

PROJECT LOCATION 260 S. Rushmore Road, Selah, WA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	LOCATION	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-10-A	5.0	SILTY SAND (SM)					
⊠	B-12-A	2.5	SILTY GRAVEL WITH SAND (GM)					
▲	B-14-A	5.0	POORLY GRADED SAND WITH SILT (SP-SM)				1.57	3.34
★	B-17-A	2.5	SILTY SAND (SM)					
⊙	B-18-A	2.5	SILTY SAND (SM)					

	LOCATION	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-10-A	5.0	4.75	0.245	0.146		0.0	81.5	18.5	
⊠	B-12-A	2.5	25	14.638	0.207		54.8	22.6	22.6	
▲	B-14-A	5.0	4.75	0.292	0.2	0.087	0.0	91.5	8.5	
★	B-17-A	2.5	4.75	0.259	0.134		0.0	81.5	18.5	
⊙	B-18-A	2.5	4.75	0.236	0.102		0.0	78.5	21.5	

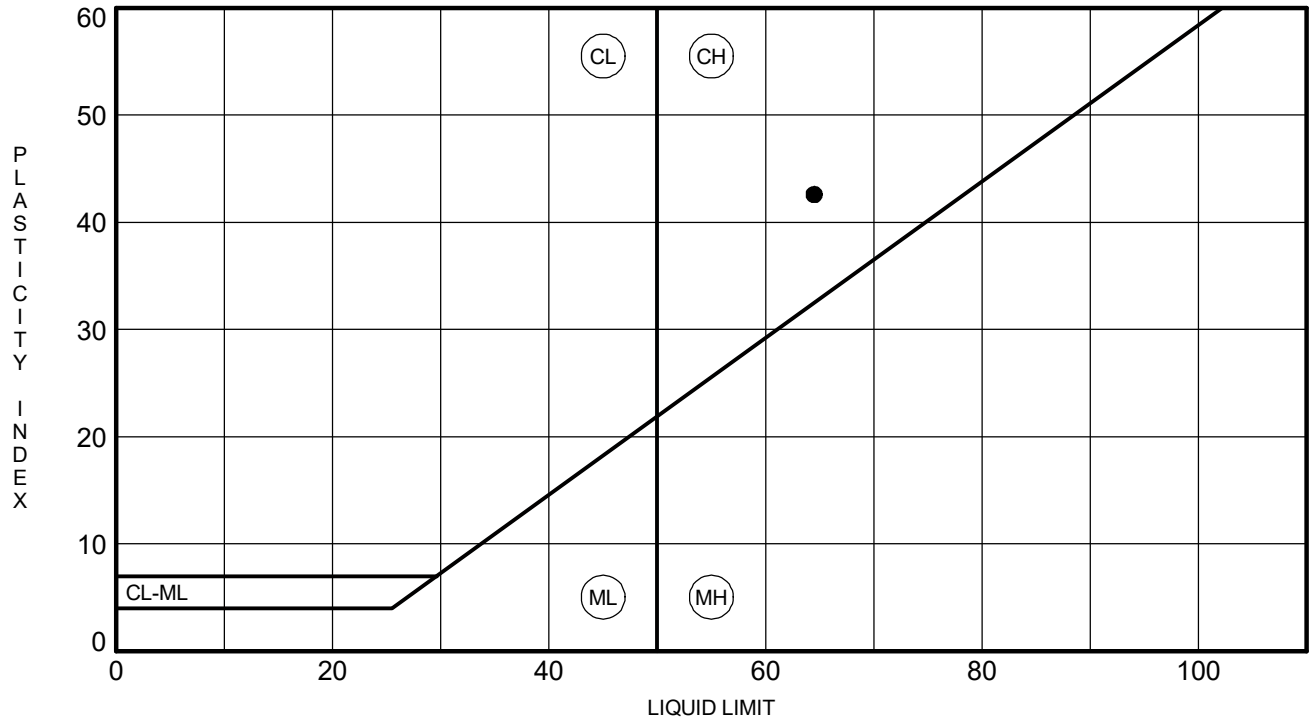
GRAIN SIZE - TEMPLATE_JESSE.GDT - 2/25/26 15:11 - C:\USERS\KHARM\ONEDRIVE\PUBLIC\ACTIVE PROJECTS\1 - CURRENT PROJECTS\225-1849 CITY OF SELAH NEW WWTP\ADDITIONAL INVESTIGATION\225-1849-1 LOGS.GPJ

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Yakima, WA 99802
Telephone: (509) 248-9798

ATTERBERG LIMITS' RESULTS

CLIENT HLA Engineering and Land Surveying, Inc. **PROJECT NAME** City of Selah WWTP Improvements-Alternate Plan

PROJECT NUMBER 225-1849-1 **PROJECT LOCATION** 260 S. Rushmore Road, Selah, WA



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-8-A**	**2.5**	**65**	**22**	**42**	**69**	**SANDY FAT CLAY (CH)**

ATTERBERG LIMITS - TEMPLATE_JESSE.GDT - 2/25/26 13:27 - C:\USERS\KHARMON\EDRIVE\PUBLIC\ACTIVE PROJECTS\1 - CURRENT PROJECTS\225-1849 CITY OF SELAH NEW WWTP\ADDITIONAL INVESTIGATION\225-1849-1 LOGS.GPJ

Appendix IV

Site & Exploration Photographs



View of site conditions near Boring B-1-A



View of site conditions near boring B-2-A



View of site conditions near boring B-3-A



View of site conditions near boring B-4-A



View of site conditions near boring B-5-A



View of site conditions near boring B-6-A

PLATE 1: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 225-1849-1**



View of site conditions near boring B-7-A



View of site conditions near boring B-8-A



View of site conditions near boring B-9-A



View of site conditions boring B-10-A



View of site conditions near boring B-11-A



View of site conditions near boring B-12-A

PLATE 2: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 225-1849-1**



View of site conditions near boring B-13-A



View of site conditions near boring B-14-A



View of site conditions near boring B-15-A



View of site conditions near boring B-17-A



View of site conditions near boring B-18-A



View of site conditions near boring B-20-A

PLATE 3: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 225-1849-1**

Northern, Inc.
Consulting Engineers Environmental Scientists Construction Materials Testing

April 14, 2026

GNN Project No.: 225-1849

HLA Engineering & Land Surveying, Inc.
2803 River Road
Yakima, WA 98902

Attn: Robert Scott, PE
cc: Brian Sterling, PE, LSB Consulting Engineers

Subject: **Geotechnical Addendum No. 1 - Micropile Design Criteria**
Selah WWTP Improvements Project- Solids Handling Building

Reference: GN Northern, Inc., *Geotechnical Site Investigation Report, City of Selah Wastewater Treatment Plant Improvements, 260 S. Rushmore Road /222 S. Railroad Avenue, Selah, Washington, dated October 22, 2025*

Preliminary estimated reactions for the Solids Handling Building provided by Brian Sterling via email dated March 26, 2026

Gentlemen,

This addendum letter presents Geotechnical design parameters for design and construction of micropiles for the subject project.

We understand that micropiles will be utilized for support of the PEMB foundations/mat slab and the existing building slab supporting the centrifuge (with dynamic loading) that will be elevated 5'-6" above the existing slab.

Our analysis is based on subsurface soil conditions encountered in borings B-8 and B-9. It shall be noted that subsurface data is not available for the existing building. The 2 borings, B-8 and B-9 completed for the extension, encountered very loose/soft, highly compressible soils with fill and organic woody debris extending to a depth of ~13 feet BGS. Our analysis is based on the assumption that similar unsuitable and unstable subsurface conditions extend beneath the existing building footprint.

Micropiles are typically constructed by drilling a cased hole to the desired depth into the bearing layer, placing a reinforcing bar to the bottom of the hole and pumping grout under pressure to form a bond zone as the casing is withdrawn. The casing typically extends several feet into the bond zone in conjunction with the full length reinforcing bar.

Design and construction of micropiles shall be conducted in accordance with Federal Highway Administration, December 2005, FHWA NHI-05-039, Micropile Design and Construction. The design should evaluate the structural capacity of uncased length, structural capacity of cased length and the adequacy of proposed bond length.

The parameters presented in table below are for estimating the axial compression (vertical) and lateral capacities of micorpile foundation system. These parameters were developed from subsurface soil conditions in exploratory borings B-8 and B-9.

Table 1: Soils Profile and Estimated Soils Properties

Soil Type	Depth to Bottom of Soil Layer (feet, BGS)	SPT* 'N' Value	Effective Unit Weight (pcf)	Internal Friction Angle (degrees)	Undrained Cohesion (psf)	p-y modulus, k (pci)	K_a*	K_p*
Silt (ML) / Silty Sand (SM), Clayey Sand (SC) with organics, loose to very loose	13	0-4	28	23	0	0	0.44	2.27
Gravel with sand (GP), dense to very dense	>21	43 - 50+	73	38	0	200	0.24	4.20

*field recorded N-value, not corrected based on hammer efficiency

Geotechnical Capacity of Micropile

Micropiles should be embedded (socketed) into the underlying dense to very dense Gravel strata encountered at depths of approx. 13 to 15 feet in exploratory borings.

Based on our analysis using a cased (no bond) length of 13 feet and uncased bond length of 12 feet (for a total pile length of 25 feet), we calculated an allowable geotechnical bond capacity in compression of **40 kips for an 8-inch dimeter** micropile and **51 kips for a 10-inch** diameter pile.

We recommend a nominal Grout-to-Ground Bond strength of 4,100 psf (from FHWA-SA-97-070, Table 5.3, Type B: Pressure grouted through the casing during casing withdrawal).

Micropiles should be spaced at least 3 times the micropile diameter or 30 inches apart to avoid group effects, whichever is greater. Group action should be considered when the pile spacing in the direction of loading is less than 3- pile-diameter on center.

Lateral Resistance: We recommend that a lateral-load analysis of the micropiles be completed by the project structural engineer using L-PILE® for the soil profile presented in the Table 1 to ensure the designed piles have sufficient overturning resistance. The analysis should consider that the micropiles are embedded several feet into the underlying dense to very dense Gravel strata.

Other Design and Construction Considerations

Cased length and bond zone length shall be shown on the drawing.

Centralizers shall be provided at 10 feet centers maximum spacing. The upper and lower most centralizer shall be located a maximum of 5 feet from the top and bottom of the micropile.

Corrosion Protection - Permanent steel pipe casing shall incorporate an additional 1/16 inch thickness of sacrificial steel for corrosion protection. Provide sacrificial steel calculation for the permanent casing. Epoxy coated threadbar shall be used on this project.

Verification and Proof Load Tests - Verification load test shall be performed in tension on at least two (2) piles to verify soil-to-grout bond and that the length of the micropile load transfer bond zone is adequate for the installed micropiles. Perform verification load testing to a minimum 200% of the design compression load. Completed production micropiles may be used as part of the reaction frame for load testing. No reaction bearing elements of the load test frame for load testing shall bear on existing structure elements.

If you have any questions, please contact us.

Respectfully submitted,

GN Northern, Inc.



Imran Magsi, PE, GE
Sr. Geotechnical Engineer

Robert Scott

From: Imran Magsi <imagsi@gnnorthern.com>
Sent: Sunday, April 26, 2026 10:12 PM
To: Robert Scott
Cc: 'Karl Harmon'; Devyn Smith; Justin Bellamy; 'David Linke'; 'Brian Sterling'
Subject: RE: Selah WWTP Solids Handling Building

Hi Brian,
By modeling a thicker/more stronger reinforced structural fill section, acting as a shallow ground improvement, we have increased the vertical subgrade modulus and bearing capacity. The following updated parameters can be used for the mat foundation design:

Foundation Type	Design Parameters	Embedment Depth	Bearing Subgrade	Static Settlement
Structural Slab/Mat*	k= 98 pci* q_{all} = 1,300 psf) μ =0.40 (Ultimate Coefficient of Sliding Friction	18 inches	Reinforced Structural Fill Prism	1" total ~ ¾" differential

*This subgrade modulus should be adjusted for scaling effects using an appropriate formula.

Revised Ground Improvement Recommendations:
The reinforced structural fill prism should consist of a minimum 4.5-foot over-excavation below the structural slab/mat foundation bottom elevation; the lateral extent of over-excavation should be 3 feet on all sides where space allows. The reinforced fill prism should consist of a minimum 2.5-foot thick quarry spalls section consisting 6-inch minus quarry spalls pushed/punched into the soft/loose silty subgrade soils. Punching of the quarry spalls should be performed with a hoe-pack and continue until a firm and dense surface is achieved. A layer of woven geotextile separation/stabilization fabric, such as Mirafi®HP370 or equivalent, shall be placed over the quarry spalls and extend a minimum 2 feet up the sides of the excavation. Then, place 2-foot thick section of imported 1¼-inch minus imported crushed rock over the densified quarry spalls. The crushed rock shall be reinforced with a layer of Tensar InterAx™ NX 750 geogrid reinforcement installed 18 inches below the final rock grade. Crushed rock shall be placed in 6-inch thick loose lifts and each lift compacted to a minimum 95% of the maximum dry density as determined by ASTM D1557. The compaction effort shall be verified in the field using a nuclear density gauge in accordance with ASTM D6938. (Note: Geotextile and Geogrid reinforcement shall be installed in accordance with manufacture's specifications and no substitution of geotextile and geogrid is allowed without the approval of the Geotechnical engineer.

The prepared subgrade (top of rock) should be proof-rolled using loaded construction equipment in the presence of a representative of the Geotechnical Engineer. Areas observed to deflect greater than ½ inch should be over-excavated to a depth of 12 inches and replaced with properly moisture conditioned and compacted granular fill. These areas should be proof-rolled again to evaluate whether additional subgrade stabilization may be required at the direction of the Geotechnical Engineer.

Prelim. Micropile Lateral Resistance: Based on our preliminary analysis, you can estimate a lateral load resistance of 7 kips at less than ½" deflection and 11 kips at less than 1" displacement at pile head for a 10-inch-diameter micropile. The analysis assumes that the micropiles are embedded at least 10 feet into dense to very dense gravel strata. The Design- Build contractor should perform a detailed lateral-load analysis using L-

PILE®, based on the Soil Profile presented in Table 1 of the Geotechnical Addendum No. 1 dated April 14, 2026, to ensure the piles have sufficient overturning resistance. The analysis must account for the micropiles being embedded several feet into the underlying very dense gravel strata (N-value>50bpf).

If you have any questions, please contact us.

Thank you!

Regards,
Imran Magsi, PE, GE
Sr. Geotechnical Engineer
GN Northern, Inc.
509/248-9798

From: Robert Scott <rscott@hlacivil.com>
Sent: Tuesday, April 21, 2026 4:47 PM
To: Imran Magsi <imagsi@gnnorthern.com>
Cc: 'Karl Harmon' <kharmon@gnnorthern.com>; Devyn Smith <dasmith@hlacivil.com>; Justin Bellamy <jbellamy@hlacivil.com>; 'David Linke' <linke@lsbengineers.com>; 'Brian Sterling' <sterling@lsbengineers.com>
Subject: RE: Selah WWTP Solids Handling Building

If you're available to talk tomorrow afternoon, it would be helpful to talk through these design criteria. I think the main issue we'd like to find a way past at this point is how to go about constructing the new covered sludge area without piles/piers, since the existing building was constructed with more conventional methods.

Thank you,

Robert J. Scott, PE
2803 River Road, Yakima, WA 98902
Office: (509) 966-7000 | Cell: (509) 230-4409
rscott@hlacivil.com | www.hlacivil.com

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From: Imran Magsi <imagsi@gnnorthern.com>
Sent: Wednesday, April 15, 2026 3:07 PM
To: Robert Scott <rscott@hlacivil.com>; 'Brian Sterling' <sterling@lsbengineers.com>
Cc: 'Karl Harmon' <kharmon@gnnorthern.com>; Devyn Smith <dasmith@hlacivil.com>; Justin Bellamy <jbellamy@hlacivil.com>; 'David Linke' <linke@lsbengineers.com>
Subject: RE: Selah WWTP Solids Handling Building

Hi Robert and Brian,
See attached addendum for the micropile design criteria.

Thank you!