CONSTRUCTION DOCUMENTS

JUDY RAW WATER PUMP STATION REPLACEMENT

Volume I of II (Procurement, Contracting, and Specifications)

Project No. 3766
C.O. No. 5040

ISSUED FOR BIDDING

September 29, 2020

DISTRICT OFFICE

1415 Freeway Drive
Mount Vernon, WA 98273
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DISTRICT OFFICIALS

Commission
Joe Linquist, President
Al Littlefield, Vice President
Germaine Kornegay, Secretary

General Manager
George Sidhu, P.E.

Engineering Manager
Mark C. Handzlik, P.E.

Operations Manager
Mike Fox

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Bid Documents and Specifications

Judy Raw Water Pump Station Replacement

C E R T I F I C A T I O N

These specifications and design drawings for the Judy Raw Water Pump Station Replacement have been prepared under the direction of the following Registered Professional Engineer.

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APPENDICES

Appendix A – Building Permit BP20-0302 (includes the Stormwater Site Plan (Drainage Report) and the Geotechnical Report as Appendix E of the Drainage Report)

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INVITATION TO BID

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INVITATION TO BID

Notice is hereby given that Public Utility District No. 1 of Skagit County (District) will receive sealed Bids for the **Judy Raw Water Pump Station Replacement Project.** Each bid shall be placed in a sealed envelope and shall be mailed or delivered to the District office, 1415 Freeway Drive, Mount Vernon, Washington 98273, to arrive no later than 10:00 AM, October 20, 2020. In person meetings are suspended; therefore, the bid opening will be held virtually through ZOOM Cloud Meetings no sooner than 10:01 AM on October 20, 2020. The web link, meeting ID, and passcode will be posted on the District's website at **www.SkagitPUD.org.**

NOTE: Under RCW 39.04.350, Bidders must have received Labor & Industries training on prevailing wage and public works requirements or be exempt.

Judy Raw Water Pump Station Replacement Project

> Installation of a new raw water pump station with three vertical turbine pumps, split-faced CMU building, metal roof, and associated mechanical appurtenances, electrical equipment, and heating and cooling systems. Site improvements include water yard piping, storm drain modification, chain-link fence, site lighting, final grading, pavement and surface restoration, and landscaping restoration.

The location of the proposed work is shown on the project plans.

A Pre-Bid Meeting will be held at 10:00 AM on Tuesday, October 13, 2020, at the project site at 19061 Morford Road, Sedro-Woolley, Washington.

An unofficial bid set can be viewed on the District's website **www.SkagitPUD.org**. Construction plans, specifications, addenda, and plan holders list for this project can be viewed or purchased on-line through Builders Exchange of Washington, Inc., at **http://www/bxwa.com**; 2607 Wetmore Avenue, Everett, WA 98201-2929, (425) 258-1303, Fax (425) 259-3832. Click on: "bxwa.com"; "Posted Projects"; "Public Works", "PUD #1 of Skagit County" and "Projects Bidding". *(**Note**: Bidders are encouraged to "Register as a Bidder" in order to receive automatic e-mail notification of future addenda and to be placed on the "Bidders List". This service is provided **free of charge** to Prime Bidders, Subcontractors and Vendors bidding this project. Contact Builders Exchange of Washington at (425) 258-1303, should you require further assistance.)* Contract documents will be available on or after September 29, 2020.

Point of Contact: Catherine Price, Contract Coordinator

PUBLIC UTILITY DISTRICT NO. 1 OF SKAGIT COUNTY

_____

George Sidhu, P.E., General Manager

Published: September 29, 2020 and October 6, 2020 (Skagit Valley Herald)
September 29, 2020 (Daily Journal of Commerce)

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INSTRUCTIONS TO BIDDERS

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INSTRUCTIONS TO BIDDERS

1.01 GENERAL

The Judy Raw Water Pump Station Replacement consists of the following:

> Installation of a new raw water pump station with three vertical turbine pumps, split-faced CMU building, metal roof, and associated mechanical appurtenances, electrical equipment, and heating and cooling systems. Site improvements include water yard piping, storm drain modification, chain-link fence, site lighting, final grading, surface restoration, and landscaping restoration.

An unofficial bid set can be viewed on the District's website **www.SkagitPUD.org**. Construction plans, specifications, addenda, and planholders list for this project can be viewed or purchased on-line through Builders Exchange of Washington, Inc., at **http://www/bxwa.com**; 2607 Wetmore Avenue, Everett, WA 98201-2929, (425) 258-1303, Fax (425) 259-3832. Click on: "bxwa.com"; "Posted Projects"; "Public Works", "PUD #1 of Skagit County" and "Projects Bidding". *(*Note*: Bidders are encouraged to "Register as a Bidder" in order to receive automatic e-mail notification of future addenda and to be placed on the "Bidders List". This service is provided free of charge to Prime Bidders, Subcontractors and Vendors bidding this project. Contact Builders Exchange of Washington at (425) 258-1303, should you require further assistance.)* Addenda will be sent out to those who "Register as a Bidder" on Builders Exchange of Washington, Inc., at **http://www/bxwa.com**. Contract documents will be available on or after September 29, 2020.

2.01 LOCATION

The location for the project is adjacent to the existing Raw Water Pump Station at 12061 Morford Road within the County of Skagit, State of Washington as shown on the Contract Drawings.

3.01 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE

Bidders shall satisfy themselves as to construction conditions by personal examination of the Plans, Specifications, other Bid Documents, and from attendance at applicable Pre-Bid Meetings. Bidders shall carefully correlate their observations with the requirements of the Contract Documents and shall otherwise satisfy themselves regarding the expense and difficulties associated with performing the Work and shall fully account for it in their bids. The submission of a bid shall constitute a representation of compliance by the Bidder with this requirement.

3.02 BID DOCUMENTS

The Bid Documents for the Project include the following:

Project Manual including general and technical specifications.
Washington State Department of Transportation Standard Specifications.
Contract Drawings.
Skagit PUD Design Standards and Details.

4.01 BIDS

The project will be awarded based on the lowest responsive responsible Bidder.
Bids shall be made on the forms included herewith and shall be addressed to the Public Utility District No. 1 of Skagit County, Post Office Box 1436, 1415 Freeway Drive, Mount Vernon, Washington 98273. Each Bid shall be placed in a sealed envelope and shall be mailed or delivered to the Public Utility District No. 1 of Skagit County, to arrive no later than 10:00 AM on October 20, 2020.

In person meetings are suspended; therefore, the bid opening will be held virtually through ZOOM Cloud Meetings no sooner than 10:01 AM on October 20, 2020. The web link, meeting ID, and passcode will be posted on the District's website at **www.SkagitPUD.org**. No Bid may be withdrawn after the time set for the Bid opening or before award and execution of the contract unless the Owner does not award the contract within sixty (60) calendar days after the opening of Bids.

5.01 BID DEPOSIT

As a guarantee of good faith and as required by law, each Bid shall be accompanied by a Bid Deposit in the form of certified check, cashier's check, postal money order, or surety bond payable to the order of the "Public Utility District No. 1 of Skagit County" for an amount not less than 5 percent of the total amount of the Bid, including all potential additions and alternatives, but not including sales tax. If a surety bond is to be used as the bid deposit, the document included with the bid submission must have original signatures. The Bid Deposits of the three lowest Bidders will be retained until the Contract between the successful Bidder and the Owner have been entered into and a Performance and Payment Bond in an amount of one-hundred percent (100%) of the contract price has been filed as required under these Contract Documents. The Bid Deposits of each other Bidder will be returned as soon as it is determined that they are not one of the three lowest Bidders.

5.02 ESCROW BID DOCUMENTS

Within 24 hours after the time of the Bid opening, the three low Bidders shall submit one copy of all documentary information generated in preparation of Bid prices for this Project. This material is hereinafter referred to as "Escrow Bid Documents" (EBD). The EBD of the Successful Bidder will be held in escrow for the duration of the Contract; refer to Supplementary Conditions for further information.

Timely submission of complete EBD is an essential element of the Bidder's responsibility and a prerequisite to Contract award. Failure to provide the necessary EBD is cause for the Owner to reject the Bid.

Bidders may submit EBD in their usual cost-estimating format. It is not the intention of this provision to cause the Bidder extra work during the preparation of the proposal, but to ensure EBD will be adequate to enable complete understanding and proper interpretation for their intended use. The EBD shall be in the language (e.g., English) of the Specifications.

EBD shall clearly itemize the estimated costs of performing the Work to allow a detailed cost review. EBD shall include all quantity takeoffs, crew, equipment, calculations of rates of production and progress, copies of quotations from Subcontractors and Suppliers, and memoranda, narratives, consultant's reports, add/deduct sheets, and all other information used by the Bidder to arrive at the prices contained in the Bid Form. Estimated costs should be broken down into the Bidder's usual estimate categories such as direct labor, repair labor, equipment operation, equipment ownership, expendable materials, permanent materials, and subcontract costs as appropriate. Materials, equipment, and indirect costs should be detailed in the Bidder's usual format. Bidder's allocation of material, equipment, indirect costs, contingencies, markup, and other items to each Bid item shall be included. All costs shall be identified. For Bid items amounting to less than $10,000, estimated unit costs are acceptable without a detailed cost estimate, providing labor, equipment, materials, and subcontracts, as applicable, are included and provided indirect costs, contingencies, and markup, as applicable, are allocated.

EBD shall be submitted in a sealed container. The container shall be clearly marked on the outside with the Bidder's name, date of submittal, Project name, and the words "Escrow Bid Documents."

EBD shall be accompanied by Escrow Bid Document Certificate form; signed by an individual authorized by Bidder to execute the Bid Form, stating material in the EBD constitutes all the documentary information used in the preparation of Bid and that the signatory has personally examined the contents of the container and has found the documents are complete. The Successful Bidder agrees, as a condition of the award of the Contract, the EBD constitutes all of the information used in preparation of its Bid, and that no other Bid preparation information shall be considered in resolving disputes.

Bid documents provided by the Owner should not be included in the EBD, unless needed to comply with the requirements of this Specification.

Prior to award, EBD of the apparent Successful Bidder will be examined, organized, and inventoried by representatives of the Owner, together with members of the Bidder's staff who are knowledgeable in how the Bid was prepared. This examination is to ensure the EBD are authentic, legible, and complete. It will not include review of, and will not constitute approval of, proposed construction methods, estimating assumptions, or interpretations of Contract Documents. Examination will not alter any condition(s) or term(s) of the Contract. EBD will not be used for pre-award evaluation of Bidder's anticipated methods of construction or to assess Bidder's qualifications for performing the Work. If all the documentation required herein has not been included in the original submission, additional documentation shall be submitted, at the

Owner's discretion, prior to award of the Contract. The detailed breakdown of estimated costs shall be reconciled and revised, if appropriate, by agreement between the Bidder and Owner before making the award.

If Contract is not awarded to the apparent Successful Bidder, the EBD of the next Bidder to be considered for award shall be processed as described herein. Following award of the Contact, EBD submitted by unsuccessful Bidders will be returned unopened, unless opened as provided above.

If Bidder's proposal is based on subcontracting any part of the Work, each Subcontractor, whose total subcontract price exceeds 5 percent of the Total Contract Price proposed by the Bidder, shall provide EBD to be included with those of the Bidder. These documents will be opened and examined in the same manner and at the same time as the examination described above for the apparent Successful Bidder.

6.01 EVALUATION OF BIDS AND AWARD OF CONTRACT

The Owner will award the Bid to the lowest responsive, responsible Bidder based on the Total Bid Amount as stated on the Bid Proposal Form. In the case of a conflict between the Total Bid Amount as stated numerically and as stated in words, the words shall take precedence.

In the case of a conflict between the quantity, unit price and unit price extension for a given bid item, the Owner will adjust the unit price extensions based on the unit price. If the Bidder does not provide a unit price or a unit price extension for every bid item, the bid will be considered non-responsive.

The right is reserved by the Owner to waive any and all informality in the Bids, to reject any or all Bids, including nonresponsive, unbalanced, or conditional bids, to reject any or all schedules, to re-advertise for new Bids, or to otherwise carry out the Work. The Owner reserves the right to reject any bid that is materially unbalanced to the Owner’s potential detriment. The Owner further reserves the right to delete portions of the Work.

Bids which are incomplete, or which are conditioned in any way, or which contain erasures, alterations, or items not called for in the Bid Form, or which are not in conformity with the law or these Instructions, may be rejected as non-responsive

6.02 RESPONSIBILITY CRITERIA

Before the Owner awards the contract, state law is used to determine that responsible contractors and subcontractors perform the work. Bidder responsibility is determined by the Bidder successfully demonstrating its ability to satisfy the mandatory responsibility criteria and any project specific criteria established by the Owner.

To comply with the responsibility criteria for this bid, a Bidder must provide sufficient information as required. If the Bidder fails to provide the requested information within the time and manner specified in these bid documents, the Owner reserves the option to determine responsibility upon any available information related to any supplemental criteria and/or may

find the Bidder not responsible. If the lowest Bidder is found not responsible, the Owner reserves the right to award to the next low Bidder without re-advertising or rebidding the project.

6.03 MANDATORY RESPONSIBILITY CRITERIA

It is the intent of Owner to award a contract to the low responsible bidder. Before award, the bidder must meet the following Bidder responsibility criteria to be considered a responsible bidder. The Bidder may be required by the Owner to submit documentation demonstrating compliance with the criteria. The Bidder must:

1. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of bid submittal.

2. Have a current Washington Unified Business Identifier (UBI) number.

3. If applicable:

    a) Have Industrial Insurance (workers' compensation) coverage for the bidder's employees working in Washington, as required in Title 51 RCW.
    b) Have a Washington Employment Security Department number, as required in Title 50 RCW.
    c) Have a Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW.

4. Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065(3).

5. Until December 31, 2013, not have violated more than one time the off-site, prefabricated, non-standard, project specific items reporting requirements of RCW 39.04.370.

6. For public works projects subject to the apprenticeship utilization requirements of RCW 3.0.04.320, 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 first date of advertising for the project.

7. Prior to the award date, the Contractor shall produce evidence of having received by the Department of Labor & Industries training on prevailing wage and public works requirements or are exempt under RCW 39.04.350.

6.04 SUBCONTRACTOR RESPONSIBILITY CRITERIA

Before award, the Bidder shall verify responsibility criteria for each first-tier subcontractor the Contractor hires and a subcontractor of any tier subcontractor that hires other subcontractors must verify responsibility criteria for each of its subcontractors. Verification shall occur at the

time of subcontract execution and shall include that each subcontractor meets the responsibility criteria listed in Section 6.03 and possesses an electrical contractor license (if required by RCW Chapter 19.28) or an elevator contractor license (if required by RCW Chapter 70.87). These verification requirements, as well as the responsibility criteria, shall be included in each of the Contractor's subcontracts of any tier. The Contractor shall certify that this verification is complete prior to contract close-out.

6.05 PROTESTS

Any Bidders wanting to file a bid protest shall submit a formal protest consisting of a written letter signed by an authorized official of the company within 48 hours of the bid opening. The protest will be reviewed by the Owner and if warranted, a meeting will be held with the Owner, the low Bidder and the Bidder filing the protest within 4 Calendar days to review the protest. A decision on the protest will be made by the Owner within 7 Calendar days.

6.06 CONTRACT TIME

The Contract completion date is an essential part of the Contract, and it will be necessary for each Bidder to satisfy the Owner of its ability to complete the Work within the time allowed. Bidders shall base their bids on utilizing the full Contract Time of 365 Calendar Days for the Work, as specified.

7.01 FAILURE TO EXECUTE CONTRACT AND FURNISH BOND

In the event the successful Bidder fails to furnish a Payment and Performance Bond complying with this Invitation for Bids, and fails to sign the contract within ten (10) calendar days after notification by the Owner, an amount equal to 5 percent of the amount of the Bid shall be forfeited to the Owner as liquidated damages, and it is agreed that this said sum is a fair estimate of the amount of damages the Owner would sustain in the event that the Bidder failed to enter into the Contract or furnish the required Bond. Said liquidated damages shall be paid from the Bid Deposit submitted with the Bid. Other Bids will then be reconsidered for award by the Owner.

8.01 CORRECTIONS, INTERPRETATIONS, AND ADDENDA

If Bidders find or observe any omissions, discrepancies, or need for interpretations of the Bid Documents, they shall bring such facts in writing to the attention of the Owner. Written addenda to clarify questions which arise will then be issued. Interpretations or explanations of the Contract Documents will be in the form of written addenda only. Oral statements by the Owner, Engineer, or other representative of the Owner whether made before or after award of the Contract shall in no way modify the Contract Documents.

Any requests for information or interpretation of the Bid Documents shall be made by phone or email to Catherine Price, Contract Coordinator (360) 424-7104 or price@skagitpud.org. All such requests shall be received no later than three (3) days prior to Bid opening.

10.01 SUBCONTRACTORS & SUPPLIERS

In compliance with RCW 39.30.060 for all projects estimated to cost $1 million or more, all Bidders must complete and submit the Subcontractors List form provided in the Bid Proposal Forms. The Subcontractors List form must be submitted with the Bid. The failure of a Bidder to submit the names of such subcontractors, or to name itself to perform such work, or the naming of two or more firms (subcontractors or Bidders) to perform the same work shall render the Bidder's bid non-responsive and, therefore, void.

11.01 BIDDER QUALIFICATIONS

All Bidders shall submit with their bids evidence of sufficient qualifications and experience for the work as specified in Bid Proposal Forms. The Owner will utilize the information submitted for the purpose of determining the responsibility of the low Bidder for determining eligibility for award.

The Bidder should have experience over the most recent past five (5) years with successfully completing public works projects similar in size and complexity to the current Project. The Contractor's Superintendent and Project Manager should also have experience within the past five (5) years successfully managing to completion public works projects of similar size and complexity to the current Project.

1. Provide a list of public works construction contracts similar in size and complexity that the Bidder's organization has completed in each of the past five (5) years, giving the date of completion, name of the project, and the name, address, and phone number of the project owner. This information will be used for references.

2. Provide a list of public works construction contracts similar in size and complexity that the Bidder's superintendent has completed in each of the past five (5) years, giving the date of completion, name of the project, and the name, address, and phone number of the project owner. This information will be used for references.

3. Provide a list of public works construction contracts similar in size and complexity that the Bidder's project manager has completed in each of the past five (5) years, giving the date of completion, name of the project, and the name, address, and phone number of the project owner. This information will be used for references.

12.01 PERMITS

The Owner has obtained or will obtain the permits and approvals required for the Work as listed below. The Contractor shall comply with the provisions of all permits, approvals and easements. All other required permits or licenses (i.e. right of way permits) shall be the responsibility of the Contractor. Below is a list of the Owner-obtained permits and approvals, which are included for reference in Appendix A.

State Environmental Policy Act (SEPA) Determination of Non-significance
Skagit County Building Permit

Should the Contractor procure additional formal or informal access easements, rights of entry, Work or storage areas, or enter private property, he/she shall obtain and file all such private property agreements with the Owner prior to such access. The Contractor shall provide to the Owner property release forms for all Work or access on private property.

13.01 PRE-BID MEETING

A Pre-Bid Meeting will be held at 10:00 AM on Tuesday, October 13, 2020, at the project site at 19061 Morford Road, Sedro-Woolley, Washington.

END OF SECTION

Mandatory Bidder Responsibility Checklist

The following checklist may be used by Owners in documenting that a Bidder meets the mandatory bidder responsibility criteria. It is suggested that Owners print a copy of documentation from the appropriate website to include with this checklist in the contract file.

General Information	
Project Name: Judy Raw Water Pump Station Replacement	Project Number: 3766
Bidder's Business Name:	Bid Submittal Deadline:
Contractor Registration – https://fortress.wa.gov/lni/bbip/	
License Number:	Status: Active: Yes ☐ No ☐
Effective Date (must be effective on or before Bid Submittal Deadline):	Expiration Date:
Is Bidder on Infraction List?	Yes ☐ No ☐
Current UBI Number – http://dor.wa.gov/content/doingbusiness/registermybusiness/brd/	
UBI Number:	Account Closed: Open ☐ Closed ☐
Industrial Insurance Coverage – https://fortress.wa.gov/lni/crpsi/MainMenu.aspx	
Account Number:	Account Current: Yes ☐ No ☐
Employment Security Department Number –	
Employment Security Department Number:	
• Has Bidder provided account number on the Bid Form? Yes ☐ No ☐ • And/or have you asked the Bidder for documentation from Employment Security Department on account number? Yes ☐ No ☐	
State Excise Tax Registration Number – http://dor.wa.gov/content/doingbusiness/registermybusiness/brd/	
Tax Registration Number:	Account Closed: Open ☐ Closed ☐
Not Disqualified from Bidding – http://www.lni.wa.gov/TradesLicensing/PrevWage/AwardingAgencies/DebarredContractors/default.asp	
Is the Bidder listed on the "Contractors Not Allowed to Bid" list of the Department of Labor and Industries? Yes ☐ No ☐	
Checked by:	
Name of Employee:	Date:

Subcontractor Responsibility Checklist

The following checklist may be used by Contractors and Subcontractors in documenting that a subcontractor of any tier meets the subcontractor responsibility criteria. It is suggested that Contractors and Subcontractors print a copy of documentation from the appropriate website to include with this checklist in their contract file.

General Information	
Project Name: Judy Raw Water Pump Station Replacement	Project Number: 3766
Subcontractor's Business Name:	Subcontract Execution Date:
Contractor Registration – https://fortress.wa.gov/lni/bbip/	
License Number:	Status: Active: Yes ☐ No ☐
Effective Date (must be effective on or before Subcontract Bid Submittal Deadline):	Expiration Date:
Current UBI Number – http://dor.wa.gov/content/doingbusiness/registermybusiness/brd/	
UBI Number:	Account Closed: Open ☐ Closed ☐
Industrial Insurance Coverage – https://fortress.wa.gov/lni/crpsi/MainMenu.aspx	
Account Number:	Account Current: Yes ☐ No ☐
Employment Security Department Number –	
Employment Security Department Number:	
• Has Subcontractor provided account number on the Bid Form? Yes ☐ No ☐ • And/or have you asked the Subcontractor for documentation from Employment Security Department on account number? Yes ☐ No ☐	
State Excise Tax Registration Number – http://dor.wa.gov/content/doingbusiness/registermybusiness/brd/	
Tax Registration Number:	Account Closed: Open ☐ Closed ☐
Not Disqualified from Bidding – http://www.lni.wa.gov/TradesLicensing/PrevWage/AwardingAgencies/DebarredContractors/default.asp	
Is the Subcontractor listed on the "Contractors Not Allowed to Bid" list of the Department of Labor and Industries? Yes ☐ No ☐	
Contractor Licenses – https://fortress.wa.gov/lni/bbip/	
Electrical: If required by Chapter 19.28 RCW, does the Subcontractor have an Electrical Contractor's License? Yes ☐ No ☐	Elevator: If required by Chapter 70.87 RCW, does the Subcontractor have an Elevator Contractor's License? Yes ☐ No ☐
Checked by:	
Name of Employee:	Date:

BID PROPOSAL FORMS

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BID PROPOSAL FORM

BIDDER'S CHECKLIST

This Checklist has been prepared and furnished to aid Bidders in including all necessary supporting information with their Bid. Bidder's submittals shall include, but not be limited to, the following:

ITEM	CHECKED
1. Bid to Commission	
2. Bid Schedule	_____
3. Proposal Signature, Addenda Acknowledgement and Non-Collusion Declaration Sheet	_____
4. Subcontractor List	_____
5. Bidders List	_____
6. Bidder’s Qualifications	_____
7. Bid Deposit	_____

BID TO COMMISSION

TO: Board of Commissioners
Public Utility District No. 1 of Skagit County, Washington

Gentlemen:

The undersigned has examined the site, specifications, plans, laws and ordinances covering the improvements contemplated. In accordance with the terms, provisions and requirements of the foregoing, the following lump sums and unit prices are tendered as an offer to perform the Work and furnish the labor, tools, equipment, materials, appurtenances, incidentals, and guarantees, where required, complete in place, in good working order.

As a guarantee of good faith and as required by law, a Bid Deposit in the form of a certified check, cashier's check, postal money order or surety bond made payable to the order of Public Utility District No. 1 of Skagit County ("District") is attached hereto. The undersigned understands and hereby agrees that, should this offer be accepted and the undersigned fail or refuse to enter into a Contract, furnish the required Payment and Performance Bond and required liability insurance, the undersigned shall forfeit to the District an amount equal to five percent (5%) of the amount Bid as liquidated damages, all as provided for in this Invitation for Bids.

The undersigned hereby proposes to undertake and complete the work embraced in this improvement, in accordance with the terms of the Specifications and Contract Documents, at the following lump sum and unit prices:

JUDY RAW WATER PUMP STATION REPLACEMENT
BID SCHEDULE

Item No.	Bid Schedule Description	Estimated Quantity	Unit Price	Total
1	Mobilization	1 LS	$	$
2	Contractor Health and Safety Plan, Site-Specific Safety Plan, and Spill Prevention Control and Countermeasure (SPCC) Plan	1 LS	$	$
3	Staking and Project Control	1 LS	$	$
4	Temporary Erosion and Sedimentation Control	1 LS	$	$
5	Furnish and Install Adequate Site and Trench Safety Systems in Accordance with Chapter RCW 49.17	1 LS	$	$
6	Site Work	1 LS	$	$
7	Chemical Injection Vault and Chemical Feed Line	1 LS	$	$
8	Buried Water Main and Building Drains Outside of Building Footprint	1 LS	$	$
9	Structural	1 LS	$	$
10	Finishes	1 LS	$	$
11	Pumps, Suction Barrels, Motors, Seals and Seal Safe System	1 LS	$	$
12	Heating and Ventilation	1 LS	$	$
13	Mechanical	1 LS	$	$
14	Electrical	1 LS	$	$
15	Automatic Control	1 LS	$	$
16	Testing, Startup and Training (min. $5,000)	1 LS	$	$
17	Demobilization and Cleanup	1 LS	$	$
18	As-Builts	1 LS	$ 5,000	$ 5,000
19	Operation and Maintenance Manuals	1 LS	$ 5,000	$ 5,000
20	Force Account	1 FA	$ 10,000	$ 10,000

Sub-Total Base Bid $ _____

Sales Tax (8.5%) $ _____

Total Bid Amount $ _____

_____ **DOLLARS**

Total Bid Amount (written in words)

PROPOSAL SIGNATURE, ADDENDUM ACKNOWLEDGMENT AND NON-COLLUSION DECLARATION

The bidder is hereby advised that by signature of this proposal he/she is deemed to have acknowledged all requirements and signed all certificates contained herein. The undersigned hereby agrees to pay to labor not less than the prevailing rates of wages or less than the hourly minimum rate of wages as specified in the Specifications and Conditions for this project. A proposal guarantee in an amount of five percent (5%) of the total bid not including sales tax, based upon the approximate estimate of quantities at the above prices and in the form as indicated below, is attached hereto:

CASH $ _____ CASHIER'S CHECK $ _____

BID BOND $ _____ CERTIFIED CHECK $ _____

Receipt is hereby acknowledged of Addenda Nos. _____, _____, and _____.

I, by signing the proposal, hereby declare, under penalty of perjury under the laws of the United States that the undersigned person(s), firm, association or corporation has (have) not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the project for which this proposal is submitted.

SIGNATURE OF AUTHORIZED OFFICIAL(S)
NOTE: Proposal must be signed

Signature _____

Firm Name _____

Address _____

_____

_____
Washington State Contractor's License Number

Sworn to before me this _____ day of _____, 20_

_____
(SEAL) NOTARY PUBLIC

SUBCONTRACTORS LIST – RCW 39.30.060 FORM

In compliance with RCW 39.30.060 for all projects estimated to cost $1 million or more, all Bidders must complete and submit this Subcontractors List form with their Bid Proposal.

List of Subcontractors: The Bidder shall indicate on the Subcontractors List the names of the subcontractors with whom the Bidder, if awarded the contract, will subcontract for performance of the work of heating, ventilation and air conditioning, plumbing as described in Chapter 18.106 RCW, and electrical as described in Chapter 19.28 RCW.

List Bidder if Bidder Performing Work: If the Bidder will perform the work in any of the three areas required, the Bidder shall name itself for the work on the Subcontractors List.

Name Only One Form for Each Category of Work: The Bidder shall not list more than one firm (subcontractor or Bidder) for each category of work identified, unless subcontractors vary with bid alternates or additive, in which case the Bidder must indicate which firm will be used for which alternate or additive.

Substitution of Subcontractors: Substitution of any listed subcontractor may only be according to the procedure and parameters set forth in RCW 39.30.060.

Factors relating to Non-Responsiveness: Failure of the Bidder to submit the names of such subcontractors, or to name itself to perform such work, or the naming of two or more firms (subcontractor or Bidder) to perform the same work shall render the Bidder's bid non-responsive and, therefore, void.

Applicable to Direct Subcontractors: The requirement of this section to name the Bidders' proposed heating, ventilation and air conditioning, plumbing and electrical subcontractors applies only to proposed heating, ventilation and air conditioning, plumbing and electrical subcontractors who will contract directly with the Bidder.

Submission Requirements: The Subcontractors List must be submitted with the Bid Proposal.

Trade	**Bidder must check one box for each Trade. If subcontracting the work, Bidder must name the subcontractor.**
HVAC (Heating, Ventilation and Air Conditioning	□ N/A (this project does not include this work) □ Bidder will self-perform this work □ Name and address of subcontractor _____ _____
Plumbing	□ N/A (this project does not include this work) □ Bidder will self-perform this work □ Name and address of subcontractor _____ _____
Electrical	□ N/A (this project does not include this work) □ Bidder will self-perform this work □ Name and address of subcontractor _____ _____

Trade	**Bidder must check one box for each Trade. If subcontracting the work, Bidder must name the subcontractor.**
Structural Steel and Rebar	□ N/A (this project does not include this work) □ Bidder will self-perform this work □ Name and address of subcontractor _____ _____

BIDDERS LIST

Contractors are required to complete the following information for all subcontractors submitting bids for this work. The Bidders List is required to be submitted with the Bid. (use additional sheets if necessary)

Subcontractor's Name and Point of Contact	Address, Phone, and E-Mail Address	Work Bid by Subcontractor	Status as MBE/WBE or Non MBE/WBE

BIDDER'S QUALIFICATIONS

1. Comparable Contract History

The following is a partial list of the jobs our organization completed within the past five (5) years which are similar in character to this project.

Year	Project Name	Owner Representative	Owner's Phone No.

2. Superintendent Work History

The following is a partial list of the jobs our superintendent, _____ (name) completed within the past five (5) years which are similar in character to this project.

Year	Project Name	Owner Representative	Owner's Phone No.

3. Project Manager Work History

The following is a partial list of the jobs our project manager, _____ (name) completed within the past five (5) years which are similar in character to this project.

Year	Project Name	Owner Representative	Owner's Phone No.

Name of Company: _____

Address: _____

Telephone: _____

_____
Date

_____
Signature

_____
Title

_____
Contractor's License Number

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, _____

_____

of_____

Hereinafter called the Contractor (Principal), and _____

_____

a corporation duly organized and existing under and by virtue of the laws of the State of _____ hereinafter called the Surety, and authorized to transact business within the State of Washington as Surety, are held and firmly bound unto Public Utility District No. 1 of Skagit County, Washington (Obligee) in the full and penal sum of five percent (5%) of the total bid amount appearing on the bid proposal of said principal for the work hereinafter described, for the payment of which, well and truly be made to the Owner, the Contractor and the Surety bind themselves and each of their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THE ABOVE OBLIGATION ARE SUCH THAT WHEREAS, the Principal herein is herewith submitting his or its bid proposal for JUDY RAW WATER PUMP STATION REPLACEMENT_____

NOW THEREFORE, if the bid proposal submitted by the Principal is accepted, and the contract is awarded to said Principal, and if said Principal shall duly make and enter into and execute said contract and shall furnish the Performance and Payment Bond as required by the bidding and contract documents within a period of ten (10) days from and after said award, exclusive of the day of such award, then its obligation to pay the above-mentioned penal sum as liquidated damages shall be null and void, otherwise it shall remain and be in full force and effect.

Signed and sealed this _____ day of _____, 20____.

_____	_____
Contractor	Surety
By _____	By _____
	Attorney-In-Fact
Title _____	
Corporate Seal	Corporate Seal

The Attorney-In-Fact who executes this bond on behalf of the Surety must attach a copy of his Power of Attorney as evidence of his authority.

APPROVED AS TO FORM:

Public Utility District No. 1 of Skagit County, Owner _____, 20____

This Bond is executed in pursuance of Chapter 39.08, Revised Code of Washington.

NOTE: The Surety named on this Bond shall be one which is licensed to conduct business in the state where the project is located, and named in the current list of Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies, as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of the authority to act for the Surety at the time of the signing of this Bond.

Corporate Seal:

CERTIFICATE AS TO CORPORATE SEAL

I hereby certify that I am the (Assistant) Secretary of the Corporation named as Principal in the within Bond; that _____who signed the said Bond on behalf of the Principal, was _____of said Corporation; that I know his signature thereto is genuine, and that said Bond was duly signed, sealed, and attested for and in behalf of said Corporation by authority of its government body.

_____
Secretary or Assistant Secretary

A copy of this bond shall be filed with the County Auditor.

ATTACH POWER OF ATTORNEY

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AGREEMENT

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AGREEMENT
Project No. CP-5040-3766-____

THIS CONTRACT is made and entered into by and between the **PUBLIC UTILITY DISTRICT NO. 1 OF SKAGIT COUNTY** (District/Owner) and _____ (Contractor) whose names are subscribed hereto.

WITNESSETH:

WHEREAS the Owner has caused the preparation of certain Contract Documents entitled **JUDY RAW WATER PUMP STATION REPLACEMENT**.

WHEREAS the Owner has invited proposals, has received and analyzed said proposals, and has duly given notice of Acceptance of Proposal to the Contractor herein set forth and as stated more in detail in the Contract Documents which are defined in Section II General Conditions, all of which Contract Documents are made a part hereof and which constitute the whole Contract between the Owner and the Contractor.

NOW, THEREFORE, it is hereby agreed that:

1. The Contractor shall furnish the work, pay all costs, and perform all requirements of this Contract in the manner specified in the Contract Documents, and;

2. The Proposal calls for unit prices and lump sums in the Bid Schedule(s) set forth in (1) above. The Owner shall pay to the Contractor a corrected Total Contract Amount computed from the unit prices and lump sums in said Bid Schedule(s) set forth in the Contractor's Proposal and the actual quantities of units furnished. Based upon the lump sum and unit prices in said Bid Schedule(s) set forth in the Contractor's Proposal and upon the quantities estimated from the Contract Drawings for bidding purposes, the estimated Total Contract Amount is $ _____ _____ ($_____.00), and;

3. In Washington State the Owner is required to pay state or local sales or use taxes included in the Total Contract Amount and the Contractor is required to receive the said taxes for payment to the state, the amount payable to the Contractor by the Owner shall be the Total Contract Amount as above specified including the amount of the said taxes, and;

4. It is further agreed that the Contractor will start work within ten (10) Calendar days after the date specified in the Owner's Notice to Proceed and shall be substantially complete within 365 Calendar days from the date of Notice to Proceed is issued, and;

5. In the event that the Contractor fails to substantially complete the Project by the date of substantial completion as specified above or as modified by Change Order, the Contractor shall be liable for liquidated damages of One Thousand and no/100 Dollars ($1,000.00) per calendar day thereafter until the Owner determines the Project to be substantially complete, and;

6. The attached Indemnification Agreement is hereby made part of this agreement.

IN WITNESS WHEREOF, two (2) identical counterparts of this Contract, each of which shall for all purposes be deemed an original hereof, have been duly executed by the parties hereto.

CONTRACTOR	PUBLIC UTILITY DISTRICT NO. 1 OF SKAGIT COUNTY, WASHINGTON
By _____	By _____ George Sidhu, P.E., General Manager
Title _____	
Date _____	Date _____

INDEMNIFICATION AGREEMENT

The Contractor agrees to defend, indemnify, and hold the District harmless from any and all claims, demands, losses, and liabilities to or by third parties arising from, resulting from, or connected with work performed or to be performed under this Contract by the Contractor, its agents, employees, and subcontractors, even though such claims may prove to be false, groundless or fraudulent, to the fullest extent permitted by law and subject to the limitations provided below.

The Contractor's duty to indemnify the District shall not apply to liability for damages arising out of bodily injury to persons or damage to property caused by or resulting from the sole negligence of the District or the District's agents or employees. The Contractor's duty to indemnify the District for liability for damages arising out of bodily injury to persons or damage to property caused by or resulting from the concurrent negligence of Contractor, its agents, employees, or subcontractors and/or the District or the District's agents or employees, shall apply only to the extent of negligence of Contractor, its agents, employees, or subcontractors.

With respect to claims against Contractor by the District pursuant to this Contract only, Contractor expressly waives any immunity that may be granted it under the Workers' Compensation, Industrial Insurance or like statutes and/or any administrative regulations issued pursuant thereto. This waiver does not include or extend to any claims by Contractor's employees directly against Contractor.

Further, Contractor's defense and indemnification obligations under this Contract shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable to or for any third party under Workers' Compensation, Industrial Insurance or like statutes and/or any administrative regulations issued pursuant thereto.

Contractor's duty to indemnify the District for liabilities or losses, other than for bodily injury to persons or damage to property caused by or resulting from negligence, shall apply only to the extent of the fault of Contractor, its agents, employees, or subcontractors, except in situations where fault is not a requirement for liability, in which case indemnity will be provided to the extent the liability or loss was caused by Contractor or its agents, employees, or subcontractors.

Contractor's duty to defend, indemnify and hold the District harmless shall include, as to all claims, demands, losses and liabilities to which it applies, the District's actual attorneys' fees and costs incurred in connection with defending such claim(s) including, without limitation, consultant and expert witness fees and expenses and personnel-related costs in addition to costs otherwise recoverable by statute or court rule.

THE UNDERSIGNED HEREBY CERTIFY THAT THIS AGREEMENT WAS MUTUALLY NEGOTIATED.

CONTRACTOR	PUBLIC UTILITY DISTRICT NO. 1 OF SKAGIT COUNTY
By: _____	By: _____
Name, Title	George Sidhu, P.E., General Manager
Dated: _____	Dated: _____

The Contractor shall cause each of its subcontractors (and suppliers to the extent any perform any work on the Project site) to execute an Indemnification Contract substantially in the form of the foregoing by which each such entity or person assumes to the District all obligations Contractor assumes to the District as set forth above.

Certificate of Owner's Attorney

I, the undersigned, **Peter Gilbert**, the duly authorized and acting legal representative of Public Utility District No. 1 of Skagit County, do hereby certify as follows

I have examined the attached contract(s) and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements are adequate and have been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with terms, conditions, and provisions thereof.

_____

Peter Gilbert, Attorney

Date: _____

PERFORMANCE AND PAYMENT BOND

Bond No._____
Amount: $_____

KNOW ALL MEN BY THESE PRESENTS, that

_____

Of_____
Hereinafter called the Contractor (Principal), and _____

_____

a corporation duly organized and existing under and by virtue of the laws of the State of _____ hereinafter called the Surety, and authorized to transact business within the State of Washington as Surety, are held and firmly bound unto Public Utility District No. 1 of Skagit County, Washington as Owner (Obligee), in the sum of _____ Dollars ($_____), lawful money of the United States of America, for the payment of which, well and truly be made to the Owner, the Contractor and the Surety bind themselves and each of their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents as follows:

THE CONDITIONS OF THE ABOVE OBLIGATION ARE SUCH THAT:
WHEREAS, the Contractor has executed and entered into a certain Contract hereto attached, with the Owner, dated _____, 20____.
For:_____
_____.

IN WITNESS:NOW THEREFORE, if Contractor, its heirs, executors, administrators, successors, or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and agreements in the said Contract for the duration thereof, including the one-year warranty period, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said Contract that may hereafter be made, at the time and in the manner therein specified and shall pay all laborers, mechanics, subcontractors or lower tier subcontractors, and material persons, and all persons who shall supply such person or persons, or subcontractors or lower tier subcontractors, with provisions and supplies for the carrying on of such work, on his or their part, and shall indemnify and save harmless Owner, its officers and agents, then this obligation shall become null and void; otherwise, it shall be and remain in full force and effect.

And Surety, for value received, hereby further stipulates and agrees that no change, extension of time, alteration or addition to the terms of Contract or to the work to be performed thereunder or the plans or specifications accompanying the same shall in any way affect its obligation of this Bond, and it does hereby waive notice of any change, extension of time, alterations or additions to the terms of the Contract, the plans or the specifications.

Surety hereby agrees that modifications and changes may be made in the terms and provisions of the Contract without notice to Surety, and any such modifications or changes increasing the total amount to be paid the Contractor shall automatically increase the obligation of the Surety on this Bond in a like amount.

The Surety expressly acknowledges that it shall be liable, under this Bond, for any liquidated damages assessed against the Contractor in accordance with the provisions of the Contract.

Any claim(s) relating to or against this Bond shall be subject to and decided by arbitration in accordance with the provisions of the Revised Code of Washington Chapter 7.04.

Any dispute relating to the performance or enforcement of the provisions of this Bond shall be governed by Washington State Law. Jurisdiction and venue shall be Skagit County Courts. If non-binding arbitration or mediation is conducted involving the Owner, the Contractor, the Surety, or any other party concerning or in any way relating the work required or alleged to be required by the Contract, the Contractor and Surety expressly consent to a consolidated or joint arbitration if and as called for by the Owner. The prevailing party in each such litigation shall be entitled to recover its attorneys' fees, in addition to any other relief granted.

IN WITNESS WHEREOF, the Contractor and the Surety have caused this bond and two (2) counterparts thereof to be signed and sealed by their duly authorized officers.

Signed and sealed this _____ day of _____, 20____.

_____	_____
Contractor	Surety
By _____	By _____
	Attorney-In-Fact
Title _____	
Corporate Seal	Corporate Seal

Address of local office and agent of Surety Company:

_____
_____
_____
_____

Certification of Compliance with Wage Payment Statutes

The bidder hereby certifies that, within the three-year period immediately preceding the bid solicitation date of October 20, 2020, the bidder is not a "willful" violator, as defined in RCW 49.48.082, of any provision of chapters 49.46, 49.48, or 49.52 RCW, as determined by a final and binding citation and notice of assessment issued by the Department of Labor and Industries or through a civil judgment entered by a court of limited or general jurisdiction.

I certify under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

_____
Bidder

_____
Signature of Authorized Official*

_____
Printed Name

_____
Title

_____ _____ _____
Date City State

Check One:
Individual ☐ Partnership ☐ Joint Venture ☐ Corporation ☐

State of Incorporation, or if not a corporation, State where business entity was formed:

_____

If a co-partnership, give firm name under which business is transacted:

_____

** If a corporation, proposal must be executed in the corporate name by the president or vice-president (or any other corporate officer accompanied by evidence of authority to sign). If a co-partnership, proposal must be executed by a partner.*

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GENERAL CONDITIONS

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GENERAL CONDITIONS

NOTICE OF DISCLAIMER

TAKE NOTICE, that the General Conditions are the 2020 Edition of the Washington State Department of Transportation Standard Specifications for Road, Bridge and Municipal Construction.

TAKE NOTICE, that these General Conditions have been materially amended by certain additions, deletions or other modifications to meet the needs of the Public Utility District No.1 of Skagit County. These amendments are contained in the Supplementary General Conditions.

END OF SECTION

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SUPPLEMENTARY GENERAL CONDITIONS

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SUPPLEMENTARY GENERAL CONDITIONS

The following provisions of the Washington State 2020 Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT) Division 1 General Requirements is hereby amended, changed, or supplemented and superseded as follows. All other provisions which are not amended, changed, or supplemented remain in full force.

1	Order of Precedence	
2	Section 1-01.3	Definitions
3	Section 1-03	Award and Execution of Contract
3.1	Section 1-03.4	Contract Bond
3.2	Section 1-03.8	Award and Execution of Contract
4	Section 1-05	Control of Work
4.1	Section 1.05.0	General
4.2	Section 1-05.4	Conformance With and Deviations from Plans and Stakes
4.3	Section 1-05.10	Guarantees
5	Section 1-07	Legal Relations and Responsibilities to the Public
5.1	Section 1-07.1(1)	Laws to be Observed
5.2	Section 1-07.6	Permits and Licenses
5.3	Section 1-07.9	Wages
5.4	Section 1-07.18	Public Liability and Property Damage Insurance
5.5	Section 1-07.26	Personal Liability of Public Officers
6	Section 1-08	Prosecution and Progress
6.1	Section 1-08.5	Time for Completion (Contract Time)
6.2	Section 1.08.9	Liquidated Damages
6.3	Section 1.08.10(2)	Termination for Public Convenience
7	Section 1-09	Measurement and Payment
7.1	Section 1-09.4	Equitable Adjustment
7.2	Section 1-09.6	Force Account
7.3	Section 1-09.11(3)	Time Limitations and Jurisdiction
7.4	Section 1-09.13(3)	Claims Resolution
7.5	Section 1-09.14	Claims Against Contractor's Retainage and/or Public Contract Bond

1 ORDER OF PRECEDENCE. THE ORDER OF PRECEDENCE OF THE CONDITIONS OF THE CONTRACT ARE AS LISTED BELOW - FIRST IS THE HIGHEST AND LAST IS THE LOWEST:

Addenda
Bid Forms
Technical Specifications
Drawings
Special Provisions
Supplementary General Conditions
Division 1 General Requirements (WSDOT) 2020 Edition

2 SECTION 1-01.3 DEFINITIONS IS SUPPLEMENTED BY ADDING THE FOLLOWING DEFINITIONS:

Whenever these words are used in the Contract Documents, they shall have the following meanings:

"COMMISSION": Redefined to mean the three elected Commissioners of the District; substitute for "Commission" and "Washington State Transportation Commission" whenever cited.

"CONTRACTING AGENCY", "DISTRICT" or "OWNER": Public Utility District No. 1 of Skagit, Washington; substitute for "State," "Department," and "Department of Transportation" whenever cited.

"GENERAL MANAGER": The person appointed by the Commission per RCW 54.16.100 as the chief administrative officer of the District; substitute for "Secretary" and "Secretary of Transportation" whenever cited.

"ENGINEER": Public Utility District No. 1 of Skagit County and its sub consultants.

"STANDARD PLANS": Redefined to refer to the Standard Detail Sheets included with the Plans and Specifications as well as the WSDOT Standard Plans. The requirements of the Standard Detail Sheets shall be controlling in the case of any discrepancy between the Standard Details and the WSDOT Standard Plans.

3 SECTION 1-03 AWARD AND EXECUTION OF CONTRACT IS SUPPLEMENTED BY ADDING THE FOLLOWING:

3.1 Add the following to Section 1-03.4, Contract Bond:

Upon substantial completion of the Project, the Contractor shall provide a Utility Maintenance Bond for 25% of the Total Contract Amount on the form specified by the District that warrants all equipment, materials, and labor it furnishes or performs under the

Agreement against defects in design, materials, and workmanship for one (1) year after final acceptance as described in Section 1-05.10.

3.2 Add the following new Section 1-03.8 Award and Execution of Contract:

1-03.8 **Award and Execution of Contract**

1-03.8(1) The Contract for the Project shall be awarded to the responsible Bidder submitting the lowest responsive Bid. The lowest responsive Bid shall be determined by the total of the amount of the base Bid and the amount(s) Bid for any alternate(s) which the Owner, in its discretion, elects to include in the Contract.

4 SECTION 1-05 CONTROL OF WORK IS REVISED AS FOLLOWS:

4.1 Insert the following new Section 1-05.0 General:

1-05.0 **General**

Where the Specifications, the Owner's instructions, laws, ordinances, or any government authority require any work to be specially tested, or inspected, the Contractor shall give the Owner timely notice that such test of completed work is ready for inspection. If the inspection is by another authority than the Owner, the Contractor shall give the Owner timely notice of the date fixed for such inspection. Required certificates of inspection by other authority than the Owner shall be secured by the Contractor.

4.2 Revise Section 1-05.4, Conformance With And Deviation From Plans And Stakes, as follows:

Delete the word “Engineer” and replace with “Contractor” throughout this section with reference to setting stakes, marks, lines, etc. for the layout and prosecution of the Work. All surveying and layout required for this Project shall be performed by the Contractor. The Engineer retains final authority for determination of conformity of the Work and shall be notified immediately of any errors found to cause deviations in the Work.

4.3 Delete Section 1-05.10, Guarantees, and replace with the following:

1-05.10 **Guarantees**

The Contractor shall furnish to the Contracting Agency any guarantee or warranty furnished as a normal trade practice in connection with the purchase of any equipment, materials, or items used in the construction of the project.

The Contractor shall be responsible for correcting all defects in workmanship and materials incurred within one year (365 days) after the date of final acceptance of the project. When corrections of defects are made, the Contractor shall be responsible for correcting all defects in workmanship and/or materials in the corrected Work for one year after

acceptance of the correction by the Owner. The Contractor shall commence remedying such defects within seven (7) days of receipt of notice of discovery thereof from the Owner and shall complete such Work within a reasonable time. In emergencies, where damage may result from delay or where loss of service may result, such corrections may be made by the Owner, in which case the cost shall be borne by the Contractor. In the event the Contractor does not complete corrections within a reasonable time, the Work shall be otherwise accomplished and the cost of same shall be paid by the Contractor.

The Contractor shall be liable for any costs, losses, expenses, or damages, including consequential damages, suffered by the Owner resulting from defects in the Contractor's Work including but not limited to costs, labor, materials, equipment and administration incurred by Owner in making emergency repairs of such defective Work and associated costs of engineering, inspection, and supervision by the Owner or Engineer. The Contractor shall defend, indemnify, and hold the Owner harmless from any and all claims which may be made against the Owner as a result of Contractor's defective Work.

5 SECTION 1-07 LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC IS SUPPLEMENTED BY ADDING THE FOLLOWING:

5.1 Add the following Section 1-07.1(1) Owner Safe Access:

1-07.1(1) **Owner Safe Access.**

The Contractor shall provide safe access for the Owner and its inspectors to adequately inspect the quality of work and the conformance with Contract Documents. The Contractor shall provide adequate lighting, ventilation, ladders, and other protective facilities as may be necessary for the safe performance of inspections.

5.2 Add the following to Section 1-07.6, Permits And Licenses:

The Contractor shall comply with all requirements of all permits provided by the Owner for this project.

5.3 Add the following to Section 1-07.9, Wages, 1-07.9(1), General:

Prevailing wage rates for this project area and size can be found at the Washington State Department of Bureau of Labor Industries or on the internet at: https://fortress.wa.gov/lni/wagelookup/prvWagelookup.aspx

Wage rates applicable for this project are those for Skagit County with an effective date of this Contract Bid Date.

The September 1, 2020 prevailing wage rates for public works contracts in Washington are contained in the following publications: The September, 2020 Prevailing Wage Rates for Public Works Projects in the state of Washington. Such publications can be reviewed at

the above-listed website and are hereby incorporated as part of the contract documents by reference.

This project is located within unincorporated Skagit County.

A printed version of the wage rates can be made available for viewing at the Public Utility District No. 1 of Skagit County's office, 1415 Freeway Drive, Mount Vernon, Washington 98273.

5.4 Revise Section 1-07.18, Public Liability and Property Damage Insurance as follows:

All reference to the State or Department of Transportation shall be supplanted with Public Utility District No. 1 of Skagit County.

5.5 Revise Section 1-07.26, Personal Liability of Public Officers, as follows:

Neither the Owner nor any elected official, officer, or its employees shall be personally liable for any acts or failure to act in connection with the Contract, it being understood that in such manners, they are acting solely as agents of the Owner.

No right of action shall accrue upon or by reason of this Contract to or for the use or benefit of anyone other than the parties to this Contract. The parties to this Contract are the Contractor and the Owner.

6 SECTION 1-08, PROSECUTION AND PROGRESS, IS REVISED AS FOLLOWS:

6.1 Supplement Section 1-08.5, Time For Completion (Contract Time), with the following:

Contractor shall complete all work associated with the Bid Schedule within 365 Calendar Days after the issuance of the Notice to Proceed. It is the intent to award the project and provide a Notice to Proceed in June 2020 with material submittals and purchasing. On site construction is intended to commence on September 30, 2020.

6.2 Section 1-08.9, Liquidated Damages replaced numbered paragraphs 1 and 2 with the following:

1. To pay liquidated damages for each working day beyond the number of days established for substantial completion, to authorize the Owner to deduct these liquidated damages from any money due or coming due to the Contractor.

6.3 Revise Section 1-08.10(2), Termination For Public Convenience, as follows:

Substitute "Resolution" for "Executive Order", substitute "Commission" for "President", and delete "or Governor".

7 SECTION 1-09, MEASUREMENT AND PAYMENT, IS REVISED AS FOLLOWS:

7.1 Supplement Section 1-09.4, Equitable Adjustment, with the following:

All bilateral agreements shall constitute a full accord and satisfaction and represent payment in full as to adjustments in both Contract price and time of completion for all costs, whether direct or indirect, arising out of, or incidental to, or otherwise attributable to, the changed work including any and all delays and impacts resulting from the change to the contract. Acceptance of payment by Contractor pursuant to such bilateral agreement shall constitute a waiver of any and all claims, known or unknown, arising out of, or incidental to, or otherwise attributable to the changed work.

7.2 Revise Section 1-09.6, Force Account, as follows:

Revise Item No. 1 as follows: Substitute "21 Percent" for "29 percent" for Contractor's allowance for overhead and profit.

7.3 Revise Section 1-09.11(3), TIME LIMITATIONS AND JURISDICTION

Revise as follows: Substitute Public Utility District No.1 of Skagit County for State of Washington (six times). Substitute Superior Court of Skagit County for Superior Court of Thurston County.

7.4 Replace Sections 1-09.13(3), (3)A, (3)B and (4), Claims Resolution, with the following:

CLAIMS 1-09.13(3)

The Contractor and Contracting agency mutually agree that claims submitted in accordance with Section1-09.11 and not resolved by nonbinding ADR process, shall be resolved by litigation unless the Contracting agency elects to resolve the claim through binding arbitration.

Venue. The venue of any Dispute Resolution Proceedings between the parties to this Agreement shall be Mount Vernon, Washington unless otherwise mutually agreed in writing.

Injunctive Proceedings. Notwithstanding any other provisions of these Dispute Resolution Procedures, any Disputes otherwise subject to submission to these Dispute Resolution Procedures may instead be first submitted, by any party having a legal interest therein, to the jurisdiction of the Superior Court for Skagit County, State of Washington, if and only to the extent necessary to secure injunctive relief reasonably necessary under the circumstances.

7.5 Add the following new Section 1-09.14 Claims Against Contractor's Retainage and/or Public Contract Bond:

1-09.14 Claims Against Contractor's Retainage and/or Public Contract Bond

The Contractor shall be liable for all costs incurred by the Owner, including, but not limited to, legal fees, salary/wage costs of Owner's employees and litigation costs (whether or not recoverable by statute or court rule) arising out of claims against the retainage or the Contractor's Public Contract Bond. Owner may deduct any such costs from funds otherwise due the Contractor, including the retention, by unilateral Change Order.

END OF SECTION

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TECHICAL SPECIFICATIONS

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1.10 GENERAL

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

Sections in these specifications titled "*Related Sections*" shall be read as integral to the specification as if they were fully detailed within. All work and materials described in such sections shall be provided and performed by the Contractor.

1.11.01 Project Description

See Invitation to Bid for project description.

1.11.02 Reuse of Documents

Contractor and any Subcontractor or Supplier shall not:

1. Have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
2. Reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.
3. The prohibitions of this Paragraph will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

1.11.03 Electronic Data

1. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner to Contractor, or by Contractor to Owner, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
2. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 30 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 30-day acceptance period will be corrected by the transferring party.
3. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

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1.13 Permits and Licenses

The Owner will secure and pay for the following permits:

- Building Permit
- SEPA

The Contractor shall acquire and pay for all other necessary permits which may include:

- Electrical Permit

A copy of the Owner acquired permits are available in Appendix A. Conform to the requirements of these permits and all other permits issued for this project.

1.15 Warranty

The Contractor shall warrant all work and products for a period of one (1) year following project acceptance except for those components and listed warrantees below. The date of project acceptance is defined as the date the final payment is sent to the Contractor from the Owner.

Warranty does not cover damage due to misuse by the Owner or conditions outside of the Owner or Contractor's control or exceptional events (force majeure) including war, strikes, floods (water exceeding normal high water mark), rainfall in excess of 100 year storm event, fire, earthquakes, high winds (over 85 mph for 3 seconds peak gust), freezes below 10 degrees Fahrenheit, governmental restrictions, vandalism, and power failures or surges. The Contractor has control over workmanship, third party subcontractors and parts and materials used to complete the project.

Warranties in addition to this warranty are listed in the following sections:

- Division 7.05 Roof systems
- Division 11.10.1 Pumps
- Division 11.20.1 Pump motors

1.16 Locks and Keys

Contractor shall provide dedicated construction locks, or Owner's standard lock with removable construction core, for site and facility security during construction. Contractor shall provide Owner with four construction key(s) for all temporary locks. Owner may "double lock" any padlocks at their discretion.

The Owner will not provide Owner keys for the facility. The Contractor shall remove the existing key cores from the access gate to the site and replace with construction cores.

All devices requiring locks, including but not limited to doors, gates, access hatches, convenience hatches, electrical enclosures, etc. shall be configured to match Owner standard lock and keys. The Contractor shall provide and install the mortise cylinders. The Contractor shall provide the cores. The Owner uses a Best 1E series mortise cylinder and Best 7-pin interchangeable core. ***A1 Lock in Burlington, WA shall supply the locks, as they have the key code.***

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Location	Type
Exterior doors	Thumb latch
vault hatch	Padlock

If the Owner provides a key to the Contractor for existing Owner locks, the Contractor will be responsible for the key until returning it to the Owner. If the Contractor loses the key, the Contractor will pay for re-coring of all Owner locks that use that key.

1.20 PRICE AND PAYMENT

1.21.29 Quantity Allowances

If more or fewer materials are needed when the construction quantity is within plus or minus 25 percent of the bid quantity, costs for restocking of unused materials, or handling and delivery costs on additional materials shall be incidental to the bid price and no additional payment will be made.

1.30 ADMINISTRATIVE

1.31 Responsibilities

1.31.1 Contractor's Responsibility

The work included in this contract is shown on the contract plans and described in these project specifications. All work incidental and necessary to the completion of the work described and shown shall be performed by the Contractor. In submitting a bid for this project, the Bidder warrants that they are an expert in this and related work, that they understand the process and functions shown, and that various work and processes not shown but necessary for the successful operation of this project will be provided by the Contractor.

The General (or Prime) Contractor is fully responsible for providing the subcontractors and suppliers with all relevant portions of the plans and specifications necessary to bid and construct the improvements.

Damage to existing utilities or property shall be repaired or replaced by the Contractor at the discretion of the Owner.

The Contractor and each of the Subcontractors are responsible for coordinating the required inspections. There are specific requirements for inspection responsibilities and the advance notice that must be given to minimize construction delays. It is the Contractor's responsibility to be familiar with these requirements, include the coordination necessary in this estimate of project costs and schedule, and to comply with the requirements during construction. Failure to follow proper inspection and notification procedures may result in on-site work stoppages and removal or demolition of unapproved structures or systems, all at the Contractor's expense. See Testing, Startup, and Operation section below for details.

Do not start work on this project or on any public or private right-of-way or easement until clearance is given by the Owner. It will be the responsibility of the Contractor to comply with the requirements of any permit for the project. Do not hinder private property access without

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a 24-hour notice to the private property owner, and do not hinder access for more than an 8-hour period. Do not disrupt emergency aid access to private property.

The Contractor is solely responsible for all elements of site safety. Inspections performed by the Owner are only to monitor and record that project plans and specifications are being complied with and construction is consistent with the design intent.

The Contractor shall be responsible for managing, coordinating, and overseeing his subcontractors, suppliers, manufacturers' representatives, or any other persons performing Work. The Contractor shall have a competent representative, familiar with the project and work being performed, on-site at all times.

1.31.1.1 Construction Inspection Scheduling

Unless otherwise noted on the plans or within these specifications, 48-hour prior notice shall be given to the Owner and appropriate reviewing agency for all inspections required for the construction of the project. Forty-eight-hour notice is defined as two complete working day notice. Time is not counted on weekends and holidays (inspections required on a Monday or the day after a holiday shall be scheduled a minimum of 48 hours in advance not including the holiday hours or weekend hours.)

Contractor shall schedule and arrange for the following inspections and tests with the appropriate reviewing agency and testing company.

- Special Inspections as required per IBC Division 17 and as noted on the drawings
- Any additional inspections required by the Building Department, or other approval agency
- Native subgrade visual review
- Soils and crushed rock compaction
- Asphalt materials and compaction
- Pressure testing

1.31.1.2 Contractor Conducted Progress Meetings

The Contractor shall schedule and hold regular on-site progress meetings at least every two weeks during active construction and at other times as requested by the Owner or as required by progress of the work. The Contractor, Owner, and all Subcontractors active on the site must attend each meeting.

Contractor to provide an agenda covering the following items at a minimum, as applicable.

1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede planned schedule.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.

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8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Discussion of upcoming required inspections/approvals.
12. Maintenance of quality and work standards.
13. Effect of proposed changes on progress schedule and coordination.
14. Safety issues relating to work.
15. Other business relating to work.

1.31.1.3 Contractor Provided Schedule and Non-working Day Approval

Contractor is responsible for providing an up to date construction schedule with each monthly pay estimate and at other times as requested by the Owner or as required by progress of the work. If the current schedule is still in-line with the previous schedule, the Contractor shall inform the Owner with each pay estimate. Non-working day requests shall also be submitted by the Contractor with each monthly pay estimate. Owner may delay monthly progress payments if Contractor fails to submit updated schedule and non-working day requests.

1.31.2 Owner Inspector's Responsibility

The Owner may elect to have an inspector on site to monitor, observe and record construction progress. The Contractor maintains complete responsibility to verify construction is meeting the design intent and is being constructed in accordance with the plans and specifications. It is not the responsibility of the Owner's inspector to address neither means and methods issues on site nor direct safety issues on site. ~~The Owner's inspector does not have the authority to stop work if unsafe conditions are observed.~~

1.33 Submittals

1.33.1 Submittal and Shop Drawings

Submittals are required for all items installed on this contract. Submittals shall be addressed to:

PUD No. 1 of Skagit County
1415 Freeway Dr
Mount Vernon, WA 98273

Attn: Brandt Barnes

Email: barnes@skagitpud.org

Submittals may be provided in electronic format (preferred) or hard copy. Owner reserves the right to require the Contractor to provide hard-copy submittals at no additional cost to the Owner. Where hard-copy submittals are provided, Contractor shall submit two (2) copies; one set will be returned to the Contractor after review.

Electronic submittal via email is acceptable and encouraged, however the Contractor shall take responsibility to follow up with the Owner to verify that the submittal was received. The Owner assumes no responsibility for emails that do not make it to the recipient. In the case

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of electronic submittals, only one copy will be returned to the Contractor, either electronically or hard copy at the Owner's discretion.

Submittal data for each item shall contain sufficient information on each item to determine if it is in compliance with the contract requirements. Submittal cutsheets and datasheets shall be annotated by the Contractor and shall clearly indicate the equipment and materials that will be provided, including any options or additive items. No generic cutsheets or datasheets will be accepted.

Items that are installed in the work that have not been approved through the submittal process shall be removed and an approved product shall be furnished, all at the Contractor's expense.

Shop drawing review will be limited to general design requirements only, and shall not relieve the Contractor from responsibility for errors or omissions, or responsibility for consequences due to deviations from the contract documents. No changes may be made in any submittal after it has been reviewed except with written notice and approval from the Owner.

Shop drawings shall be submitted on 8½-inch by 11-inch, 11-inch by 17-inch, or 22-inch by 34-inch sheets and shall contain the following information:

- Project Name as it appears on the Document Cover.
- Prime Contractor and Applicable Subcontractor.
- RH2 Engineering.
- Owner's Name.
- Applicable Specification and Drawings Reference.
- A stamp showing that the Contractor has checked the equipment for conformance with the contract requirements, coordination with other work on the job, and dimensional suitability.
- A place for the Engineer to stamp.

Submittals that do not comply with these requirements may be returned to the Contractor for re-submittal. The Contractor shall revise and resubmit, as necessary. Acceptable submittals will be reviewed as promptly as possible and transmitted to the Contractor not later than 13 calendar days after receipt by the Engineer. Delays caused by the need for re-submittal shall not be a basis for an extension of contract time or delay damages.

Shop drawings and submittals shall contain the following information for all items:

1. Shop or equipment drawings, dimensions, and weights.
2. Catalog information.
3. Manufacturer's specifications.
4. Special handling instructions.
5. Maintenance requirements.
6. Wiring and control diagrams.
7. List of contract exceptions.

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By approving and submitting shop drawings and samples, the Contractor warrants that they have determined and verified all field measurements, field construction criteria, materials, catalog numbers, and similar data, and have checked and coordinated each shop drawing with the requirements of the work and of the contract documents.

The Owner will pay the costs and provide review services for a first and second review of each submittal item. Additional reviews shall be paid by Contractor by withholding the appropriate amounts from each payment estimate.

The Contractor is responsible for identifying the shop drawings and submittals required for this project. Specific submittal requirements are listed in each section of these specifications. Contractor shall keep a complete and up to date copy of all submittals and review responses at the job site readily available to the Owner for inspection.

1.33.2 Substitutions

Any product or construction method that does not meet these specifications will be considered a substitution. Substitutions must be approved prior to their installation or use on this project.

No guarantee is made that product model numbers included in the specifications or on the plans are current at the time of bidding. The bidder shall provide pricing in their proposal for current versions of discontinued models. If the bidder is uncertain of the correct replacement model, or feels there is a price discrepancy, the bidder shall request a substitution following the requirements of section 1.33.2.2 Substitutions After Contract Execution. Requests for price increases after award will not be accepted.

1.33.2.2 After Contract Execution

Within 60 calendar days after the date of the contract, the Owner shall consider formal requests from the Contractor for a substitution of products in place of those specified. Submit two copies of each request for a substitution. Data shall include the necessary change in construction methods, including a detailed description of the proposed method and related drawings illustrating the methods. An itemized comparison of each proposed substitution with product or method specified shall be provided.

In making a request for a substitution, the Contractor represents that they have investigated the proposed product or method and has determined that it is equal or superior to the product specified. The Contractor shall coordinate the installation of accepted substitutions into the work, making changes that may be required for the work to be completed. The Contractor waives all claims for additional costs related to substitutions.

1.40 QUALITY CONTROL

1.42 Reference Specifications

Work under this contract shall be performed in accordance with applicable sections of the current Standard Specifications for Road, Bridge and Municipal Construction, Washington, hereafter referred to as the Standard Specifications.

Certain other referenced standards used in this specification are from the latest editions of:

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- Skagit County Municipal Code
- IBC International Building Code
- UPC Uniform Plumbing Code
- IMC International Mechanical Code
- IFC International Fire Code
- NEC National Electrical Code
- AWWA American Water Works Association
- ANSI American National Standards Institute
- ASA American Standards Association
- ASTM American Society for Testing and Materials
- WSEC Washington State Energy Code

1.50 CONSTRUCTION SUPPORT

1.51 Temporary Utilities

The Contractor is responsible for providing all necessary water for construction-related fire protection and utilities required by this contract, or by laws and regulations. Sanitary facilities adequate for all workers shall comply with all codes and regulations.

At the close of this contract, the Contractor shall pay all utility bills that are outstanding, remove all temporary electrical, sanitary, gas, telephone and water facilities, and any other temporary service equipment that may remain. In addition, the Contractor shall arrange for the transfer of electrical and water accounts to the Owner's name.

Temporary electrical power is available at the site. The Contractor may use existing power at the existing pump station building.

Temporary water is available at the site. The Contractor may use existing water taps connected to the W1 pumps in the existing pump station building. Coordinate with Owner staff and provide 2 calendar weeks' notice prior to use.

1.52 Temporary Facilities

The Contractor is responsible for construction and location of all field offices, all necessary gates and barricades, fences, handrails, guard rails, and securities required by this contract, or by laws and regulations. There shall be shelters and dry facilities for the workers as required. The Contractor shall provide all guards, marks, shields, protective clothing, rain gear, and other equipment required by law, ordinance, labor contracts, Occupational Safety and Health Administration (OSHA) regulations, and other regulations for the maintenance of health and safety. First aid kits and equipment as required by law shall also be supplied.

Provide a site-specific safety plan for review and approval.

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1.54 Construction Aids

The Contractor or product manufacturer may include work, materials, or components to aid in shipping, storage, installation, or other work for their convenience. Such items shall be removed prior to final project acceptance if they may interfere with the operation or maintenance of permanent work. Some examples include, but are not limited to:

- Lifting eyes (remove only if a safety concern or obstruction)
- Picking holes (plug)
- Intermediate or shipping bracing (remove)
- Protective shipping adhesives, coatings or covers (remove and clean residue)

1.55.26 Traffic Control

Any traffic control activities required during construction shall be consistent with the Uniform Traffic Control Manual, latest edition, and applicable local codes. The Contractor shall limit delay of traffic to 4 minutes.

If flaggers are used, orientation meetings per WAC 296-155-305 of the Standard Specifications shall be held each time a new flagger is introduced to the site or if site conditions change significantly. The Contractor is responsible for scheduling such meetings.

1.59 Site Control

The Contractor shall not perform work activities, store materials or equipment, move equipment through, or disturb in any way the areas outside the "Construction Limits shown unless approved by the Owner in writing.

Construction limits may be occupied throughout the duration of the contract. Access to the existing pump station building shall be provided at all times during construction unless scheduled 7 calendar days or more in advance with written review and approval.

1.59.1 Surveying and Staking

The Contractor is responsible for surveying and staking and shall stake out the locations of the permanent easements, temporary easements, rights-of-way, and all major facilities shown on the Plans and establish benchmarks at locations designated by the Owner. The Contractor shall protect all stakes and marks in their original conditions. If stakes and markings are destroyed or defaced before their use is ended, the cost of replacing them will be at the Contractor's expense. All stakes, points and marks shall be administered and approved by a registered professional land surveyor licensed in the State of Washington. Provide approved and stamped survey notes, and control points to the Owner for as-built purposes.

Replace all damaged survey monuments in accordance with WAC 332-120 and the Standard Specifications.

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1.70 EXECUTION AND CLOSEOUT

1.72 Scheduling and Sequencing

Refer also to the Completion Time section under the Instructions to Bidders.

Contractor is allowed four periods of shutdown of the Owner's systems for tie ins. Raw Water tie in period shall last no longer than 12 hours to connect the Concrete Cylinder Pipe, 12 hours to connect Chlorine Dioxide line, 6 hours to connect W1 pump potable water system for the seal safe system connection and 7 calendar days to complete the power drop. All shutdowns shall be scheduled and approved by the Owner with at least 14 calendar day notice. Shutdowns will be coordinated with the Owner, the City of Anacortes for water supply and Puget Sound Energy for the power drop. No shutdowns are allowed from April 15 to October 1.

Power drop shall be completed with the use of a 700 kW or larger portable standby Generator on site and hard wired into the pump station. Contractor shall provide generator, fuel, maintenance and operation for the shutdown. Submit generator information for power drop use for review and approval.

1.74 Cleaning and Waste Management

1.74.2.1 Site and Facility Cleanup

Clean up debris and unused material and remove from the site and any buildings. If vehicle traffic causes ruts, repair asphalt (new or existing) in paved areas, in other areas back track with dozer or excavator and repair to proposed surface condition including necessary hydroseed, mulch, and landscaping. Eliminate weeds within the construction area prior to project closeout.

Buildings shall be broom clean and all foreign damage or markings removed or repaired.

Equipment shall be washed clean using appropriate methods.

Unpainted exposed concrete structures shall be cleaned to a consistent bare concrete surface finish. Remove extraneous substances such as efflorescence, leakage residue, and excess repair materials.

Remove existing equipment or materials identified in the contract documents or that interfere with the work. Dispose of all such existing equipment or materials unless the Owner requests items to be salvaged for their use. Owner has first right of salvage.

Should the Owner identify salvageable items of their property prior to removal, the Contractor shall protect said items from damage during the work and will be responsible for reimbursing the Owner should the Contractor damage the items.

1.75 Testing, Startup, and Operation

1.75.01 Schedule

The placing of all improvements in service shall consist of three parts: "testing", "startup", and "operation". Not less than 21 calendar days before the anticipated time for beginning

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testing, the Contractor shall notify and submit to the Owner for approval, a complete plan for the following:

1. Schedules for tests:
   A. Factory Demonstration Test (at panel shop)
   B. Pumps and motors
   C. Control system
2. Detail schedule of procedures for startup.
3. Complete schedule of events to be accomplished during testing.
4. An outline of work remaining under the contract that will be carried out concurrently with the operation phases.

Failure to provide proper notification to the Owner may lead to liquidated damages if schedule cannot be maintained. If rescheduling is required because components are not ready for testing the notification requirements are reset and shall provide for 21 calendar days advance notice in order to reserve Engineer's and/or Owner Representatives' time.

1.75.02 Testing

The Contractor may periodically request preliminary testing for items that must be covered or tested before other work can proceed. In these cases, the work shall not be tested or covered up without timely notice to the Owner of its readiness for testing. Should any work be covered up without notice, approval, or consent, it must, if required by the Owner, be uncovered for examination at the Contractor's expense. Where work is to be tested, all necessary equipment shall be set up and the work given a preliminary test so that any and all defects may be discovered and repaired prior to calling out the Owner for the test.

Final testing shall consist of individual tests and checks made on equipment intended to provide proof of performance of unit and proper operation of unit control together with necessary tests to show system operation in the presence of the Owner. Assure proper alignment, size, condition, capability, strength, proper adjustment, lubrication, pressure, hydraulic test, leakage test, and all other tests deemed necessary by the Owner to determine that all materials and equipment are of specified quality, properly situated, anchored, and in all respects, ready for use. Any certificates required by these specifications by the manufacturer's representatives shall be supplied to the Owner prior to startup.

All piping shall be tested as required by specifications and applicable codes. Tests on individual items of equipment, such as pipelines, structures, controls, and other items shall be as necessary to show proper system operation. During testing, the Contractor shall correct any defective work discovered. Startup shall not begin until all tests required by these specifications have been completed and approved by the Owner.

Not less than five working days before the anticipated time for beginning the testing, the Contractor shall provide a list of representatives that will be attending the testing. The Owner may request additional representatives at no additional cost if said representatives are identified in these specifications.

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Qualified product representatives to be on site for the following equipment, at a minimum:

- Pumps
- Motor Control Centers

Additional representatives required may be identified elsewhere in these specifications.

The Contractor shall conduct all testing and startup. Testing and startup shall not be a cause for claims for delay by the Contractor and all expenses for testing and startup shall be incidental to this contract. The Contractor shall make arrangements for all materials, supplies, and labor necessary to efficiently complete the testing, startup, and operation. At a minimum, the Contractor shall provide:

- Calibrated pressure gauge
- Voltmeter
- Amp meter.
- Vibration measuring device (rpm and inch/sec) (pump testing)

1.75.03 Scheduling of Owner Review for Testing

See Division 1.75.01 Scheduling for scheduling and notification requirements.

In addition, the Contractor shall provide further notification two working days and two working hours (to confirm schedule) of the scheduled test to the Owner confirming that the Contractor has successfully completed all preliminary testing and that all equipment, tools, materials, labor, subcontractors, manufacturer's representatives, and all other items required for witnessed testing are available and fully functional. Failure to provide advance notification and confirmation or meet any of the testing requirements shall constitute a failed test in accordance with the section Inspection and Tests of the General Conditions.

A detailed testing schedule shall be provided by the Contractor and updated as needed to be at least 48 hours ahead of actual testing at the project site. If testing requires downtime in order to perform repairs due to failed test, the Contractor shall pay the Owner in the amount of $250 per hour per Owner Representative on site (minimum of $500 per scheduled visit) for downtime lasting longer than 1 hour required to complete repairs to verify the complete construction is ready for startup and operation. This amount will be deducted from the appropriate bid item that relates to the finished construction and documented by the Owner at their discretion. The Contractor is required to have all systems pre-tested to their satisfaction prior to calling the Owner for formal testing.

Schedule shall include system testing starting on Mondays and Tuesdays so that the remainder of the week can be used to identify the stability of the control system for the SCADA system, pump station, or treatment plant. Testing shall not start on a Thursday, Friday or the day before an Owner identified holiday.

1.75.04 Pump Testing

See Divisions 11.10.1 for pumps and 11.20.1 for motors.

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1.75.06 Electrical and Control Systems Testing

See Division 16.95 for electrical system testing.

See Division 17.90 for automatic control system testing.

The following is a list of components that shall be tested prior to project completion. This list is intended as a general guide and is not necessarily complete:

- Pressure sensors and alarms
- Flow sensors and alarms
- Flood switches
- Temperature sensors and alarms
- Smoke alarms
- Intrusion sensors and alarms
- Motion sensors
- Photovoltaic sensors
- HVAC controls
- Local control
- Automatic control
- Variable speed drives

1.75.30 Startup

See Division 17.92 for control system startup.

Startup shall consist of a simulated operation of all equipment and controls. The purpose of startup shall be to check that all equipment will function under operating conditions, that all interlocking controls and sequences are properly set, and that the facility will function as an operating unit.

Technically qualified factory representatives shall be present for the startup phase. All Representatives shall be trained, qualified, and have experience in troubleshooting and fixing field issues. The startup shall continue until it is demonstrated that all functions, controls, and machinery are functioning correctly.

Authorized factory representatives shall be provided for the following items:

- Pumps and motors
- Variable frequency drives
- Motor control centers (electrician may qualify if approved by manufacturer)
- Telemetry equipment

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1.79 Training and Documentation

Failure to provide acceptable final documentation including O&M manuals and as-built drawings will result in non-payment of the appropriate bid item in the schedule of prices.

The Contractor shall remove all tags and instructions that come packaged with or attached to equipment used on the project. Deliver all such documents to the Owner bound in a three-ring binder or with the Operation and Maintenance Manual. Insert documents in sleeves if they cannot be punched. Scan all such documents to Adobe PDF format and provide with the Operation and Maintenance (O&M) Manual.

1.79.1 Training

See Division 17.93 for automatic control systems training.

At the time that the facility is ready to be put into operation, the Contractor is to conduct an operation and maintenance training meeting with the owner to explain in detail the operation and maintenance requirements of each of the facility's components. The training meeting shall not occur on the same date(s) as a startup.

Operation of the facility shall commence immediately after completion of testing, startup, and owner training and after satisfactory repairs and adjustments have been made.

1.79.2 Operation and Maintenance Manuals

See also Division 17.94 for additional requirements for automatic control systems manuals. Detailed requirements for specific equipment and systems may also be included in their respective specification sections.

Prior to the receipt of payment for more than 90 percent of the work and at least one calendar month before construction completion, the Contractor shall deliver to the Owner acceptable manufacturer's operating and maintenance instructions covering equipment and systems installed on the Project requiring operational and/or maintenance procedures and for any additional items indicated by the Owner, including coatings furnished under this contract.

At a minimum, provide O&M information for the following:

- Pumps (including flow and head curves)
- Motors
- Transfer switch
- Mechanical valves
- Chemical dosing equipment
- Telemetry
- Controls
- Electrical systems

The operating and maintenance instructions shall include, as a minimum, the following data for each coating and item of mechanical and electrical equipment:

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Products

A. Equipment Identification including brand name, model number and serial numbers.
B. Date of manufacture and date of installation on job site.
C. Complete as-built elementary wiring and one-line diagrams.
D. Complete parts list, by generic title and identification number, complete with exploded views of each assembly.

Maintenance

A. Recommended spare parts.
B. Lubrication schedule including the applicable lubricant designation available from the Standard Oil Company of California.
C. Recommended preventive maintenance procedures and schedules. Schedule shall be provided for daily, weekly, monthly, quarterly, semi-annually, and annually maintenance.
D. Disassembly and re-assembly instructions including parts identification and a complete parts breakdown for all equipment.
E. Weights of individual components of each item of equipment weighing over 50 pounds.
F. Name, location, and telephone number of the nearest suppliers and spare parts warehouses.
G. All manufacturers' warranties. Include name, address, and telephone number of the manufacturer's representative to be contacted for warranty, parts, or service information.
H. Cleaning, repair, and maintenance instructions for each coating system.
I. Provide videotapes, video CDs or DVDs utilized in the manufacturer's instruction program for the owner.

Operation

A. Recommended troubleshooting and startup procedures.
B. Recommended step-by-step operating procedures.
C. Emergency operation modes, if applicable.
D. Normal shutdown procedures.
E. Long term shutdown (mothballing) procedures.
F. Equipment specifications and guaranteed performance data.
G. General manuals which describe several items not in the contract will not be accepted unless all references to irrelevant equipment are neatly eradicated or blocked out.

Provide pdf copy compatible with the Owner's Sharepoint® document system. Initial submittal can be provided online and final complete copy shall be provided on CD or USB thumb-drive.

Each set of instructions shall be bound into multiple volumes; each volume to be complete with an index and bound in a suitable, hard-covered binder. Binders shall be of hardback

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construction with full-length metal hinge. Capacity shall be 3-inch to 5-inch as appropriate for the quantity of O&M documentation. More than one binder may be required for large projects. Binders shall be equal to Wilson-Jones WLJ344 series or WLJ369 series or Specialty Loose Leaf models 87784, 98085, 98086, or 98984.

Manuals shall be assembled and indexed so that information on each coating and piece of equipment can be readily found.

Progress payments for the total contract work in excess of 90 percent completion may not be made until the operation and maintenance manual has been delivered and approved by the Owner, at their discretion.

The Contractor shall secure and deliver to the Owner all equipment warranties and other warranties and guarantees required for all equipment and processes. Delivery shall be done at one time covering all major and minor equipment warranties. Copies of the warranties shall be included in each O&M Manual.

See Division 1.15 for details regarding required warranties for specific components.

1.79.3 Construction Record Drawings

Prior to receiving final payment for the work, the Contractor shall deliver a complete set of acceptable "As-Constructed" records to the Engineer. Plans shall be made on clean, unmarked prints for this project in accordance with the following standards:

- Yellow markings or highlights = deleted items
- Red markings = new or modified items

The Contractor shall provide "as-built" information on all items and work shown on the plans showing details of the finished product including dimensions, locations, outlines, changes, manufacturers, etc. The information must be in sufficient detail to allow the Owner's personnel to locate, maintain, and operate the finished product and its various components.

See also electrical plan requirements in Division 16.05.

1.80 PERFORMANCE REQUIREMENTS

1.81 Seismic Restraint and Anchorage

Contractor shall furnish seismic restraint for all piping, valves, conduit, and other mechanical and electrical components. Seismic restraint shall be designed to meet IBC (ASCE 7 Chapter 13 – "Seismic Design Requirements for Nonstructural Components") code requirements. The following design values shall be used in calculating seismic forces:

Ip = 1.5	Sds = 0.8g	Sd1 = 0.464g	Seismic Design Category = D

A complete seismic restraint system shall be provided including struts, straps, bolts, nuts, washers, etc. as required for secure attachment to foundations, pads, ceilings, floors, and/or walls.

Contractor shall submit either of the following in accordance with ASCE 7, 13.2.1 for all components:

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1. Project-specific design and documentation prepared and submitted by a registered design professional.
2. Submittal of the manufacturer's certification that the component is seismically qualified by:
   a. Analysis
   b. Testing in accordance with the alternative set forth in ASCE 7, Section 13.2.5.
   c. Experience data in accordance with the alternative set forth in ASCE 7, Section 13.2.6.

Special Certifications are required for the following systems for Seismic Design Categories C, D, E, and F. Systems shall be certified in accordance with ASCE 7, 13.2.2.

1. Mechanical and electrical equipment that must remain operable following the design earthquake. All mechanical and electrical equipment installed under this project falls under this category.
2. Components with hazardous contents.

All materials and fabrication shall be as required in these specifications. Contractor shall submit this information to the Owner for review prior to fabrication and installation.

Contractor shall install seismic restraints when called for in the contract or recommended by the product manufacturer. Install in accordance with the manufacturer's requirements as applicable.

Seismic restraint systems shall be installed so as not to interfere with normal operations and maintenance of the equipment and other components as shown on the plans. Interference with normal operations and maintenance shall be as determined by the Owner. Drilled-in anchors for non-rotating equipment shall be Concrete Anchors unless otherwise specified.

1.82 Pressure Ratings

Fittings, valves, pipe, and fluid systems shall have pressure ratings equal to or greater than the pressures identified below, unless specifically called out otherwise in the plans or specifications:

Equipment Function	Working Pressure	Test Pressure
Raw Water Intake	5-15 psi	25 psi
Raw Water Discharge	60-70 psi	125 psi
Chlorine Dioxide Chemical Piping	< 80 psi	150 psi
Seal Safe Potable Supply line before PRV	< 130 psi	150 psi
Seal Safe Potable Supply line after PRV	> 15 psi	20 psi

Working Pressure: Manufacturer's rating of maximum pressure during extended operation.

Test Pressure: Maximum pressure during project specific testing.

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1.88 Location Designations

The following location designations shall be used except where otherwise noted on the plans:

Dry Locations: Indoor continually dry areas including office, laboratory, blower, and electrical rooms.

Wet Locations: All locations exposed to the weather, whether under a roof or not, or within channels, basins, or tanks.

Damp Locations: Process areas; areas containing pumps, valves, and major piping; all spaces wholly or partially underground, or having a wall or ceiling forming part of a channel or tank, unless otherwise designated on the Plans. Any areas which do not fall within the definitions for dry, wet, or corrosive shall be considered damp.

Corrosive Locations: Areas where chlorine gas under pressure, sulfuric acid, or liquid polymer are stored or processed, sewer wetwells and sewer manholes.

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Division 2
Sitework

2.00 GENERAL

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

2.05 Common Work for Sitework

This division covers that work necessary for providing materials and performing all sitework as described in these specifications and as shown on the Plans.

Part 1 - General

Submittals

Submittal information shall be provided to the Owner for the following items:

- Erosion and Sedimentation Control Plan
- Erosion Control Fence Fabric
- Dewatering Plan
- Shoring Plan and Calculations
- General Fill
- Structural Fill
- Pipe Bedding
- Trench Backfill
- Crushed Surfacing
- Hydroseed
- Fencing

Other Items listed in this section or required by the Owner.

Site Conditions

No exploration of subsurface soil and groundwater conditions at the project site was performed. Soils are assumed to be competent to support the improvements. Groundwater is expected to be seasonally prevalent at elevations below 5-feet of existing pump station grade. Skagit County requires maximum bearing capacity of 1,500 pounds per square foot by prescription.

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2.09 Special Inspections for Earth Work

Part 3 – Execution

Field Quality Control

Special inspections including visual, probing of subgrade and compaction effort (nuclear densometer) are required for the following locations:

- Trench backfill crossing roads and site access road and parking areas (visual, probe and nuclear densometer testing)
- Access road and parking area fill and native subgrade (visual, probe. Nuclear densometer testing if found necessary by the Owner)
- Native (and fill if any) subgrade of Booster Pump Station (visual and probe)
- Embankment fill subgrade (Nuclear densometer, visual and probe)

Areas where fill (either native or non-native) is being placed shall be tested for compaction compliance by a special inspector. The Owner will pay for the initial testing. If tests indicate failure of compaction requirements, the Contractor shall pay for subsequent tests until tests indicate compliance with the specifications. Areas of native undisturbed subgrade shall be visually inspected by the Owner prior to placement of any material overtop. Contractor shall coordinate with the Owner a minimum of two (2) full working days prior to inspection being needed.

The Contractor shall fully cooperate with the special inspector, including providing safe access to the testing areas. No extra compensation will be provided for cooperation with and facilitation of inspections.

2.10 SITE PREPARATION

2.10.2 Clearing and Grubbing

Part 3 - Execution

Construction

Clearing and grubbing shall be performed by the Contractor to remove and dispose of unwanted debris, vegetative matter, and other items noted on the Plans within the construction limits and shall conform to Section 2-01 of the Standard Specifications.

Protect trees and tree roots, structures and foundations, utilities, fences, and all other improvements not to be removed regardless if shown to be protected on the Plans.

Remove and relocate permanent improvements that are within the construction limits, such as mailboxes and traffic signs. Locate mailboxes such that mail service is maintained during construction. Return facilities to original location, or plan location, at completion of local work.

Do not remove organic material including plants, grasses, trees, and native topsoil unless directed by the Plans. In instances where the Contractor is allowed to clear areas to facilitate construction but is not required to, any areas disturbed by construction shall be surface

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restored to existing or better condition including matching surface restoration with hydroseed or plantings as shown in adjacent areas required to be modified by the Plans. Where the Contractor is allowed to clear areas to facilitate construction, surface restoration shall be completed at no additional cost to the owner.

2.10.4 Dewatering

Part 1 - General

Submittals

The Contractor shall prepare a detailed dewatering system plan and submit it to the Owner for review prior to the installation of any dewatering system. This plan shall include, as a minimum, the scope, type, size, quantity, method of installation, operation, and removal of all dewatering systems to be used.

Part 3 - Execution

Installation/Construction

The Contractor is to determine the scope, type, size, quantity, method of installation, operation, and removal of the dewatering system necessary to keep all excavations de-watered to an elevation below the base of the excavation sufficient to stabilize the soils in the excavation and the surrounding areas, and to prevent flotation of partially completed structures. Any dewatering systems must be positioned away from all building and utility construction so as to not become a part of the permanent facility.

The Contractor shall furnish, install, and operate all necessary machinery, appliances, and equipment to meet these water control requirements, and shall dewater and dispose of the water so as not to cause injury to public or private property or to cause a nuisance to the public. The Contractor shall maintain sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outages, and shall have available at all times competent workmen for the operation of the pump equipment. The dewatering system shall not be shut down between shifts, on holidays or weekends, or during work stoppages.

Field Quality Control

The Contractor shall control groundwater and surface water to prevent the softening of the bottom of excavations, or formation of quick conditions or boils during excavation. Ground water shall be lowered to 3 feet below the base of the excavation at all times. Determination of unsuitable soil conditions for supporting the improvements shall be determined by the Owner. Determination of unsuitable soil conditions for performing work, placing materials, and proceeding with construction activities shall be determined by The Contractor. When the dewatering system does not meet the specified requirements, and as a consequence there is a loosening or disturbance of the foundation soils, instability for the slopes, or damage to the foundation or structures occur, the Contractor shall at its own expense, supply all materials, labor, and equipment, and perform all work required for the restoration of foundation soil, slopes, or structure to the satisfaction of the Owner.

The quality of all surface and ground water discharged from the site shall meet all State and local requirements. The Contractor shall employ all means necessary to remove suspended

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solids, oils, trash, and other deleterious materials from surface and ground water prior to discharging.

Restoration

Any dewatering wells installed by the Contractor shall be removed and backfilled in accordance with applicable Federal and State regulations.

2.10.5 Construction Access

Part 1 - General

Summary

The Contractor shall provide for all temporary site access and shall maintain vehicular site access at all times. Access shall be of a quality to permit Contractor's forces and outside inspector's safe and convenient ingress/egress. Unless specifically provided for in other bid items, the cost of building and maintaining construction access shall be incidental and no separate payment shall be made. Any bid items for aggregate materials (e.g. crushed rock, ballast, etc.) shall not relate to construction access unless the description of that bid item specifically states inclusion of the construction access.

Part 3 - Execution

Repair/Restoration

The Contractor is responsible for maintaining all construction accesses during construction and the cost of such maintenance shall be incidental to the bid price. Maintenance includes repairing settled and damaged areas and providing dust control. Cost for maintenance due to rain, snow, wind, or other weather conditions shall be incidental to the bid price.

Cleaning

Wherever construction vehicle access routes intersect paved roads, provisions must be made by the Contractor to minimize the transport of sediment onto the paved road. The Contractor shall remove all dirt, mud, rocks, vegetation, or other deleterious material from all construction equipment prior to leaving the site. This may include spray washing, sweeping, or other physical methods as necessary to remove materials.

If sediment or other debris is transported onto a paved road surface, the road shall be cleaned thoroughly by the end of the workday. Debris shall be removed from roads by shoveling or sweeping. Street washing shall be allowed only after debris has been removed in this manner.

2.11 Earthwork Materials

2.11.1 Common Work for Earthwork Materials

Part 1 - General

Acceptance at Site

Owner shall review the site near the end of each pay period to determine the equivalent percentage of earthwork completed compared to the total earthwork lump sum price.

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Contractor shall be paid based on the percentage completed based on Owner's judgment of percent complete.

Part 2 - Products

Source Quality Control

All imported fill material shall be free of hydrocarbons (e.g. gasoline, diesel, oil, etc.), pesticides, herbicides, and other hazardous volatile organic compounds (VOCs) and synthetic organic chemicals (SOCs). The Contractor shall provide certification to the owner that the fill is free of these chemicals.

2.11.2 General Fill

Part 1 – General

Summary

All fill required for this project that is not specifically defined as another type shall be "General Fill".

References

Section 9-03.14(3) Common Borrow of the Standard Specifications.

Part 2 – Products

Components

General fill shall be soil free of organics, debris, and other deleterious materials with no individual particles having a maximum dimension larger than 5 inches. The moisture content of the material and weather conditions at the time of placement will be used to determine the suitability of native materials for backfill as general fill.

Part 3 – Execution

Installation/Construction

All general fill shall be compacted in uniform layers not exceeding 12 inches in loose thickness and compacted to at least 92 percent maximum dry density based on the ASTM D-1557 (modified)

2.11.3 Structural Fill

Part 1 – General

Summary

All fill placed below, beside and against building components, building structures, vaults, manholes, handholes, slabs, sidewalks, and drives shall be "Structural Fill" unless other fill materials are specifically shown on the Plans. The structural fill material has been selected to support the weight of the structure in combination with the existing native material and to prevent adverse movement during an earthquake. The Contractor must take particular care to maintain the integrity of the design by using structural fill where shown.

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References

Where free draining material for use as structural fill is required as indicated on the Plans or needed to maintain compaction in adverse weather conditions, it shall conform with Section 9-03.14(1), "Gravel Borrow" of the Standard Specifications.

Structural fill for foundation subgrades or where free drainage is not required through the structural fill shall conform with 9-03.14(2) "Select Borrow" of the Standard Specifications.

Part 2 – Products

Components

Structural fill shall be soil free of organics, debris, and other deleterious materials. The Owner shall determine if native on-site materials are suitable for use as structural fill.

Part 3 – Execution

Installation/Construction

The moisture content of the material and weather conditions at the time of placement will be used to determine the suitability of native materials for backfill as structural fill. Structural fill shall bear on firm base and be placed in uniform layers not exceeding 12 inches in loose thickness. The backfill area must be free of standing water and the subgrade soils must be stable. Each layer of structural fill shall be compacted to at least 95 percent of its maximum dry density based on the ASTM D-1557 (modified) test procedure.

2.11.4 Pipe Bedding

Part 1 – General

Summary

All fill placed below and around buried utilities shall be "Gravel Backfill for Pipe Bedding". The pipe bedding material has been selected to support the weight of the utility by distributing the load so that the completed utility and backfill system does not weigh more than the native material. In addition, the grain size has been selected so that the bedding will not migrate into the bottom of the trench. The Contractor must take particular care to maintain the integrity of the utility design by using the appropriate pipe bedding material where shown.

References

For Ductile Iron and Steel pipe larger than 4-inch diameter: Bedding material shall conform with Section 9-03.12(3) "Gravel Backfill for Pipe Zone Bedding" of the Standard Specifications except all shall pass a 1-inch sieve.

For plastic pipe regardless of diameter and Conduit, Side Service Lines, and all other piping 4-inch in diameter or less: Bedding shall conform with Section 9-03.13 "Backfill for Sand Drains" or as approved by the Inspector.

Pipe bedding used around restrained joint pipe must be a well graded cohesive material with fines. Rounded gravels and pea gravel are not acceptable.

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Part 3 – Execution

Installation/Construction

Bedding material shall surround the pipe and conduits to the limits shown on the Plans and provide uniform support along the entire length without allowing concentrated loading at joints or bells or that results in any bridging of the pipe. All bedding material shall bear on firm subgrade and be compacted to firm and unyielding condition.

2.11.5 Trench Backfill

Part 1 – General

Summary

All fill placed above the pipe bedding in a trench shall be "Trench Backfill". The trench backfill material has been selected to distribute surface loads over the utility. In addition, the grain size has been selected so that the trench backfill will not migrate into the pipe bedding or trench walls. The Contractor must take particular care to maintain the integrity of the utility design by using the appropriate trench backfill material where shown.

References

Trench backfill shall consist of materials conforming to Section 9-03.19 "Bank Run Gravel for Trench Backfill" of the Standard Specifications or as approved by the Owner.

Part 3 – Execution

Installation/Construction

Trench backfill shall be placed and compacted above the pipe bedding to finished grade elevations in unrestored areas or to subgrade elevations in restored areas.

In unimproved or landscaped areas trench backfill shall be placed in uniform layers not to exceed 12 inches in loose thickness. Each lift is to be compacted to at least 95 percent of its maximum dry density based on the ASTM D-1557 (modified) test procedure.

In areas where the trench will support roadways or vehicle access areas, trench backfill shall be placed in uniform layers not to exceed 12 inches in loose thickness. Each lift is to be compacted to at least 95 percent of its maximum dry density based on the ASTM D-1557 test procedure (modified proctor) from 0 to 4 feet below finished surface, 90 percent below 4 feet.

2.11.7 Gravel Base Course

Part 1 – General

Summary

All fill placed under paving, foundations, or structures and next to native material shall be "Gravel Base Course" unless otherwise called out on the Plans.

References

Aggregate for gravel base course under structures, and foundations shall conform to Section 9-03.10 Aggregate for Gravel Base of the Standard Specifications.

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Aggregate for gravel base course under roadways, paved areas, sidewalks, and gravel areas shall conform to Section 9-03.9(3) Crushed Surfacing Base Course of the Standard Specifications.

2.11.8 Gravel Top Course

Part 1 – General

Summary

Gravel surface paving as shown on the Plans shall be "Gravel Top Course".

References

Aggregate for gravel top course shall conform to Section 9-03.9(3) Crushed Surfacing Top Course and Keystone of the Standard Specifications.

2.11.11 Drain Rock

Part 1 – General

Summary

Granular material used for roof runoff drain around pump station.

Part 2 – Products

Materials

Drain rock shall be equal to Gravel Backfill for Dry Wells 9-03.12(5) of the Standard Specifications.

Part 3 – Execution

Compact to firm condition without damage to perforated pipe.

2.11.20 Geotextile Fabric

Part 1 – General

Delivery, Storage, and Handling

All fabrics shall be shipped, stored, placed, overlapped, and secured based on manufacturer requirements.

Part 2 – Products

Materials

Geotextile Fabric shall be chosen by the Contractor to meet the requirements based on place of use.

For geotextile fabric called out on the Plans to separate drain rock or French drains from surrounding soils, it shall be equal to Tencate Mirafi 140N.

For geotextile fabric placed between quarry spalls and fill to separate soil fines, it shall be equal to Tencate Mirafi 160N.

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For geotextile fabric called out to drain behind a wall without the use of drain rock, it shall be equal to Tencate Mirafi G100W.

For Embankment stabilization, if a geotextile fabric is called out, it shall be equal to Mirafi Miramat TM8.

For geotextile fabric placed below crushed rock in road subgrade it shall be equal to

Tencate Mirafi 500X

Other locations may require a specialized geotextile fabric and if so shall either be identified in the Plans or geotechnical report.

2.20 EARTH MOVING

2.23 Excavation

Part 1 – General

Summary

The Contractor shall excavate as necessary to construct the improvements shown.

Part 2 – Products

Materials

All excavated material below the organic layer can be re-used as backfill as long as it is properly protected from water saturation, meets the specification for the backfill purpose, and is approved by the Owner. Approval of material as backfill will be made the moment before placement of the material as backfill. Weather conditions may make previously approved material unsuitable for backfill requiring the material to be removed from the project site.

Excavated material that is not used as backfill shall be disposed off-site. All permits for the disposal of excavated material shall be obtained by the Contractor. A copy of all permits and the locations of each disposal site shall be submitted to the Owner.

All excavated material shall be removed from the project site.

Part 3 – Execution

Installation/Construction

Excavation shall include the digging, scraping, and removing existing native material, abandoned or interfering utilities, abandoned or interfering structures and any other obstacles necessary for the construction of the improvements shown on the Plans. Excavation includes utility excavation, structural excavation, and grading excavation.

Utility excavation shall be performed to the depths necessary to complete the utility construction work shown.

Structural excavation shall be performed to the limits shown and established by the Owner. The base of the excavation shall extend laterally a minimum of 2 feet beyond the structure unless specified otherwise on Plans.

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Excavated material may be stockpiled within the construction limits. Temporary stockpiling of excavated material will not be permitted outside the construction limits at any time.

Examination

The base of the excavation shall be evaluated by the Owner to determine if it is suitable for backfilling. The Owner will evaluate the stability of the base of excavation by determining if all significant organic soils or other unsuitable materials have been removed.

Construction

Excavation required by the Owner that is beyond the depth shown shall be performed by the Contractor per the direction of the Owner. The Contractor will be reimbursed for additional excavation by change order.

2.25 Erosion and Sedimentation Control

2.25.2 Contractor Provided Certified Erosion and Sedimentation Control Lead

Part 1 – General

Summary

The Contractor shall provide a Certified Erosion and Sedimentation Control Lead (CESCL) as part of their regular work force for the project. This person shall be a site superintendent, project manager or site laborer regularly on the project site during earthwork operations.

Submittals

Documentation of the Certification shall be provided to the Owner and reviewing authority if applicable with a copy of such certification always available in the job shack. Washington State Department of Ecology Certification shall be valid and up to date for this person throughout the duration of the earthwork operations of the project.

2.25.3 Temporary Erosion and Sedimentation Control (SWPPP Reference)

Part 1 – General

Quality Assurance

The Contractor shall comply with the requirements set forth in the Stormwater Pollution Prevention Plan (SWPPP) and the Temporary Erosion and Sedimentation Control (TESC) notes and details in the construction Plans. The SWPPP and TESC Plans are the minimum requirements for the anticipated site conditions. The Contractor shall add additional TESC facilities or processes as necessary to ensure that erosion and sedimentation problems do not occur. The Contractor shall be responsible for the day-to-day control of the site, and shall update TESC Plans, the SWPPP, and TESC measures as necessary to maintain the site as work progresses. The Contractor shall inspect the TESC facilities as specified in the SWPPP and maintain TESC measures as necessary to prevent off-site damage. Additional work, materials, or fines incurred as a result of failure of TESC measures shall be the full responsibility of the

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Contractor, including all related costs. The Contractor is responsible for complying with all federal, state, and local stormwater requirements, as detailed in the SWPPP.

A Storm Water Pollution Prevention Plan (SWPPP) has been prepared by the Owner and is available as an appendix. All costs associated with updating/maintaining the Stormwater Pollution Prevention Plan (SWPPP) shall be included with the bid.

2.25.4 Stormwater Discharge

Part 3 – Execution

Field Quality Control

The Contractor shall be responsible for meeting all construction stormwater discharge water quality requirements including State of Washington (WAC 173-220-020), Construction Stormwater Permit requirements and local requirements regardless of weather conditions.

If the project is fined by the permitting authority, that stormwater fine shall be paid for by the Contractor at no additional cost to the Owner.

2.30 SITE IMPROVEMENTS

2.31 Fencing

2.31.1 Common Work for Fencing

Part 1 – General

Related Sections

- Division 3 Concrete

Part 3 – Execution

Preparation

Clear the area along the fence path, remove surface irregularities and grade earth smooth and continuous prior to fence installation.

2.31.2 Temporary Construction Security Fence

Part 1 – General

Related Sections

- Division 10.14.7 Signage

Part 2 – Products

Materials

Chain link shall be 13-gauge minimum. Top and bottom wire shall be used for fencing with posts directly driven into the ground. Top and bottom rail shall be used for modular fencing using concrete block bases.

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All vehicle access gates shall be locked with a padlock provided by the Contractor. Extra keys shall be provided to the Owner prior to construction.

Part 3 – Execution

Installation/Construction

The Contractor shall provide a ***6-feet tall temporary construction fence*** surrounding the construction site wherever there is a break in the existing fence found prior to construction. Fence posts shall be spaced at a maximum of 12 feet on center. Contractor shall be responsible for maintaining fence during construction and securing fence after each workday. Posts shall be securely installed directly into the ground or set in temporary concrete base blocks. Chain link shall be securely attached to the fence posts. The construction fence may be used in combination with the permanent fence provided that the fence is continuous around the site perimeter.

Clearing limit identification fencing shall not be considered a Temporary Construction Security Fence.

2.31.3 Permanent Chainlink Fence

Part 1- General

Summary

This section describes the requirements for the chainlink fence located as shown and detailed on the Plans and these specifications.

Related Sections

- Division 2.31.1 Common Work for Fences
- Division 3.31.3 Post Footings

References

Chainlink Fence Manufacturers Institute Product Manual Specifications

DOT Standard Specifications Section 8-12

ASTM F626, A392, A817, F1083, A121, F567

Submittals

Galvanizing information, steel quality standards, hardware quality standards.

Dimensional drawings including details, finishes, accessories, and foundations.

Part 2 - Products

Materials

Obtain chain link fences and gates, including accessories, fittings, and fastenings, from a single source.

Chain-Link (woven wire fabric) fencing shall be commercial grade, as detailed on the Plans and in accordance with Section 8-12 of the Standard Specifications except as modified herein.

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Permanent fence shall match existing in height, finish, and appearance.

Components

Fence Fabric: Galvanized wire: ASTM A392 - 1.2 oz./sf. Wire Spec-A817, Type and class per use and location of the project.

Size: Helically wound and woven to height of as indicated on drawings with 2-inch diamond mesh and core wire gauge of 10.

Selvage of fabric: twisted and barbed at top and twisted at bottom.

Steel Fence Framing: Steel pipe - Type I: ASTM F1083, standard weight schedule 40; minimum yield strength of 30,000 psi. Outside diameter (OD) sizes as shown on the Plans. Hot-dipped galvanized with minimum average 1.8 oz./ft² of coated surface area.

Accessories

Chain link fence accessories per ASTM F626 Provide items required to complete fence system. Galvanize each ferrous metal item and finish to match framing.

Post caps: Formed steel weather tight closure cap for pipe posts. Provide one cap for each post. Cap to have provision for barbed wire when necessary.

Top rail and rail ends: Pressed steel per ASTM F626, for connection of rail and brace to terminal posts.

Top rail sleeves: 6-inch (178 mm) expansion sleeve with a minimum 0.137-inch wire diameter and 1.80-inch length spring, allowing for expansion and contraction of top rail.

Wire ties: 9-gauge galvanized steel wire for attachment of fabric to line posts. Thirteen gauge for rails and braces.

Brace and tension (stretcher bar) bands: Pressed steel, minimum 300-degree profile curvature for secure fence post attachment.

Tension (stretcher) bars: One-piece lengths equal to 2 inches less than full height of fabric with a minimum cross-section of $^{3}/_{16}$ inch by ¾-inch. Provide tension (stretcher) bars where chain link fabric meets terminal posts.

Tension wire (used when top rails are not required): Galvanized coated steel wire, 6 gauge, with tensile strength of 75,000 psi. Hog ties are permissible.

Tie rod, truss rods, and tightener: Steel rods with minimum diameter of ⅜-inch. Capable of withstanding a tension of minimum 2,000 lbs.

Barbed wire: ASTM A121 Class 3, zinc coated steel wire double-strand, 14 gauge twisted line wire with galvanized steel, 4-point barbs spaced approximately 5 inches on center.

Barbed wire supporting arms: Pressed steel arms with provisions for attaching three rows of barbed wire. Arms shall withstand 250 lb. downward pull at the outermost end of arm without failure. Provide three strands single arm. Provide intermediate arms with hole for passage of top rail.

Nuts and bolts are galvanized.

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Fabrication

Fence frames that require welding shall be hot dipped galvanized in the shop unless approved otherwise by the owner.

Part 3 - Execution

Installers

Installers shall have a minimum of two years of experience. References from three previous projects shall be submitted for review during shop drawing submittal.

Examination

Verify areas to receive fencing are completed to final grades and elevations.

Ensure property lines and legal boundaries of work are clearly established.

Perform complete utility locates within the areas of fencing to verify conflicting utilities. Fence posts may require adjustment to avoid utilities by a minimum of 2-feet.

Installation/Construction

Chainlink Fence Framing Installation:

A. Install chain link fence in accordance with ASTM F567 and manufacturer's instructions.

B. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30 degrees or more.

C. Space line posts uniformly at 10-feet on center maximum and to avoid utilities by 2-feet minimum.

D. Concrete set terminal and gate posts: Drill holes in firm, undisturbed or compacted soil. Trowel finish around post. Slope to direct water away from posts. Footings shall be sized per schedule on the Plans.

E. Check each post for vertical and top alignment and maintain in position during placement and finishing operations.

F. Bracing: Install horizontal pipe brace at mid-height for fences 8-feet tall and over, on each side of terminal posts. Firmly attach with fittings. Install diagonal truss rods at these points. Adjust truss rod, ensuring posts remain plumb.

G. Tension wire: If shown on the Plans, install tension wire before stretching fabric and attach to each post with ties. Secure tension wire to fabric with 12½ gauge hog rings 24 inches O.C.

H. Top rail: If shown on the Plans, install lengths, 21-feet. Connect joints with sleeves for rigid connections for expansion/contraction.

I. Brace Rails for fabric height 8-feet and over. Install brace rails between terminal posts and adjacent line posts with fittings and accessories. Install brace rails at each gate post and each corner post with angle change exceeding 30 degrees.

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Chain Link Fabric Installation

A. Fabric: Install fabric on side facing outward from site and attach so that fabric remains in tension after pulling force is released. Leave no more than 3-inches between finish grade and bottom selvage. Attach fabric with wire ties to line posts and tension wire at 15-inches on center and to rails and horizontal braces at 24-inches on center.

B. Tension (stretcher) bars: Pull fabric taut; thread tension bar through fabric and attach to terminal posts with bands or clips spaced maximum of 15-inches on center. Hog ties are allowed.

Accessories

A. Tie wires: Bend ends of wire to minimize hazard to persons and clothing.

B. Fasteners: Install nuts on side of fence opposite fabric side for added security.

C. Barbed wire: Uniformly space parallel rows of barbed wire on security side of fence. Pull wire taut and attach with clips or in slots of each extension.

2.50 SHORING AND SUPPORT

2.51 Contractor Designed Shoring

Part 1 - General

Summary

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 supports in accordance with applicable laws, codes, and safety requirements.

References

Chapter 296-155 of WAC, "Safety Standards for Construction Work, Part N, Excavation, Trenching, and Shoring".

OSHA

Quality Assurance

Where the Contractor is required to provide the shoring design, it shall be prepared by a competent person as defined by WAC 296-155-650 (Washington). Before beginning any excavation that is governed by the shoring requirements, the Contractor shall submit his stamped shoring plan and calculations to the Owner for approval. The stamp must be present on all Plans and calculations, and all submittals must be approved by the Owner prior to starting work.

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Part 3 - Execution

Installation/Construction

Design, planning, installation, and removal of sheeting, shoring, sheet piling, lagging, and bracing shall be accomplished in such a manner as to maintain the undisturbed state of soil below and adjacent to excavation.

2.60 CONTAMINATED & WASTE MATERIALS HANDLING

2.60.2 Waste Material Control

Part 1 – General

Quality Assurance

Adhere to all requirements of federal, state, and local statutes and regulations dealing with pollution. Permit no public nuisances.

Use only dump sites that are approved by the regulatory agency having jurisdiction, and present proof of approval upon request.

Part 3 – Execution

Installation/Construction

The Contractor shall take precautions to warn, protect, and prevent the public from all hazards that exist on site due to any demolition or construction operations. Stockpiled debris shall be surrounded with yellow warning tape attached to lath, stakes, poles, or fencing to warn the public of any potential hazard.

Use water sprinkling, temporary enclosures, or other methods to limit dust and dirt from rising and scattering in the air. Surface water runoff that is contaminated with site debris, silt, or other material that adversely affects water quality shall be collected and cleaned prior to discharge. On site collection ponds may not be used to keep silt laden water from entering the storm water collection system.

Do not use water to control dust when its use may create hazardous or objectionable conditions such as ice formation, flooding, and pollution.

The Contractor shall minimize the amount of dust and other airborne particles caused by any demolition, excavation, stockpiling, or removal activities. Dust control measures shall be implemented by the Contractor prior to the beginning of work activities. Exposed soil may be wetted with water or covered to minimize dust creation. Water runoff from the wetting procedure shall be accumulated and cleaned prior to disposal. Water runoff accumulation shall be removed from the site prior to project completion.

Cleaning

At all times, keep the construction area clean and orderly and upon completion of the work, leave buildings broom clean and all parts of the work clean and free of rubbish and excess material of any kind. Leave fixtures, equipment, walls, and floors clean and free of stains, paint or roofing splashes, or other marks or defects. Upon completion, restore site of all work or equipment and material storage areas to their original conditions. Remove all miscellaneous

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unused material resulting from work and dispose of it in a manner satisfactory to the Owner. The site, through the progress of construction, shall be kept as clean as possible and in a neat condition.

2.61 Contaminated Materials

2.61.2 Toxic Spill or Release Contact Requirements

Part 3 - Execution

Field Quality Control

During construction, if there is any toxic substance spill or release discharged into the environment, report the location, quantity, date and time of the spill or release to Washington State Emergency Management at 1 (800) 258-5990 and the Owner's representative. Spills shall be monitored, contained, and cleaned up to applicable codes at the Contractor's expense.

No toxic materials are known to exist on site requiring Contractor attention.

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3.00 GENERAL

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

3.05 Common Work for Concrete

Part 1 - General

This division covers that work necessary for furnishing and installing all concrete as described in these specifications and as shown on the Plans.

References

Materials shall conform to the following standards:

- Cement - ASTM C-150
- Coarse aggregate - ASTM C-33
- Fine aggregate - ASTM C-33
- Admixtures - ASTM C-494
- Air-entraining admixtures – ASTM C-260
- Fly Ash – ASTM C-618

Submittals

Submittal information shall be provided to the Owner for the following items:

- Concrete mix design including aggregate gradation and substantiating strength data.
- Admixture Data
- Special placement procedures for hot or cold weather
- Construction Joint Plan
- Concrete anchors
- Concrete anchor installer certification per ACI/CRSI Adhesive Anchor Installer Certification Program.
- Schedule of surface finishes
- Rebar mill certifications
- Rebar placement shop drawings
- Precast concrete items
- Schedule of form inserts
- Grouts
- Embedded items
- Form Release agent
- Method of plugging through-bolt holes

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Concrete mix designs shall be submitted to the engineer for approval a minimum of two weeks prior to placing any concrete. The mix design shall include the amounts of cement, fine and coarse aggregate, water and admixtures, as well as the water cement ratio, slump, concrete yield, aggregate gradation, and substantiating strength data in accordance with ACI 318, Chapter 5. A batch plant inspection may be required, the cost of which shall be paid by the Contractor. Review of mix submittals by the engineer of record indicates only that information presented conforms generally with contract documents. Contractor or supplier maintains full responsibility for specified performance.

Part 2 - Products

Components

Nominal maximum size for aggregates is the smallest standard sieve opening through which the entire amount of aggregate is permitted to pass. Provide intermediate aggregate grades as required to achieve a well-graded mix.

All concrete surfaces exposed to weather or standing water shall be air entrained. Total air content shall be in accordance with IBC requirements unless specified otherwise herein. Air shall be measured at the truck, unless otherwise agreed to.

Water used in concrete shall be potable.

Fly ash may be substituted for up to 15 percent of the required cement, except where noted.

Mixes

Concrete shall be mixed, conveyed, and proportioned in accordance with IBC section 1905.

The concrete mix shall include the amount of cement, fine and coarse aggregate, including aggregate gradations, water, and admixtures as well as water cement ratio, slump, concrete yield, and sustaining strength data in accordance with these specifications, the requirements of the International Building Code Section 1905, and the requirements of ACI 318.

Part 3 - Execution

Inspection

See Statement of Special Inspections on the Drawings for special inspection requirements. Provide two (2) full working day notice to Owner prior to needing the required inspections.

Also comply with local building department and permit requirements for inspection and notification.

The Contractor shall repair, replace or modify, as appropriate, any items noted in the Special Inspector's inspection or the building department inspection.

Testing

Concrete strength tests shall be performed per section 1905.6 of the IBC and per the requirements noted herein. The Owner will provide and pay all costs of concrete testing. The Engineer shall be furnished with copies of all inspection reports and test results.

Cylinders used for concrete strength tests shall be 6 by 12. Four by 8 cylinders may be used for mixes with maximum aggregates less than 1-inch, however the testing lab must apply a

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0.94 multiplier to the compressive strength test results unless data acceptable to the Engineer is presented that would justify a higher multiplier. All mixes utilizing aggregates over 1 inch shall be tested using 6 by 12 cylinders.

When 4 by 8 cylinders are utilized AASHTO T23 requirements shall be followed, and the retainer used with neoprene pads when testing for compressive strength shall be constructed according to ASTM C 1231.

The Contractor will coordinate all concrete testing with the testing agency. Costs will be paid by the Owner.

Give the Owner and testing agency 48-hour notice prior to concrete placement. If Contractor fails to provide the required notice, the Owner may elect to cancel the affected concrete placement. Contractor shall be responsible for costs and delays due to improper notification.

If the Contractor schedules a concrete placement and does not notify the Owner and testing agency of a cancellation within 24 hours of the scheduled placement, the Contractor shall pay the testing agency costs for an unnecessary trip. If the Contractor fails to provide the testing agency with adequate notification and testing agency cannot attend concrete placement, Contractor shall reschedule placement. Contractor shall be responsible for all associated delays.

The Contractor shall provide all assistance and cooperation necessary to testing personnel to obtain the required concrete tests. Contractor and Owner will have access to testing results as soon as they are available.

The testing agency shall take a minimum of four samples for every 50 yards of concrete placed (and a minimum of four per pour); one for a 7-day test, two for 28-day tests, and one for backup testing in case the other two samples do not meet design strength. Additional samples may be taken to verify strength prior to form removal at the Contractor's expense.

3.10 FORMING AND ACCESSORIES

3.11 Formwork

3.11.13 Cast in Place Forming

Part 1 – General

The Contractor shall submit a construction joint plan to the Engineer for review prior to formwork and rebar installation if altered from that shown on the Plans. Modifications to the construction joints shall be submitted to the Engineer no less than seven (7) working days prior to placing the forms and rebar.

Part 2 – Products

Materials

Unless otherwise directed, coat contact surface of forms with colorless, non-staining, mineral oil that is free from kerosene, or other approved suitable material, to permit satisfactory removal of forms without concrete damage. Form-release agent for interior of potable water

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storage structures shall be National Sanitation Foundation Standard (NSF) No. 61 approved for use in direct contact with potable water.

Form construction for surfaces covered with backfill shall be made of steel, plywood, or dressed, matched lumber. Form construction for exposed surfaces shall be made of new plywood or steel without surface markings.

Form ties for use in liquid containment structures shall be standard plastic cone snap-ties with ¾-inch diameter neoprene waterstop washer or removable taper ties. Use Greenstreak X-plugs with removable taper ties or equal. Contractor shall submit to the Engineer form ties to be used for review prior to installation.

Part 3 - Execution

Installation/Construction

Concrete forms shall be sufficiently tight to prevent leakage of concrete or mortar and shall be properly braced or tied together to maintain desired position and shape until removed.

Conduits, pipes and sleeves of any material not harmful to concrete and within the limitations of ACI 318, Section 6.3 are permitted to be embedded in concrete with approval of the Engineer. Provide a ¾-inch chamfer or radius at all exposed corners and edges, unless specifically stated otherwise on the Plans.

Forms shall remain in place until the concrete has developed sufficient strength to withstand imposed loads without damage or deflection. Wall and slab forms shall remain in place for a minimum of 24 hours after completion of the pour. Forms for beams and suspended slabs shall remain in place for a minimum of 14 days AND until concrete has developed 28-day design strength, unless approved by the Engineer. The Contractor shall coordinate with the testing lab to verify concrete strength prior to form removal.

Do not allow water to flow through areas where forms are to be placed. During form construction and prior to placement of concrete, keep footings and floor slab areas free of standing water.

Field Quality Control

Variations from plumb, specified grade, conspicuous lines, and walls shall not exceed plus or minus ¼-inch in any 10-foot length, and shall not exceed one inch over the entire length. Variations from dimensions shall not exceed plus or minus ½-inch. Closer tolerances shall be achieved by the Contractor as necessary to accommodate equipment and other permanent materials.

3.15 Accessory Materials

3.15.02 Premolded Joint Filler

Part 1 – General

References

Premolded joint filler for expansion or through joint applications shall conform to the specifications for "Preformed Expansion Joint Fillers for Concrete Paving and Structural

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Construction", AASHTO M 213, except the requirement for water absorption is not applicable.

Part 2 – Products

Materials

The thickness and width of premolded joint filler shall be as indicated on the Plans. Where no premolded filler thickness is indicated, the thickness shall be ¾-inch.

3.15.03 Expansion Joints

Part 2 - Products

Materials

Expansion Joint Dowels shall be epoxy-coated plain steel bars of the dimensions as shown on the Plans and shall meet the requirements of Section 9-07.5 of the Standard Specifications.

Joint Sealant shall be Sololastic Ultra by as manufactured by Master Builders Technology and as provided by Degussa Construction Chemicals, or equal. Color to match concrete. Surface preparation and prime for water immersion shall be as recommended by the manufacturer. Provide backer rod as recommended by the sealant manufacturer.

The ends of the dowel bars embedded in the expansion side of the joint shall be coated with a parting compound such as grease, or other approved parting compound prior to concrete placement.

3.15.04 Embedded Items

Part 3 - Execution

Preparation

Fill voids in sleeves, insets, anchor slots, etc., temporarily with readily removable materials to prevent entry of concrete into voids.

Installation/Construction

Position embedded items accurately, and support against displacement or movement during placement.

Coat all aluminum embedded items as specified in Division 9.

3.15.05 Pipe Penetrations through Concrete

Part 1 - General

Summary

Water holding structures and structures buried and subject to groundwater contact: As shown on the Plans.

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Structures not holding water or unburied structures: Unless identified on the Plans, all pipes larger than two inches passing through poured-in-place concrete floors and walls shall be isolated from the concrete.

Part 2 - Products

Materials

Provide a Link-Seal system (or approved equal) for walls.

Wrap the pipe in a flexible, non-biodegradable material such as high-density foam or asphalt board for floors.

Part 3 - Execution

Examination

Wrapping must be inspected and approved by Engineer prior to concrete pour. Gaps, tears, or looseness in wrapping will be cause for rejection.

Installation

Install Link-Seal per manufacturers instruction either within a cast-in-place sleeve or core drill a clean hole for walls.

For floors, wrapping shall be watertight and provide a minimum of ½-inch separation between the pipe and concrete. Extend wrapping a minimum of one inch above and below concrete pour and cut flush on accessible side(s) after curing.

3.15.19 Concrete Anchors

Part 1 - General

Quality Assurance

Installation of adhesive anchors shall be performed by personnel certified in accordance with the ACI/CRSI Adhesive Anchor Installer Certification Program. In lieu of certification the installer shall attend on-site training held by the adhesive manufacturer prior to the installation of adhesive anchors.

Part 2 - Products

Materials

Concrete Anchors shall be Hilti HIT 500-V3, Simpson SET-XP, or Powers PE1000+ Adhesive Anchors.

CMU Anchors shall be Simpson SET-XP Adhesive Anchors.

Anchorage into non-grouted, hollow masonry cells is not allowed unless specifically called out on plans. Where allowed, anchors in unreinforced masonry cells shall be Simpson SET-XP epoxy adhesive in conjunction with the Simpson Optimesh screen.

For wall mounted equipment weighing less than 250 pounds, Simpson Titen-HD Screw Anchors may be used in grouted or non-grouted CMU cells.

Threaded rod shall be stainless steel except in dry locations.

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Part 3 - Execution

Installation

Install in accordance with Manufacturer's recommendations. Special Inspection in accordance with IBC, Section 17, must be provided. Provide a minimum of 48 hours' notice to Engineer prior to starting installation. Concrete anchors shall not be used to resist tension or fatigue loading without Owner's evaluation and approval.

Use threaded rod or reinforcing bar as shown on the drawing, and meeting Manufacturer's recommendations. Provide minimum embedment as shown. Holes shall be drilled with carbide-tipped drill bit. Holes shall be cleaned of dust and debris. Adhesive shall be inserted with a mixing nozzle.

3.20 REINFORCING

3.21 Reinforcing Steel

3.21.13 Reinforcing Steel

Part 1 - General

References

ACI – American Concrete Institute- latest edition

CRSI Manual of Standard Practice – latest edition

Part 2 - Products

Materials

Grade – ASTM A706, Grade 60

ASTM A615, Grade 60 shall be permitted if:

(a) The actual yield strength based on mill tests does not exceed fy by more than 18,000 psi; and,

(b) The ratio of actual tensile strength to the actual yield strength is not less than 1.25.

Detailing - ACI 318 and ACI 315

Lap requirements - See schedule on Plans or as required by ACI 318

Tie wire - 16 gauge minimum

Bar supports shall conform to "Bar Support Specification" CRSI Manual of Standard Practice, MSP-1-80. Provide Class 1, plastic protected bar supports. Use pre-cast concrete blocks to support bars off ground. Bar supports in water holding and buried structures shall be non-metallic.

Bar supports for the bottom rebar mat of suspended slabs or beams in water holding structures must be point supports (chairs or dobbies), not continuous.

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Part 3 - Execution

Installation

Reinforcing steel shall be detailed in accordance with ACI 315and 318 and as shown on the Plans. Lap all reinforcements in accordance with "the reinforcing splice and development length schedule". Provide corner bars at all wall and footing intersections. Bend wire bar ties away from formwork to provide the same concrete clearance as shown on the Plans to the bars.

Welding of reinforcing steel shall not be performed unless specifically approved by the Engineer. If approved, Contractor will arrange and pay for all required Special Inspections associated with welding of reinforcing steel.

Field Quality Control

Reinforcing steel shall be free of rust and loose scale at time of concrete placement. Bars with kinks, improper bends, or reduced cross-section due to any cause will not be used. Bars shall not be field bent. Bars may not be tack-welded or otherwise heated.

If, within the project warranty period, rust spots appear on the concrete due to failure to achieve proper clearance on the rebar or wire ties, the Contractor shall grind out and patch the areas using a method satisfactory to the engineer.

3.30 CAST-IN-PLACE CONCRETE

3.30.01 Common Work for Cast in Place Concrete

Part 1 - General

Scheduling

Contractor shall schedule and attend a Concrete Placement meeting at least one week prior to placing concrete. The following shall attend:

- Owner
- Engineer
- Contractor
- Testing Laboratory Representative
- Concrete Supplier

The following shall be discussed at the meeting:

- Safety (Contractor's sole responsibility)
- Batching and Delivery, Adjustments to Mix; Site Dosing
- Placement Rates and Anticipated Schedule of Placing and Finishing
- Site Layout –Holding Area; Pump Truck Location; Truck Wash-out Area; Parking area
- Equipment – Pumps and Appurtenances; Vibrators; Spare Equipment
- Concrete Testing Procedures
- Curing

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Delivery

Concrete shall be transported in a truck mixer to the jobsite and discharged within 1.5 hours after cement has been added to water or aggregates. Rejected concrete will be at Contractor's expense.

Part 2 - Products

Components

If allowed, curing materials shall conform to ASTM C-171 and liquid membrane-forming compounds shall conform to ASTM C-309. When concrete is to be coated or stained, use UV-dissipating form release and curing compounds.

Part 3 - Execution

Preparation

Do not place concrete during rain, sleet, or snow until water and freezing protection is provided.

Before beginning placement of concrete, remove hardened concrete and foreign materials from inner surface of mixing and conveying equipment. Before depositing concrete, remove debris from space to be occupied by the concrete. Secure reinforcement in position to prevent movement during concrete placement.

At the beginning of the concrete pour for walls taller than 8 feet, place a 1½ to 2½-inch thick grout pad prior to placing the concrete for the wall. Grout mix shall consist of fine aggregates, concrete and water in the same ratios as used in the wall concrete. The placement of the concrete shall proceed immediately after the grout placement so as to prevent any cold joints.

At construction joints, thoroughly clean surface of existing concrete to remove laitance. Roughen existing concrete surface to expose aggregate uniformly and apply approved bonding agent to existing concrete in accordance with manufacturer's recommendations. Prior to placing fresh concrete, dampen joint and coat with grout mixture in accordance with ACI 301, Section 8.5.

Installation

Placement shall be in accordance with IBC, Section 1905.

Place no concrete when air temperature is below or expected to be below 40 degrees during the 28-day curing period unless a low temperature concrete mix has been approved by the Owner. Provide adequate equipment for heating materials and protecting concrete during freezing or near freezing weather. Keep materials, reinforcement, forms, and ground in contact with concrete free from frost at time of placement. Heat mixing water as required. Use no materials containing ice.

Place no concrete when air temperature exceeds or is expected to exceed 85 degrees during the 28-day curing period unless a high temperature placement plan has been approved, and unless adequate precautions are taken to protect work. Cool ingredients prior to mixing.

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Flake ice or crushed ice of a size that will melt completely during mixing may be substituted for all or part of water. Cool forms and reinforcing prior to placing concrete.

Handle concrete from mixer, ready-mixed truck, or from transporting vehicle to place of final deposit by methods which prevent separation or loss of ingredients. Under no circumstances shall concrete that has partially hardened be deposited.

Place concrete in maximum lifts of 3 feet. Deposit concrete continuously so that no concrete will be deposited on concrete which has hardened sufficiently to cause formation of seams and planes of weakness within the section. If a section cannot be placed continuously, locate and reinforce construction joints at points as provided for in the Plans or as approved by the Owner. Maximum concrete drop shall be 5 feet.

Consolidate concrete by vibration, supplemented by hand spading, rodding, forking, or tamping. Thoroughly work concrete around reinforcement, around embedded items, and into corners of forms to eliminate air or rock pockets which may cause honeycombing, pitting, or planes of weakness. Insert and withdraw internal vibrators at points approximately 18 inches in each direction and extend into the lower concrete lifts. At each insertion, the duration shall be sufficient to consolidate the concrete; but not sufficient to cause segregation. Do not use vibrators to transport concrete within forms. Consolidate slabs by utilizing vibrating screeds, roller pipe screeds, internal vibrators, or other approved methods. Have a spare vibrator available at jobsite during concrete placing operations.

After removal of forms, cut out and patch defects in concrete surfaces. Remove form tie cones. Cut or snap off form ties to a depth of ¾-inch. Chip out rock pockets, holes from form tie removal, and other defects to solid concrete. Repair defects in accordance with 3.01.30.71.

Curing

All concrete shall be water-cured in accordance with ACI 308.1 unless approved in advance by the Owner. If allowed, curing compound shall be applied immediately after finishing or form removal. When plastic or burlap covers are used to augment or protect curing, extend sheeting beyond the edges of the concrete and secure against wind lift. Inspect and adjust curing systems daily, including over weekends and holidays.

Curing compounds are not permitted on surfaces that will receive coatings.

Concrete structures that require differential backfill as shown on the Plans or as required for construction shall cure for a minimum of the following prior to placing backfill:

- Backfill equal or greater than 24 inches: 7 days AND 28-day strength requirements.
- Backfill between 6 and 24 inches: 3 days AND 80-percent of the 28-day strength requirements.

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3.31 CONCRETE MATERIALS

3.31.02 Structural Concrete

Part 1 - General

Summary

All concrete as shown on the Plans not used for liquid containment and below-grade structures, ringwalls, and mass concrete and not called out otherwise. Use water reducers as required to achieve slump. Hydraulic Concrete may be substituted.

Performance Requirements

28-day compressive strength – 4,500 psi minimum

Slump - Without plasticizers; 4 inches for floor and roof slabs, 7 inches for walls. With plasticizers, maximum 9 inches or as desired for placement.

Part 2 - Products

Mixes

Water/cement ratio - 0.40

Nominal maximum aggregate size – ¾-inch (AASHTO Grading No. 67)

Entrained air ratio – 3.5 percent minimum to 6.5 percent maximum

3.31.03 Thrust Blocks, Driveways, Curb, Gutter, Sidewalks, Equipment Pads, and Fence Posts

Part 1 - General

Summary

All concrete for non-structural applications including thrust blocks, driveways, sidewalks, equipment pads, and fence post foundations. Structural Concrete may be substituted.

Performance Requirements

28-day compressive strength – 4,500 psi minimum

Part 2 - Products

Mixes

Water/cement ratio - 0.45 maximum

Nominal maximum aggregate size – ¾-inch (AASHTO Grading No. 67)

Entrained air ratio – 3.5 percent minimum to 6.5 percent maximum

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3.31.09 Controlled Density Fill (CDF)

Part 1 - General

Submittals

Revisions to the mix design shall be submitted to the Engineer for approval.

Performance Requirements

CDF as shown on the Plans or as directed by the Engineer shall be proportioned to be flowable, non-segregating, and excavatable, and shall conform to the following requirements:

- Maximum Compressive Strength 300 (psi).
- Minimum 28-day compressive strength 100 (psi).

Part 2 - Products

Mixes

- Pounds of cement per cubic yard (approx.) 50.
- Pounds of fly ash per cubic yard (approx.) 250.
- Pounds of dry aggregate per cubic yard (approx.) 3,200.

If air containing or water reducing admixture is used for flowability, total water and aggregates may be adjusted for yield. Weights may be adjusted for flowability and pumpability.

Part 3 - Execution

Field Quality Control

The Contractor shall protect CDF for at least 24 hours after placement or for a duration as necessary to prevent displacement by construction equipment or traffic. CDF placing may be started if weather conditions are favorable, when the temperature is a minimum of 34 degrees Fahrenheit and rising. At the time of placement, CDF must have a temperature of at least 40 degrees Fahrenheit. Placing shall stop when the temperature is 38 degrees Fahrenheit or less and falling. CDF shall not be placed on frozen ground.

3.35 SURFACE FINISHING

3.35.01 Common Work for Surface Finishing

Part 2 - Products

Finishes

Each concrete area that requires finishing shall conform to one of the following requirements:

- Foundation (exterior) - Ordinary Wall
- Foundation (interior) - Ordinary Wall
- Interior Floors – Light Brushed

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- Equipment Pads - Sacked Wall
- Landings – Light Brushed

Part 3 - Execution

Preparation

Do not place concrete which requires finishing until the materials, tools, and labor necessary for finishing the wet concrete are on the job and acceptable to the Owner. If rainfall is possible, tent the work area prior to the pour and maintain protection until the concrete is cured sufficiently to resist damage.

3.35.03 Ordinary Wall Finish

Part 2 Products

Materials

Ordinary Wall Finish requires the use of like-new forms and linings that will produce a uniform surface.

Part 3 - Execution

Construction

After points have set sufficiently, grind or fill form marks and pointings to give a smooth surface even with flat wall surface. Fill all holes greater than ¼-inch with 1:2 mortar floated to an even, uniform finish.

3.35.06 Light Brush Finish

Part 2 – Products

Finish

When concrete has appropriately set, finish with light soft broom finish. Brush perpendicular to slab slope.

Part 3 - Execution

Construction

Consolidate, strike off, and level concrete; but do not work further until ready for floating. Begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit floating operations. Consolidate surface with power-driven floats. Hand floating may be used if area is small or inaccessible to power units.

Field Quality Control

Check surface planeness during or after first floating. Cut down high spots and fill low spots to produce surface with tolerance of ¼-inch in 10 feet in any direction. Re-float to a uniform, smooth, sweat finish concrete.

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3.35.8 Sacked Wall Finish

Part 1 – General

References

Provide sacked finish in accordance with Section 6-02.3(14)A of Standard Specifications.

3.40 PRE-CAST CONCRETE

3.40.10 Utility Structures

Part 1 - General

Related Divisions

- 13.39.13 Sanitary Sewer Manholes, Frames, and Covers

Design Requirements

All concrete structures identified on the Plans as being pre-cast, prefabricated, or not specifically detailed with reinforcing steel shall be pre-cast concrete.

Pre-cast vaults shall conform to ACI 318 and be constructed to the equivalent dimensions and functional characteristics of the specific product identified on the Plans.

Unless shown otherwise on the plans, round structures larger than 30-inch inside diameter, or rectangular structures with longest interior side 30-inches or longer, that utilize riser sections, shall be cast with an integral keyway for interlocking the riser sections.

Performance Requirements

Pre-cast structures shall be constructed to withstand anticipated construction loads that occur during transport, handling, and placement as well as the anticipated design loads. Design loads shall include the anticipated soil pressures, hydrostatic loads, and HL-93 traffic loading.

Part 2 - Products

Materials

Additional reinforcement shall be provided within the pre-cast concrete structure at all penetrations, openings, joints, and connections. The additional reinforcement shall be provided to prevent damage during shipping, handling and installation. All damaged units shall be rejected.

All precast structures that consist of sections (base, riser, lid, etc.) shall have the joints sealed with rubber gaskets or mastic, of a material appropriate for the installation.

Part 3 - Execution

Cleaning

Fill picking holes with grout flush to the structure surface, including those in vault lids. Cut, remove, and grind smooth shipping lifting hooks on the vault interior, unless directed otherwise by the Engineer.

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3.60 GROUTING

3.62 Non-Shrink Grout

Part 1 - General

Summary

Use Precision Non-Shrink Grout for grouting all equipment base plates, pipe supports, and base plates for metalwork. Precision Non-Shrink grout may also be used for all other non-shrink grouting operations. General Purpose Non-Shrink grout may be used for any applications other than those noted for Precision Non-shrink Grout. Non-shrink grout shall be used to seal all new pipe and conduit penetrations (watertight) into and out of all concrete and CMU block walled structures.

Storage and Handling

Stockpile grout to prevent contamination from foreign materials and store admixtures to prevent contamination or damage from excess temperature change

Part 2 - Products

Materials

Precision Non-Shrink Grout:

Provide a high-precision, fluid, non-shrink, quartz or non-catalyzed metallic aggregate grouting material. Provide a ready-to-use grout that hardens free from bleeding, settlement, or drying shrinkage when mixed, placed and cured at any consistency – fluid, flowable, plastic or damp-pack.

Provide precision, non-shrink natural aggregate grout that when cured produces the following properties:

A. Compressive Strength at fluid consistency (ASTM C 109-90-Modified): 3500 psi (24 MPa) at 1 day, 7500 psi (52 MPa) at 28 days.

B. Passes ASTM C 1107 as a grade B grout when tested as temperature minimum and maximums of 45 degrees Fahrenheit to 90 degrees Fahrenheit (8 degrees Celsius to 32 degrees Celsius) at a working time of 30 minutes. Grout must be tested at a fluid consistency per ASTM C 939 and remain fluid at temperature range minimum and maximums for the 30-minute working time. All materials including water must be mixed and tested at temperature minimum/maximums.

C. Modulus of Elasticity at 28 days at fluid consistency (ASTM C 469): 3.0 x 10^6 psi (20.7 GPa) minimum, 3.9 x 10^6 (27.0 GPa) maximum.

D. Coefficient of Thermal Expansion for fluid consistency (ASTM C 531): 7.5 x 10^{-6}/ degrees Fahrenheit maximum (13.5 x 10^{-6}/ degrees Celsius).

E. Flexural strength at 28 days for fluid consistency (ASTM C 78): 1300 psi (7.9 MPa).

F. Resistance to rapid freezing – thawing (ASTM C 666, Procedure A): 300 cycles- min RDF 90 percent.

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G. Split tensile strength at 28 days at fluid consistency (ASTM C 496): 450 psi (3.1 MPa).

H. Pass 24-hour grout test under stated temperature, time and fluidity constraints. See MBT Protection and Repair 24-hour Grout Form.

Precision non-shrink grout shall be Masterbuilders 928 or Embeco 885 Grout or approved equal.

General Purpose Non-Shrink Grout:

General Purpose Non-shrink grout shall meet the compressive strength and nonshrink requirements of CRD-C 621, Grades B and C; Corp of Engineers Specification for Non-shrink grout; and ASTM C 1107, Grades B and C. General Purpose Non-shrink grout shall be Masterflow 713 Plus or Embeco 636 Plus or approved equal.

Provide curing compounds as recommended by the grout manufacturer.

Water to be used in mixing the grout shall be potable.

Mixes

Comply with grout manufacturer's recommendations for mixing procedures.

Adjust water temperature to keep mixed grout temperature in the range of 45 degrees Fahrenheit (7 degrees Celsius) and 90 degrees Fahrenheit (32 degrees Celsius) minimum/maximum.

Use cold or iced water to extend working time in hot weather or in large placements.

Use warm water in cold conditions to achieve minimum as mixed temperatures.

Part 3 - Installation

Preparation

Mechanically remove unsound concrete within the limits of the grout placement.

Remove at least ¼-inch (6mm) of existing concrete facing and continue removal as required to expose sound aggregate.

Thoroughly clean the roughened surface of dirt, loose chips, and dust. Maintain substrate in a saturated condition for 24 hours prior to grouting. Surface should be saturated surface dry at time of grouting.

Clean baseplates and other metal surfaces to be grouted to obtain maximum adhesion. Remove loose rust and scale by grinding or sanding.

Comply with grout manufacturer's recommendations for form construction. Construct forms to be liquid tight.

Installation

Place grout mixture into prepared areas from one side to the other. Avoid placing grout from opposite sides in order to prevent voids. Work material firmly into the bottom and sides to assure good bond and to eliminate voids.

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Ensure that foundation and baseplate are within maximum/minimum placement temperatures. Shade foundation from summer sunlight under hot conditions. Warm foundation when foundation temperature is below 45 degrees Fahrenheit (7 degrees Celsius).

Wet cure exposed shoulders for 48 hours followed by two coats of curing compound for best results. The minimal requirement is to wet cure until grout has reached final set, followed by two coats of curing compounds.

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Division 4
Masonry

4.00 GENERAL

This division covers that work necessary for furnishing and installing masonry as described in these specifications and as shown on the Plans.

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

4.05 Common Work for Masonry

This division covers that work necessary for providing materials and performing all masonry as described in these specifications and as shown on the Plans.

Part 1 - General

Submittals

Submittal information shall be provided to the Owner for the following items:

- Masonry Mortar
- Masonry Grout
- Reinforcing Steel Shop Drawings – Include plan view showing blocks and exact location of all vertical reinforcing.
- Concrete Masonry Units (CMU) – Provide certification for all units. Provide samples for all colored and/or faced units.
- Color Scheme
- Waterproofing materials
- Masonry Insulation
- Masonry Accessories
- Letter of Certification for Masonry Prism Testing as noted in the IBC

4.20 UNIT MASONRY

4.22 Concrete Unit Masonry

Part 1 - General

Summary

This division covers that work necessary for furnishing and installing all Concrete Unit Masonry as described in these specifications and as shown on the Plans. Masonry mortar shall be used to properly level, position, bond together, seal irregularities, and provide a weather-tight joint between the concrete masonry units (CMU). Masonry grout shall be used to fill all CMU cells that contain reinforcing steel.

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Related Sections

- Division 7.21.5 Insulation
- Division 9.05.00 Common Work for Finishes
- Division 9.06 Color Schedule
- Division 9.97.23 Concrete and Masonry Coatings: Interior walls
- Division 9.97.23.10 Water repellant

References

- 2012 International Building Code
- TMS 602/ACI 530.1/ASCE 6 Specifications for Masonry Structures
- TMS 402/ACI 530/ASCE 5
- ASTM A-615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- ASTM C-33, Standard Specifications for Concrete Aggregates
- ASTM C-67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
- ASTM C-90, Standard Specification for Loadbearing Concrete Masonry Units
- ASTM C-144 Standard Specification for Aggregate for Masonry Mortar.
- ASTM C-150, Standard Specification for Portland Cement
- ASTM C-207, Standard Specification for Hydrated Lime for Masonry Purposes
- ASTM C-270, Standard Specification for Mortar for Unity Masonry
- ASTM C-404, Standard Specification for Aggregate for Masonry Grout.
- ASTM C-476, Standard Specification for Grout for Masonry
- ASTM C-744, Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units
- ASTM C1019, Standard Test Method for Sampling and Testing Grout

Design Requirements

Compressive strength shall be determined using the unit strength method or the prism test method in accordance with IBC Section 2105.2.2. Net Area compressive strength shall be a minimum of 1500 psi.

Mortar shall conform to section 2103.9 of the IBC for type "S" mortar with a minimum compressive strength of 1800 psi at 28 days.

Masonry grout shall comply with Article 2.2 of TMS 602/ACI 530.1/ASCE 6.

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Quality Assurance

A minimum 4 foot by 4-foot mockup panel will be provided in the field prior to starting the work using all block types and colors and associated mortar colors. Owner will review and approve mock-up panel prior to starting construction. The mockup panel may be incorporated into the work if agreeable to the Owner.

Storage, Delivery, and Handling

All blocks shall be covered and protected against wetting prior to use.

Stockpile and handle grout and mortar to prevent contamination from foreign materials; store admixtures to prevent contamination or damage from excessive temperature changes. Water to be used in mixing the grout shall be free from foreign materials.

Part 2 - Products

Materials

Concrete Masonry Units

Concrete Masonry Units shall be hollow load-bearing type, conforming to ASTM C-90, Grade N, Type 1, 1900 psi minimum. Provide aggregates meeting ASTM C33. All units, unless otherwise noted, shall have normal weight aggregate having a uniform quality, texture, and color. Unit sizes and shapes shall be 8 inches high by 16 inches long by 8 inches wide (nominal).

Masonry shall be ground face and glazed as shown on the drawings.

All ground face concrete masonry units shall be Trendstone plus units manufactured by Trenwyth Industries or equal. Concrete Masonry Units for grinding shall conform to ASTM C90, Type 1. The ground surfaces shall be filled with a cementitious grout which shall have a minimum cured strength and durability equal to the substrate block. After polishing, the filled surface shall have a factory-applied, heat-treated, acrylic finish conforming to ASTM C-744 with respect to adhesion, abrasion, color change, and resistance to crazing and ASTM C67 with respect to freezing and thawing. The provisions of ASTM C90 Paragraph 7.3.1 apply with regard to imperfections.

All glazed concrete masonry units shall be Astra-glaze units manufactured by Trenwyth Industries or equal. Glazing shall be applied to the unfilled face of a ground-faced masonry unit. The glazed surface shall have a smooth-satin-gloss finish, externally heat-polymerized cast on facing conforming to ASTM C-744 and all applicable Federal Specifications.

All concrete masonry units exposed to weather shall have an integral water repellant added to the block and mortar. Repellant admixture equal to Dry-Block as manufactured by W.R. Grace and Co.

Masonry Mortar

Cement shall meet ASTM C-150, lime shall meet ASTM C-207 and aggregates shall meet ASTM C-144.

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Proportion mortar by volume and mix in a standard mortar mixer operated in accordance with manufacturer's recommendations. Mix ingredients thoroughly in dry form and add water to bring the mixture to the proper consistency for use. Do not hand-mix mortar.

Mortar proportioned in accordance with ASTM C270, Table 1 need not be tested. Where testing is required, mortar shall be laboratory tested prior to use in accordance with ASTM C270.

Provide mortar pigment to match owner-selected color of concrete masonry units.

Masonry Grout

Masonry grout components shall comply with ASTM C-150 for Portland cement and ASTM C-404 for aggregates.

Per ASTM C-476 Fine Grout Standards, masonry grout shall consist of one-part Portland cement to three parts masonry sand and one-tenth part lime and shall have a minimum compressive strength of 2000 psi.

Compressive strength of masonry grout shall be determined in accordance with ASTM C1019.

Reinforcement

Joint reinforcing shall conform to Article 2.4 of TMS 602/ACI 530.1/ASCE 6.

Reinforcing steel bars shall be ASTM A-615, Grade 60. Provide bar lengths and sizes as shown on the Plans.

Components

Provide vertical reinforcement at all corners, on each side of openings 24 inches and larger than and at the intervals shown. Provide horizontal reinforcing at bond beams as shown on the Plans, and above and below all openings larger than 24-inches.

Accessories

Where called out, anchors shall be dovetail anchor slots and anchors. Anchor slots shall be equal to Burke "Fleming" masonry anchor slot and anchors shall be equal to "AA Wire Products Dovetail Flex-O-Look Channel and Ties", or equal.

Finishes/Colors

The Owner shall approve block and grout colors via submittal review. Colors shall match the existing building on site and as shown on the plans.

Acid wash inside and outside faces of blocks before coating.

Coat the following surfaces with the products identified under "Related Divisions" above.

- Interior walls

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Part 3 - Execution

Preparation

When joining fresh masonry to set or partially set masonry construction, the Contractor shall clean the exposed surface of set masonry and remove loose mortar prior to laying fresh masonry.

The Contractor shall protect sills, ledges, and offsets from mortar drippings or other damage during construction. The Contractor shall protect the adjoining work from mortar droppings, and newly-laid masonry from damage and from rain until the mortar has set.

Installation

Masonry construction shall comply with the requirements of IBC 2104 and with TMS 602/ACI 530.1/ASCE 6.

The cold weather construction provisions of TMS 602/ACI 530.1/ASCE 6, Article 1.8 C, shall be implemented when the ambient temperature falls below 40 degrees Fahrenheit (4 degrees Celsius).

The hot weather construction provisions of TMS 602/ACI 530.1/ASCE 6, Article 1.8 D, shall be implemented when the ambient air temperature exceeds 100 degrees Fahrenheit (37.8 degrees Celsius), or 90 degrees Fahrenheit (32.2 degrees Celsius) with a wind velocity greater than 8 mph (12.9 km/hr).

The Contractor shall lay only dry masonry units. When masonry needs to be sawed, only masonry saws shall be used to cut and fit masonry units. All units shall be set plumb, true to line, and with level courses accurately spaced. The masonry unit shall be adjusted to final position while the mortar is soft and plastic. If the units are displaced after the mortar has stiffened, the Contractor shall remove the units, clean the joints or mortar, and relay with fresh and clean units.

All joints shall be tooled and concave unless otherwise specified.

The Contractor shall remove mortar protruding into cells of cavities to be reinforced.

All ungrouted concrete masonry units with an exterior face shall be insulated as shown on the Plans and detailed in Division 7.

All masonry reinforcement and accessories shall be installed as shown on the Plans and submitted details. The Contractor shall not splice reinforcing except as shown on the Plans. The minimum splice, where not indicated, shall be 32 bar diameters or 24 inches, whichever is greater. All accessories shall be cleaned of all dirt, grease, oil, loose mill scale, excessive rust, or other foreign matter which may reduce bond with grout or mortar.

Fill all vertical and horizontal cells that contain reinforcing and as detailed on the Plans with grout. Cells shall have an unobstructed vertical alignment. The Contractor shall provide grouted bond beams where required. Provide lintels made up of reinforced, grouted lintel sections over all wall openings as shown on the Plans. The Contractor shall install horizontal and vertical reinforcing and hold in position as the work progresses to maintain the following clearance between the reinforcing and the block surface: 1½ exterior, ¾-inch interior.

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The maximum lift for grout pours shall be 4 feet. The Contractor shall make sure that the grout is consolidated with a vibrator immediately after pouring and re-consolidate after excess moisture has been absorbed; but before plasticity is lost. Provide clean-outs at the bottom of all grouted courses. Contractor may eliminate clean-outs at the Owner's discretion, if the bottoms of all cells are free of knocked-off mortar fins and dirt. The Contractor shall hold grout 1½ inches below the top of the upper most units when work stops for over one hour, and thoroughly clean and roughen the joint before proceeding with the work.

The Contractor shall grout full-space-around door frames and other built-in items. Build in all work with the masonry including anchor bolts. Build in wall plugs, doors, windows, and accessories and plumbing appurtenances as erection progresses.

At the stoppage of work at any time, the work shall be covered with tarpaulins or boards to prevent rain or snow from entering the cores of the block. The walls shall be adequately braced to support masonry. If mortar or grout has been misplaced, the Contractor shall have it immediately removed.

Shore reinforced lintels a minimum of 14 days after grout placement or until a 28-day strength is achieved.

Prior to completion, fill all holes in joints. All defective joints shall be cut out and repointed. At the end of each day's work and after final pointing, dry-brush the masonry surface.

Field Quality Control

Variations from plumb, specified grade, conspicuous lines, and walls shall be plus or minus ¼ inch in any 10-foot length, not to exceed plus or minus 1 inch overall. Variations from dimension shall not exceed plus or minus ½ inch.

Special Inspection shall be in accordance with Table 1.18.3 (Level C Quality Assurance) of TMS 402/ACI 530/ASCE 5.

Also see Statement of Special Inspections on the Drawings. Provide 2 working day notice to Owner prior to needing the required inspections.

Comply with local building department and permit requirements for inspection and notification.

The Contractor shall repair, replace, or modify, as appropriate, any items noted in the Special Inspector's inspection or the building department inspection.

The Contractor shall provide verification to the Engineer that site-produced mortar meets the required proportions using visual observations. Engineer reserves the right to require additional testing in accordance with ASTM C 270.

Field testing of grout shall be meet the requirements of ASTM C1019. The testing agency shall take a minimum of three grout samples for every 5,000 square feet of wall placed (and a minimum of four per week); two for 28-day tests, and one for backup testing in case the other two samples do not meet design strength. Additional samples may be taken to verify strength at the Contractor's expense.

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Division 5
Metals

5.00 GENERAL

This division covers that work necessary for furnishing and installing all fabricated metalwork as described in these specifications and as shown on the Plans.

Sections in these specifications titled "*Common Work for* . . . shall apply to all following subsections whether directly referenced or not.

5.05 Common Work for Fabricated Metalwork and Plastics

Part 1 - General

Related Sections

- Division 1.81 Seismic Restraint
- Division 1.88 Location Designations
- Division 8.31.20 Vault Hatch
- Division 9.90.00 Common Work for Painting and Coating
- Division 9.90.01 Color Schedule
- Division 9.91.13.12 Metals in contact with Concrete
- Division 9.91.13.01 Exterior metals
- Division 9.91.23.01 Metals interior
- Division 9.91.23.04 Galvanized iron and nonferrous
- Division 9.91.33 Submerged metals

Submittals

Submittal information shall be provided to the Owner for the following items:

- Shop Drawings showing details of Fabricated Metalwork including connections and welding
- Calculations and plans stamped by a professional engineer licensed in the State of Washington for all Contractor- or Manufacturer-designed components or assemblies.

Inspections

Unless otherwise noted on the Plans, specifications, or building department requirements, special inspections related to metal fabrications, placement and welding shall be subject to 48-hour notice to the Engineer prior to the inspection time. 48-hour notice is defined in Division 1, Contractor Responsibility.

Any Field welding shown on the Plans will require special inspections in accordance with section 1704.3 of the IBC and AISC 360.

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Quality Assurance

Only prequalified welds (as defined by AWS) shall be used.

Fabricator shall be registered and approved by American Institute of Steel Construction (AISC) to perform shop fabrication without special inspection. Submit certificate of compliance to the Owner at the completion of fabrication. Owner will forward this to the Building Official.

If fabricator is not registered and approved, or the certificate of compliance is not received, the Contractor shall reimburse the Owner for all Special Inspections required by the IBC on shop fabricated items. The Contractor shall also reimburse the Owner for all Special Inspections required by the IBC for field welding not specifically shown on the Plans. Contractor shall alert Owner at least 30 calendar days in advance if such Special Inspections will be required in order to procure the services of a testing lab.

Special Inspection by the Owner does not relieve the Contractor of responsibility of performing his own inspections and testing to ensure that all items are properly constructed.

Welding of steel and stainless-steel fluid transport pipe that is not a structural member shall be performed by operators qualified for AWS B2.1, AWS D10.18 or the ASME Boiler and Pressure Vessel Code Section IX part A. Welders may also provide other certifications for review and approval by the Owner, though approval of other certifications should not be assumed.

Part 2 - Products

Materials

Structural Steel

Structural steel shall conform to the following requirements:

Plates, shapes, angles, rods - ASTM A36, Fy ≥ 36 ksi

Special shapes, plates - ASTM A572, Fy ≥ 50 ksi

Pipe Columns - ASTM A53, Grade B Type E or S, Fy ≥ 35 ksi (see Division 15.22 for steel pipe carrying fluids).

Structural Tubing - ASTM A500, Grade B, Fy ≥ 46 ksi

Stainless Steel

Stainless steel shall be type 304 (non-welded) or type 304L (welded) or as called out.

Plates - ASTM A240

Fasteners - ASTM F593

Extruded Structural Shapes - ASTM A276

Pipe - ASTM A240 or higher grade or as called out.

See Section 15.22.4 for information on pipe used for mechanical applications.

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All stainless steel shall have a standard mill finish where concealed or No. 4 finish where exposed and shall be cleaned of all foreign matter before delivery to the job site.

Aluminum

Plates - ASTM B209, Type 6061-T6

Extruded Shapes - ASTM B308, Type 6061-T6

Pipe - ASTM B210 Type 6061

Architectural Applications - ASTM B210, Type 6063

Aluminum materials in contact with concrete or other metals or other masonry materials shall have surfaces coated per Division 9.

Galvanized Steel

Base metal shall be as specified for Mild Steel.

Hot-dip galvanized after fabrication in accordance with ASTM A 924/A 924M.

Finishes: For pieces that will NOT be painted, galvanize with zinc coating in accordance with ASTM A 653/A 653M For pieces that WILL be painted, galvanneal with zinc/10 percent iron coating in accordance with ASTM A 653/A 653M

Fiberglass Reinforced Plastic (FRP) Structural Shapes

All FRP components shall be equal to that manufactured by Strongwell.

Fiberglass reinforced plastic (FRP) structural shapes shall be produced using the pultrusion process. Mechanical and physical properties (from ASTM coupon specimens) must be submitted to the Engineer for approval.

Pultruded structural shapes are to have the minimum longitudinal mechanical properties listed below:

Property	ASTM Method	Value	Units
Tensile Strength	D-638	30,000 (206)	psi (MPa)
Tensile Modulus	D-638	2.5×10^6 (17.2)	psi (GPa)
Flexural Strength	D-790	30,000 (206)	psi (MPa)
Flexural Modulus	D-790	1.8×10^6 (12.4)	psi (GPa)
Flexural Modulus (Full Section)	N/A	2.8×10^6 (19.3)	psi (GPa)
Short Beam Shear (Transverse)	D-2344	4,500 (31)	psi (MPa)
Shear Modulus (Transverse)	N/A	4.5×10^5 (3.1)	psi (GPa)
Coefficient of Thermal Expansion	D-696	8.0×10^{-6}	in/in/°F
		(1.4×10^{-6})	(cm/cm/°C)
Flame Spread	E-84	25 or less	N/A

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Seal cut edges and holes according to manufacturer's instructions with a polyester resin compatible with resin matrix of structural shape and corrosion resistance equal or superior to the grating. Glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.

All finished surfaces of FRP items and fabrications shall be resin-rich, free of voids and without dry spots, cracks, crazes, or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.

Manufactured Units

Design of Contractor- or Manufacturer-designed components or assemblies shall meet the specific component requirements as provided here-in, as well as all applicable state and federal codes. Design shall include gravity loads and seismic loads in accordance with ASCE 7-10 Chapter 13 "Seismic Design Requirements for Nonstructural Components". Design criteria shall be as provided herein for components, and as provided on the Plans.

Contractor-designed components and assemblies shall be shop welded and field bolted if possible. Field welding will NOT be allowed unless specifically shown, or there is no reasonable alternative.

Finishes

Isolate and coat dissimilar metals to prevent galvanic corrosion.

Non-exposed structural steel: Mill finish or as shown on Plans

Exposed structural steel (damp or wet locations): Division 9

Aluminum: Division 9

Galvanized steel: Division 9

Stainless steel: Division 9

Fiberglass: Uncoated

Part 3 - Execution

Fabrication

All welding shall be in accordance with AISC and American Welding Society (AWS) standards and shall be performed by AISC and/or AWS certified welders using electrodes to match base material. Only prequalified welds (as defined by AWS) shall be used. Welding inspection shall be performed in accordance with the applicable AWS provisions and Chapter 17 of the IBC. Shop welding requiring inspection or testing per IBC Chapter 17 must be tested by an independent testing laboratory certified by AWS and approved by the owner at the Contractor's expense. Field welding, where required or allowed, will be inspected by a representative of the owner at the owner's expense. This does not relieve the Contractor of responsibility of performing his own inspections and testing to ensure that all items are properly constructed.

All shop welds shall be ground smooth.

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Any shop paint on metal surfaces adjacent to joints to be field welded shall be wire brushed to remove the paint film prior to welding.

Where steel items to be welded are galvanized, galvanizing must first be removed by grinding with a silicon carbide wheel, by grit blasting or by sand blasting.

Any cutting or grinding equipment used on stainless steel must be new or only previously used on other stainless-steel material.

All stainless-steel shop welds shall be pickled after welding to remove heat damage and contaminants. Field welds must be passivated using an Engineer approved product (Citrisurf 2210 or equal). If the metal will be in contact with potable water, pickling and passivation products must be citric acid based and thoroughly removed, or use a product approved by USDA or NSF.

Coating

All steel fabrications shall be surface prepped, shop primed and field coated in accordance with Division 9. Shop priming shall be protected as required to prevent damage to the coating during shipping. Hold back shop priming from areas to be field welded.

Installation

Fabrications shall be installed as shown on the approved shop drawings. All members shall be accurately located and erected plumb and level.

Metal fabrications shall be installed or erected as based on the American Institute of Steel Construction (AISC) "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings", latest edition, plus all referenced code requirements.

Temporary bracing, such as temporary guys, braces, false-work, cribbing, or other elements, shall be provided by the Contractor in accordance with the requirements of the "Code of Standard Practice", wherever necessary to accommodate all loads to which the structure may be subjected, including construction loads. Such bracing shall be left in place as long as may be required for safety. As erection progresses, the work shall be securely bolted or welded to compensate for all loads during construction.

No permanent bolting or welding shall be performed until the structure has been properly aligned.

5.05.23 Bolts and Other Connectors

Part 2 - Products

Materials

Bolts and other connectors not specifically called out otherwise shall be in accordance with the following.

Under no circumstances shall the fasteners be of lesser strength or higher corrosion potential than the materials being connected.

Connection bolts, nuts, and washers for all materials in wet, damp, or corrosive locations shall be Stainless Steel, alloy 304 in raw domestic or treated domestic water, alloy 316 in treatment process and sewage applications, and alloy 317 for acidic transport. Bolts and nuts shall meet

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ASTM F593B (bolts ¼-inch to 1½-inch in diameter with 30 ksi yield) and F594B (***nuts). Use Nitronic 60 bolts and nuts for strong chlorine environments (Chlorine Dioxide Injection vault and downstream).***

Steel and cast-iron fabrications: Connection bolts for dry locations shall be ASTM A307 galvanized or zinc plated bolts.

Structural Plastic Fabrications: Connection bolts shall be ASTM A307 galvanized in dry applications and Stainless Steel in wet, damp, or corrosive locations.

Aluminum Fabrications: Connection bolts shall be ASTM A307 galvanized. Aluminum fasteners may be allowed where high strength is not needed (e.g. mounting expanded metal screens, or louver fins), confirm with Engineer prior to use. Steel screws must be galvanized, or zinc plated. 300 Series stainless steel fasteners allowed only with the use of isolating washers.

Stainless steel fabrications: Fasteners to match same stainless series as structure (e.g. 300 series fasteners with 300 series structure)

Bolts installed into hardened concrete and CMU shall be Concrete Anchors as specified herein.

Bolts and studs shall be long enough that at least two threads extend beyond the face of the tightened nut.

For pump anchor bolts, see Division 11.19.

For mechanical pipe (non-structural) connections, see Division 15, "Common Work for Pipe and Fittings".

Part 3 - Execution

Installation

All materials to be joined together shall be connected as shown on the Plans, specifications, as recommended by the manufacturer, or as required by standard industry practices if not otherwise specified.

Dissimilar metals:

In damp locations, isolate dissimilar metals using nylon isolation sleeves and washers, Cooper B-Line Nylon Headed Sleeve Kit or equal.

For wet locations: avoid dissimilar metals unless specifically approved or shown. Use similar metals with welded connections. If approved or shown, use galvanized mild steel bolts installed into prepped and coated holes with additional field coating over the top of bolt.

5.60 LADDERS

5.60.01 Common Work for Ladders

Part 1 - General

Design Requirements

Ladders shall meet the requirements set forth in the IBC, ASCE 7, OSHA 1910.27 and WAC 296-876.

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Safety cages, platforms, and fall prevention devices shall be provided as shown on the Plans. They shall comply with WAC Section 296-876-60065 through 296-876-60080.

Ladders shall extend the full distance from base landing to top access plus extension. Ladders that are short shall be field extended by method approved by the Engineer or replaced with proper length ladder.

Part 2 - Products

Materials

All ladders and ladder accessories shall be hot-dipped galvanized steel, aluminum, or fiberglass as indicated on the Plans.

Fabrication

Ladders shall be shop assembled, pre-drilled and prepared for field attachment of standoff clips, or as otherwise shown.

5.60.10 Fiberglass Reinforced Plastic (FRP) Ladders

Part 2 - Products

Materials

FRP ladders shall be made from FRP structural shapes as specified.

Ladder side rails shall be produced by the pultrusion process. The side rails shall be 2-inch square tube with a wall thickness of 0.25-inch. The rungs shall be 1-inch minimum diameter thermal cure clear solid rod with a nonslip footing surface. All joints and rungs shall be epoxied and riveted.

Fabrication

Ladders shall be shop assembled, pre-drilled and prepared for field attachment of standoff clips.

All cut or machined edges shall be sealed with a resin compatible with the resin matrix used in the structural shape.

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Division 6
Wood, Plastics, and Composites

6.00 GENERAL

This division covers that work necessary for furnishing and installing all carpentry as described in these specifications and as shown on the Plans.

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

6.05 Common Work for Carpentry

Submittals

Submittal information shall be provided to the Owner for the following items:

- Trusses: Submit truss design drawings bearing the Professional Engineering seal and signature of the truss designer, placement diagram(s), permanent individual truss member restraint/bracing method and details, and any other structural details germane to the trusses.
- Trusses: Submit registration and approval to perform truss fabrication without special inspection and provide certificate of compliance or submit detailed fabrication and quality control procedures as specified.
- Structural Panels
- Structural Lumber
- Preservative Wood Treatment
- Shop Fabricated Structural Wood
- Millwork
- Wood Trim

6.10 ROUGH CARPENTRY

6.11 Wood Framing

Part 1 - General

References

U.S. Department of Commerce/National Institute of Standards and Technology - American Softwood Lumber Standard PS 20.

American National Standards Institute / American Forest and Paper Association National Design Specifications (ANSI/AF&PA NDS).

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Part 2 - Products

Components

Structural lumber shall be of the nominal dimensions shown on the Plans and shall not exceed 19 percent moisture content when installed. All pieces shall be Kiln Dried Hem Fir or Spruce-Pine-Fir No. 2 grade or better unless otherwise specified on the Plans.

Lumber and other wood members shall meet requirements of ANSI/AFPA NDS: National Design Specification for Wood Construction, American Forest & Paper Association/American Wood Council, 2005 edition.

Accessories including bolts with necessary nuts and washers, timber connectors, drift pins, dowels, nails, screws, spikes, and other metal fastenings shall conform to ASTM A-307. Washers shall be malleable iron. Bolts shall be provided with washers under nuts.

Nails shall be round wire of standard form. Spikes shall be button-head boat spikes. Galvanize bolts, dowels, washers, spikes, and other hardware, including nails, in accordance with ASTM A-153.

Preservative Treated Wood

All wood members which contact concrete or masonry shall be naturally durable wood or preservative-treated wood using water-borne preservatives, in accordance with AWPA U1 (Commodity Specifications A or F) for above-ground use. Coat cut ends of pressure treated wood with copper naphthenate based wood preservative.

- All fasteners in contact with preservative treated wood shall be hot-dip galvanized
- All connectors in contact with preservative treated wood shall be hot-dip galvanized
- Interior connectors in contact with preservative treated wood that are not exposed to the elements may be G185 galvanized.

Part 3 - Execution

Construction

Accurately cut and frame all lumber so that joints will have a close fit over entire contact surface. Secure lumber and piles in their proper alignment. No shimming will be permitted in making joints, nor will open joints be accepted. Bore holes in small timbers for boat or wire spikes with a bit of the same diameter or smallest dimension of the spikes, when necessary, to prevent splitting. Counterboring for counter-sinking shall be done wherever smooth faces are required.

Connectors and fasteners shall comply with the applicable provisions of IBC Sections 2304.9.1 through 2304.9.7. The number and size of fasteners connecting wood members shall not be less than that set forth in IBC Table 2304.9.1.

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6.17 Shop Fabricated Structural Wood

6.17.53 Trusses

Part 1 - General

References

Wood trusses shall comply with IBC Section 2303.4. Trusses shall be metal-plate-connected meeting the design, manufacture and quality assurance requirements of ANSI/ TPI 1 as published by the Truss Plate Institute.

Quality Assurance

Prefabricated wood trusses and cross-bracing and blocking shall be designed and certified by the truss manufacturer to meet the loads shown on the Plans and the above requirements. Each individual truss design drawing shall bear the Professional Engineering seal and signature of the truss designer.

Fabricator shall provide detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.

In lieu of procedures noted, fabricator may provide documentation that they are registered and approved to perform such work without special inspection. At completion of fabrication, the approved fabricator shall submit a certificate of compliance to the building official stating that the work was performed in accordance with the approved construction documents.

6.20 FINISH CARPENTRY

6.20.1 Common Work for Finish Carpentry

Part 1 - General

Summary

Furnish all architectural woodwork shown on the Plans and specified herein. Architectural woodwork includes all exterior and interior non-structural woodwork exposed to view in finished project including shelving, millwork, trim, and plastic laminates.

Related Sections

- Division 9.90.00 Common Work for Paint and Coating
- Division 9.90.01 Color Schedule
- Division 9.91.13.10 Exterior Wood
- Division 9.91.23.11 Interior Stain
- Division 9.91.23.12 Interior Paint

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References

The "Quality Standards" of the Architectural woodwork institute (AWI) shall apply and, by reference, are hereby made a part of this specification. Any reference to premium, custom, or economy in this specification shall be defined as the latest edition of the AWI "Quality Standards".

Part 2 - Products

Quality Control

Discard material with defects which might impair the quality of work, and units which are too small to fabricate the work with minimum joints or optimum joint arrangement. Finish trim boards are to be selected for straight and un-warped / un-curled shape.

Part 3 - Execution

Installation

Set carpentry work accurately to required levels and lines, with member plumb and true and accurately cut and fitted. All exposed trim work is to be mitered at corners. Where long runs require more than one board, ends to be cut at 45 degrees.

Securely attach carpentry work to substrates by anchoring and fastening as shown and as required by recognized standards. Countersink nail heads on exposed carpentry work and fill holes. Use common wire nails or finishing screws, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required. Fill nail holes with putty prior to painting. Provide adequate end and edge distances.

Install hardware specified or required to complete the project. Adjust movable parts to operate perfectly at time of final acceptance. Make further adjustments required during the guarantee period.

6.22 Millwork

6.22.13 Standard Pattern Wood Trim

Part 2 - Products

Materials

Trim board material shall be as shown on the Plans. If not shown on the Plans, trim board shall have a smooth, untextured finish. Board shall be high density fiberboard (HDF), oak or fir.

Part 3 - Execution

Installation

Trim board shall be installed straight and true. All corners shall be mitered. Where gaps between the trim and the mating surface are unavoidable, such gaps shall be caulked.

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Division 7
Thermal and Moisture Protection

7.00 GENERAL

This division covers furnishing all labor, materials, and equipment for providing a structure that is completely weather-tight.

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

7.05 Common Work for Thermal and Moisture Protection

Part 1 - General

Submittals

Submittal information shall be provided to the Owner for the following items:

- Thermal insulation
- Ceiling insulation
- Foundation insulation
- CMU wall insulation
- Roofing System
- Siding
- Flashing and sheetmetal
- Vents
- Joint sealants
- Caulk

Warranty – Roofing System

The roofing Contractor shall warrant the roof system provided under this contract against leakage, and defects in materials and workmanship for a period of two years after date of project acceptance. The roofing system manufacturer shall provide a warranty for the roof system against leakage and defects in materials for a period of eighteen years after the roofing Contractor warranty expires.

Following roof installation, supplier shall furnish services of a qualified manufacturer's representative to inspect the roof and inform Owner of any defects or concerns regarding condition of roofing system at the job site. Contractor shall provide repair as necessary to the satisfaction of the manufacturer representative at Contractor's expense. Upon resolution of any defects or concerns (if any), manufacturer's warranty shall then be in full effect. The finished roofing system shall be free from leaks, warps, permanent discoloration, and coating degradation for the warranty period.

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The roofing system manufacturer's warranty shall be non-prorated and in full effect (100 percent covered) for the full 2 years following project acceptance.

The manufacturer's warranty shall be Prorated from 100 percent covered from year 2 to year 5 and linearly decreasing to 10 percent at year 20.

7.20 THERMAL PROTECTION

7.21 Thermal Insulation

7.21.03 Ceiling Insulation

Part 1 – General

Performance Requirements

Insulation shall be Kraft-paper-faced batt with a minimum R value of 49.

Part 2 – Products

Manufacturers

Ceiling insulation shall be equal to Owens Corning.

Part 3 – Execution

Installation

Provide and install ceiling insulation as shown on the project Plans. Place insulation with craft paper face down and as recommended by the manufacturer. Insulation shall be placed to the extents possible to cover the attic. Place baffles above the insulation as the slope of the roof meets the building edge.

7.21.04 Foundation Insulation

Part 1 – General

Performance Requirements

Provide a minimum R value of 10. Insulation shall be suitable for direct bury application.

Storage and Handling

Protect insulation stored on the jobsite from physical damage and direct sunlight. Insulation should be stored off the ground and covered with a light color polyethylene film. Make sure the covered insulation is well ventilated to prevent excessive temperature build-up.

Part 2 – Products

Manufacturers

Insulation shall be Foamular 150 as manufactured by Owens Corning or equal.

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Part 3 – Execution

Installation

Extruded polystyrene insulation shall be placed as shown on the Plans. Contractor shall not damage insulation during installation and take adequate care to backfill soils to meet compaction standards while not damaging insulation. Finish top edge of insulation 1-inch to 2-inches below finished ground elevation.

Install only as much insulation as can be covered, at least temporarily, during the same day.

7.21.05 CMU Wall Insulation

Part 1 – General

Performance Requirements

All non-grouted exterior exposed CMU walls meet be filled with insulation.

Part 2 – Products

Materials

All non-grouted concrete masonry units with an exterior face shall be insulated with perlite insulation or equal.

Part 3 – Execution

Installation

Insulation shall be installed by methods and personnel approved by the block manufacturer.

7.40 ROOFING AND SIDING PANELS

7.42.93 Soffit Panels

Part 1 – General

Design Requirements

The panels shall be able to withstand the wind loading identified in the Plans.

Finishes

Finish all panels as recommended by the manufacturer. Color shall be chosen by the Owner from a minimum of 15 colors.

Part 2 – Products

Materials

Steel panels shall be equal to AEP Span Prestige Series (PS-12) soffits. Panels shall have a Zincalume or Kynar finish. Vented and non-vented soffit panels shall have matching beads or groove widths and matching finishes. Provide venting per local building code requirements. All vents shall include aluminum or galvanized bird screens.

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Part 3 – Execution

Installation

Panels shall run perpendicular to rafters. Install panels next to transition between wall and eave as recommended by the manufacturer.

7.46 Siding

7.46.46 Fiber Cement Siding

Part 1 – General

Design Requirements

Siding panels shall be resistant to fungus and mildew.

Finishes

Siding shall be pre-primed for finish coat. Finish color shall be chosen by the Owner from a minimum of 15 colors.

Part 2 – Products

Materials

Lap siding shall be James Hardie HardiePlank® or equal. Install and finish siding per manufacturer's written recommendations. Siding shall be pre-primed for finish coat and be resistant to fungus and mildew.

Surface texture shall be selected by Owner during the submittal process.

Part 3 – Execution

Installation

Panels shall run perpendicular to studs. Install per manufacturer's written recommendations. ***Spacing to match existing pump station building onsite.***

7.60 FLASHING AND SHEET METAL

7.61 Sheet Metal Roofing

7.61.05 Common Work for Metal Roofing

Part 1 – General

General

Work covered in this section consists of furnishing all labor, material, and equipment for preformed metal roofing as shown on the Plans and as specified herein.

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Submittals

Submit shop drawings detailing all edges, hips, valleys, eaves, rakes, other flashing and include fastener schedule and in accordance with Division 1.33. Prior to Engineer review, Contractor shall have the shop drawings reviewed and approved by the system manufacturer.

The Roofer shall submit a list of a minimum of five (5) successfully completed projects with owner references, total roofing system square footage and roofing cost. The Roofer shall be regularly engaged in construction of metal roofing systems and approved to install metal roofing by the accepted system manufacturer. Such approval shall be submitted in writing along with the shop drawings as specified below.

Storage and Handling

The Contractor is responsible for continuously maintaining materials subject to precipitation or weather damage in new condition. Replace warped or weathered plywood, insulation, or other materials damaged by climatic conditions.

Follow all manufacturer's recommendations regarding product delivery, storage, and handling of materials.

Part 2 – Products

Materials

Materials shall be purchased directly from the manufacturer's commercial department to verify that the Contractor is approved by the system manufacturer to install the roofing system specified.

All materials shall be provided by one manufacturer and conform to the current IBC.

Roofing felt shall be 30-pound asphalt-saturated felt, conforming to ASTM D-226, Type 1 and 2, plain, unperforated.

Fasteners shall be as recommended by the roofing manufacturer; lengths as required. Other miscellaneous exposed fasteners shall be stainless steel or ZAC (exposed head of zinc/aluminum alloy). Fasteners shall be of the length to penetrate the top ridges of the steel decking only. Fasteners shall be inserted to penetrate only the top ridges of the steel roof support decking.

Finishes

The Owner shall select the roofing color from manufacturer's standard offering of not less than 15 colors. Color options shall be provided with the submitted shop drawings.

Part 3 – Execution

Examination

Verify that work of other trades which penetrates the roof deck, or requires workers and equipment to traverse roof deck, has been completed.

Examine surfaces for inadequate anchorage, foreign material, moisture, and unevenness which will prevent the execution and quality of application of roofing system as specified. Do not proceed with application of roofing until these defects are corrected.

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Preparation

Provide temporary roof during inclement weather. Requests for use of alternate structural and/or base materials with superior weathering resistance, if approved by the Engineer, may be made in lieu of temporary roof replacement. Submit a description of each temporary roof system or alternate material schedule proposed.

Provide special protection from heavy traffic on completed work. Restore to original condition, or replace work or materials damaged during handling of roofing materials.

Installation

Apply roofing felt below waterproof roof paneling, single-ply, lapped shingle fashion, 3-inch head laps and 6-inch side laps. Install no more roofing felt than can be covered by metal roofing in the same day. Roof underlayment shall be dry and free of defects prior to the installation of metal roofing.

Apply roofing only in dry weather and when the ambient temperature is above 40 degrees Fahrenheit.

Except as otherwise shown or specified, comply with recommendations and instructions of metal roofing manufacturer.

Form and fabricate sheets, seams, strips, cleats, clips, hips, ridges, edge treatments, integral flashings, and other components of specified metal roofing to profiles, patterns, and drainage arrangement shown, and as required for permanent leak-proof construction. Provide for thermal expansion and contraction of work caused by ambient air temperature difference of 100 degrees Fahrenheit.

All openings shall be sealed from weather and to prevent recessed areas that may attract nesting animals. Panel corrugations shall be sealed with the manufacturer's standard closed cell neoprene blocks conforming to the panel corrugation. Gaps created between corrugations and flashings shall be avoided whenever possible. Where such gaps occur, they shall be sealed with manufacturer's low pitch closures, or equal. All closures shall be installed as close to the face of the opening as possible to minimize any recessed areas.

Provide uniform, neat seams with no exposure of sealant to ultraviolet light.

Flashing with a drip edge shall be installed on all edges, corners and angle points. Unless otherwise noted on the Plans extend roofing and flashing below fascia with drip edge hanging below wood supports and fascia. Valley gutters shall be provided at all valleys.

Field Quality Control

Metal roofing and its flashing shall be weather-tight. Exposed surfaces shall be free of dents, scratches, abrasions, or other visible defects.

Construction and fabrication of metal roofing shall comply with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) recommendations for fabrication and construction of details, expansion joints, and installation procedures, except as shown or specified.

Fabricate and install work true and accurate with lines and corners of exposed metal units. Form exposed faces and starter sections of seams flat and free of buckles, excessive waves,

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and avoidable tool marks considering temper and finish of metal. Hold-down attachments for roof shall be designed and spaced to resist uplift pressure due to Basic Wind Speed and Exposure as identified in the General Notes. Provide uniform, neat seams without tool marks or irregularities.

7.61.13 Standing Seam Sheet Metal Roofing

Part 2 – Products

Materials

Preformed metal roof paneling shall be equal to *Design Span HP as manufactured by AEP Span* or *Custom Bilt Metals, SL-1750 Snap-Lock Roof Panel*. The metal roofing system shall consist of 24-gauge, factory-formed, pre-finished panels with major ribs not less than 1⅝-inch in height.

Match ribs and finish to existing pump station building roof. Submit layout plan for review and approval prior to ordering material. Color to match existing building roof. See plans for details.

Shop-fabricate metal in conformance with manufacturer's pattern specifications to result in a minimum 1-inch effective water dam height on both edges. Standing seam interval shall not exceed 16 inches with no stiffening ribs.

Edges, hips, valleys, eaves, rakes, and miscellaneous flashing shall be finished with matching pre-finished pieces of 24-gauge minimum, to form a weather-tight roofing system.

Roofing panels shall be factory-prefabricated in accordance with manufacturer's standard pattern and design.

www.custombiltmetals.com

https://www.aepspan.com/product/design-span-hp/

Finishes

Color options shall be provided with the submitted shop drawings. All panels and flashing shall be treated with a protective coating of Zincalume conforming to ASTM 792, AZ50, with factory-applied paint finish of Kynar 500 or Hylar 5000 with a total dry film thickness of 1 Mil. Reverse face shall be protected by a wash coat or primer.

Part 3 – Execution

Installation

Panels shall be held down to the structure with concealed clips and fasteners. The fastening schedule shall be designed by the manufacturer to resist the loads identified in the General Notes. System shall extend to full extent of fascia boards and include a drip edge unless otherwise noted on the Plans. Extend panels from eaves to ridge in one piece.

All final hand turning of seams at joints and junctions is to be of the same quality as the machine-produced seams. Practices and techniques described in the SMACNA Architectural Sheet Metal Manual are to be used as the standard of practice unless otherwise specified or shown on the Plans.

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7.62 Sheet Metal Flashing and Trim

Part 1 – General

Flashing shall be factory coated steel equal to *Construction Metals Inc. Professional Grade Flashing*. Gauge shall match flashing to be replaced or 26-guage minimum. Width shall match existing to be replaced. Provide color choices to Owner for approval. Minimum color choices are 10.

Part 3 – Execution

Installation

Install drip tight per manufacturer's requirements.

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Division 8
Openings

8.00 GENERAL

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

8.05 Common Work for Openings

Part 1 – General

The Owner will have a security specialist design and install intrusion switches, camera surveillance and general security items separately. Contractor shall provide access to the facility to the Owner's security specialist and coordinate schedule with the security specialist.

Summary

This division covers furnishing all labor, materials, and equipment necessary for providing all interior and exterior doors, frames, and windows.

Related Sections

- Division 5.05.23 Bolts and Other Connectors

Submittals

Submittal information shall be provided to the Owner for the following items:

- Doors
- Roof Hatches
- Vault Hatches
- Hardware
- Locks
- Keys

8.10 DOORS AND FRAMES

8.11 Metal Doors and Frames

8.11.01 Common Work for Metal Doors and Frames

Part 1 - General

Summary

This specification covers the doors, frames, accessories, and hardware for both interior and exterior man doors.

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Related Sections

- Division 1.16 Owner Standard Locks and Keys

Submittals

Submittal information shall include the following:

Manufacturer's product data and installation instructions for each type of door, frame, accessory, or hardware. Include both published data and any specific data prepared for this project.

Door and frame shop drawing for approval prior to fabrication. Include detailed plans, elevations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials.

As requested by the Engineer, provide sample color chips representing specified colors and finishes.

Performance Requirements

Doors between rooms requiring a fire separation shall have a listed fire rating equal to or greater than the required room fire rating. Doors and frames shall be listed and labeled for a minimum of 45 minutes.

Doors between rooms shall have a minimum STC rating of 45.

All exterior doors and frames shall be insulated for a maximum U-value of 0.60.

Quality Assurance

The manufacturer(s) shall be a minimum of ten (10) continuous years documented experience specializing in the manufacturing of doors, frames, accessories, and/or hardware of the type required for this project. At the request of the Engineer, the manufacturer shall provide testing and/or certification information demonstrating that the manufacturer shall design and construct all equipment to the latest applicable codes and standards. The manufacturer or their representative shall be available for consultation to all parties engaged in the project, including instruction to installation personnel.

Scheduling

The Contractor shall ensure that all approvals and/or shop drawings are supplied or returned to the manufacturer in time for fabrication without affecting construction progress schedule. In addition, they shall ensure that templates and/or actual hardware requested by manufacturer are available in time for fabrication without affecting construction progress schedule.

Part 2 - Products

Components

Provide doors, frames, and accessories as noted on the Door Schedule. Provide door hardware as specified, as noted on the Door Schedule, and as required by the local building code.

Contractor shall provide weather tight trim around all doors.

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The frames shall be furnished with sufficient wall and head anchors to secure the jamb and door against all operating, wind, and seismic loads. Exterior door frames shall have an integral weather-strip at head and jambs. Frames shall be trimmed in the field to form a weather tight seal.

Accessories

Provide door accessories as noted on the Door Schedule.

Hinges shall provide 180-degree rotation of the door. Hinges which are exposed at building exterior shall be equipped with tamper-proof pins that cannot be removed. Hinges exposed at the interior of the building shall be removable. The manufacturer shall provide door stops; no screw-on stops will be accepted.

Finishes

Prime doors and frames at the factory according to requirements for metals in Division 9.

Finishes shall be per the appropriate metal finishes in Division 9.

Part 3 - Execution

Installation

Install doors and frames in accordance with manufacturer's instructions and approved shop drawings; set frames plumb, square, level, and aligned to receive doors. Anchor frames to adjacent construction in strict accordance with recommendations and approved shop drawings and within tolerances specified in manufacturer's instructions. Seal metal-to-metal joints between framing members using good quality elastomeric sealant, and all doorjambs with caulking as specified.

Reinforce hinge and lock areas. Mount door using minimum of three (3) hinges.

Hang door in the frames and apply hardware in a neat, secure manner so that the doors will operate without dragging or binding.

Cleaning/Repair

Upon completion of installation, thoroughly clean door and frame surfaces in accordance with AAMA 609. Do not use abrasive, caustic, or acid cleaning agents.

Protect products of this section from damage caused by subsequent construction until substantial completion. If damage does occur, Contractor shall repair damaged or defective products to original specified condition in accordance with manufacturer's recommendations. Replace damaged or defective products that cannot be repaired to Owner's acceptance.

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8.11.13 Hollow Metal Doors and Frames

Part 2 - Products

Components

Doors and frames shall comply with ANSI/SDI A250.8 for level and model and A250.4 for physical performance level. All doors shall be 1¾-inch thick and insulated with a solid polyurethane or urethane foam core. Exterior doors shall be Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless) and fabricated from 16 gauge steel minimum. Interior doors shall be Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush) and fabricated from 18 gauge steel minimum.

Frames shall be furnished with sufficient wall and head anchors to secure the jamb and door against all operating, wind, and seismic loads.

Door frames installed within CMU walls shall be 16-gauge galvanized steel, tied to the CMU with masonry wire clips. Fully grout CMU block within one length of a full-sized block measured from door frame.

8.30 SPECIALTY DOORS

8.31 Access Doors and Panels

8.31.20 Vault Hatches

Part 1 - General

Summary

Access hatches shall be of the dimensions and type shown on the project Plans.

Related Sections

- Division 1.16 Locks and Keys

Performance Requirements

Access doors located in sidewalks or off regularly traveled path areas shall be rated for H-20 (AASHTO) loading.

Access openings shall not have any obstructions such as intermediate hatch support beams.

Safety grate shall be below the hatch.

Submittals

Provide manufacturer's statement of load rating.

For aluminum frames to be cast in concrete, provide submittal for frame coating.

Locate gutter drain outlet location and routing of drain line to daylight with schedule 80 PVC pipe.

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Finishes

Aluminum hatch frames shall be protectively coated prior to casting in concrete to prevent the accelerated corrosion that occurs when aluminum is in contact with concrete.

Safety grate shall be safety orange.

Warranty

Manufacturer shall guarantee against defects in material or workmanship for a period of five years.

Part 2 - Products

Manufacturers

Hatches shall be equal to USF Fabrications, Bilco, Halliday or LW Products.

Components

Access hatches shall have aluminum diamond plate door leaf (or leaves), stainless steel spring lift, neoprene weather seal, stainless steel hardware, self-latching stainless-steel slam lock, and recessed padlock hasp with cover. An unkeyed internal lever shall open the latch to prevent accidental entrapment. Any drainage provision provided by the hatch or frame shall be routed to the vault or building sump or drain system using Sch 40 PVC anchored to the walls and ceiling unless shown otherwise on the plans.

Frame shall be channel style with a full anchor flange around the perimeter and shall allow for controlled water drainage away from the opening.

Compression spring operator lift system enclosed in telescopic tubes, expansion spring, or torsion springs shall be provided for smooth, easy and controlled door operation throughout the entire arc of opening and closing. Operation shall not be affected by temperature. The door shall automatically lock in the vertical position by means of a heavy steel hold-open arm with release handle.

Part 3 - Execution

Installation

Installation shall be in accordance with manufacturer's instructions.

Hatch gutter drain shall be connected to 2.5-inch or larger Schedule 80 PVC pipe and routed to daylight or storm drain unless shown otherwise on the plans.

Field Quality Control

Frame shall be installed square and true without binding of door throughout the full arc of travel. Mis-operation of door shall be corrected by the Contractor.

8.31.40 Building Roof Hatch

Part 1 – General

Roof Hatches shall be equal to Lane-Aire Vent model SV.

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Part 2 – Products

Hatches shall have stainless steel hardware and curb mounting unit compatible with the metal roof and roof sheathing. Cover shall be aluminum with EPDM seal gasket. Curb shall be aluminum. Finish shall be aluminum mill finish.

Vent shall open by cable winch system.

Roof hatches shall be openable/closeable from the floor of the building via cable and pulley system. Hatches shall provide full clear opening to pass the pumps and motors chosen by the Contractor. Contractor shall be responsible for coordination and fit of pumps and motors thru the roof hatches.

Part 3 – Execution

Install units in strict conformance with manufacturer's recommendations. Provide and install all materials necessary for a watertight construction.

Provide and install cable pulley winch system to operate each hatch from ground level. Set winch in location chosen in the field with Owner representative present. Winch shall be capable of operation by hand and/or drill to fully open and close the hatch.

8.71 DOOR HARDWARE

8.71.01 Common Work for Door Hardware

Part 1 - General

Summary

This specification covers door hardware for interior and exterior doors. The Contractor shall provide all hardware necessary to install doors in a secure, weather-tight manner. Unless otherwise specified, all door hardware shall be according to this section.

Related Sections

- Division 1.16 Locks and Keys

Submittals

Door hardware submittal information shall indicate that hardware is suitable for fire- and sound-rated applications, where applicable.

Performance Requirements

All door hardware shall be selected to meet local building and fire codes.

Part 2 – Products

Components

Key cylinders shall utilize the Owner's standard core and key. The key cylinder shall fit all exterior locking hardware and shall ***not*** automatically lock when the door is closed. A vandal-resistant cover plate shall be provided at exterior surface of doors to prevent exterior access to slam latches at gap between door and frame.

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All doors and frames shall have perimeter gasketing. Exterior doors shall have a weather stripping consisting of a vinyl, neoprene, or sponge neoprene strip mounted on an aluminum or stainless steel bracket which is fastened to the door or frame. Gasketing shall be Pemko or equal.

8.71.02 Hardware for Man-doors

Part 2 - Products

Accessories

Dead Bolt: Doors with dead bolt locks shall use a 1-inch bolt throw, with concealed mounting screws, and a brushed stainless steel finish. The dead bolt shall be thrown or retracted by a key on the outside and by a thumb knob on the inside. The dead bolt shall be equal to Schlage.

Interior Door Locksets

Passage Latch: Interior doors shall have a passage latch, unless otherwise noted (ANSI F75).

Office/Privacy Lock

Interior room doors shall not lock.

Interior doorknobs shall have a 2¾-inch backset with lever-style design.

Interior doorknobs shall have brushed stainless steel finish, or equal.

See Division 8.05 for intrusion switches, alarming, and security camera requirements by others.

Exterior Door Lockset

Entrance Lock (Non-Emergency Exit): Non-emergency, exterior doors shall have an entrance lock (ANSI F20) with 3-inch-wide by 16-inch-high raised plate and rectangular pull with thumbpiece and deadbolt key cylinder hole on the exterior, and a lever and deadbolt thumbturn on the inside. The latchbolt shall be retracted by the thumbpiece/lever from either side. When locked, the outside key or inside knob/lever shall retract the deadbolt and latchbolt simultaneously. Throwing the deadbolt shall automatically lock outside knob/lever. The inside lever shall always be free for immediate egress.

Exit Device (Exterior Doors): Exit devices shall only be provided on the active door of a double door.

Exit devices shall be Dorma 9500 series mortise lock style with 3-inch wide by 16-inch high raised plate and rectangular pull with thumbpiece and cylinder hole, or equal.

Panic bar exit hardware shall be provided on each interior face of the active exterior door. Panic bar shall have a brushed stainless steel finish and shall be equal to Von Duprin Series 98/99 panic bar.

- Key cylinders shall be interchangeable and compatible with the Owner's preferred cylinder.
- Exterior doorknobs shall have brushed stainless steel finish, or equal.
- Exterior doorknobs shall be ANSI A156.13 Series 1000 Grade 1, Schlage or equal.

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Closers: Door closers shall be provided for exterior doors and fire-rated doors. Door closers shall be surface mounted, parallel-arm type with an aluminum or stainless steel finish. Door closers shall be Dorma 8600 or equal. Closer shall be UL-listed for fire door rating.

Push/Pull Plates: The inactive door on a double door shall be equipped with push/pull hardware. The pull hardware shall be the rectangular pull style mounted on a 3-inch-wide by 16-inch-high plate. The push plate shall be 3-inches wide by 16-inches high. Push/pull hardware shall be fabricated from brushed stainless steel. Doors with push/pull hardware shall be equipped with closer.

Door Hinges: Door hinges shall be fabricated using brushed stainless steel and shall be equipped with permanently lubricated ball bearings. Hinges shall provide 180-degree rotation of the door. Hinges which are exposed at building exterior shall be equipped with tamper-proof pins that cannot be removed. Hinges exposed at the interior of the building shall be removable.

Thresholds: All interior and exterior doors shall have an extruded aluminum threshold. Thresholds shall be Pemko or equal.

Door Bottoms: All doors shall have a non-handed full-mortise automatic door bottom with neoprene seal that is fire and sound rated. Automatic door bottom shall be Pemko 434ANBL or equal. All exterior and fire rated doors shall have vinyl or neoprene door-shoe or door-bottom sweep, Pemko or equal.

Astragals: Provide flush extension bolts at the top and bottom of inactive double doors. Equip inactive doors with an overlapping astragal constructed of similar material to door. Astragals shall be Pemko or equal.

Door Stops: All doors shall have a doorstop and holder fabricated from aluminum or stainless steel. Strike shall be wall- or floor-mounted and provide automatic doorstop and hold with quick release. Doorstop for interior doors shall be a stainless steel hook mounted to the floor.

Coordinator: All double doors shall have a coordinator to restrict the closing of one door before the other so that they close and lock properly. Owner shall select which double door will be the primary and secondary door during the submittal stage of the project.

Rain Drip: All exterior doors shall be equipped with an aluminum door-top rain-drip weather strip, mounted to the top edge of the door frame to prevent water intrusion. Rain drips shall be Pemko or equal.

Finishes

All hardware shall have the same finish and shall be brushed stainless steel.

8.90 LOUVERS AND VENTS

8.90.01 Common Work for Louvers and Vents

Part 1 – General

Related Sections

- Division 17.08 - HVAC Functional Control

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System Design and Performance Requirements

See Louver and Damper Schedule on Plans and Functional Control description for design and performance requirements.

Submittals

Submit detailed product information including specifications, sizing information, dimensional drawings, coating systems, and available colors, and other information relevant to this project.

Part 2 – Products

Manufacturers

The following manufacturers are considered to be acceptable "or equals".

- Pottorff
- Cesco
- Louvers & Dampers, Inc.

Accessories

Provide all accessories needed for a complete installation including wall and roof thimbles, backguards, and mounting sleeves.

Components

A bug and rodent/bird mesh shall be provided on the exterior side of all louvers. Mesh shall not impede rotation of dampers, if any. The screen shall be corrosion resistant mesh 20x20 size.

Finishes

All louvers shall be coated with factory Kynar, or powder coat finish, color to match exterior color scheme.

Part 3 – Execution

Install per manufacturer's recommendations.

Louver assembly shall be set flush with the wall exterior

Operate all moving parts prior to installation. Any non-functional or binding parts shall be repaired or replaced prior to installation. Install so that blade linkages are accessible after installation to permit service and lubrication without requiring removal of wallboard or other structures.

8.91.13 Motor Actuated Dampers:

Part 2 – Products

Components

If automatic controlled operation, blades shall be adjustable from fully open to fully closed via a 120VAC motor actuator sized appropriately to operate the damper fully. Blades shall seal

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with neoprene or vinyl seals. Blades shall pivot on bronze or nylon bushings, or steel bearings. Contractor shall verify compatibility of damper to actuator. Motor actuator if any, shall be side mounted, out of the air stream. Motor actuator shall be located no lower than 6-inches above floor level. Provide disconnect switch for each unit (where applicable).

8.91.19 Fixed Louver

Part 1 – General

Provide fixed louver(s) as shown on the Plans.

Part 2 – Products

Components

Louver shall include channel frame mounted to the inside face of the wall.

Height and width of louver and damper shall be as shown on the Plans. Depth of louver, filter, and screen assembly shall be set flush with the wall exterior and any intrusion into the interior wall supported by the frame.

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9.00 GENERAL

This division covers work necessary for providing all materials, equipment, and labor to coat all items in accordance with these specifications.

Sections in these specifications titled *"Common Work for . . ."* shall apply to all following subsections whether directly referenced or not.

9.20 PLASTER AND GYPSUM BOARD

9.29.16 Gypsum Board for Low Occupancy Areas

Part 1 - General

Summary

This section covers work within infrequently occupied facilities, process, or industrial buildings. This section includes the following areas:

1. Pump Room
2. Electrical Room

Related Sections

- Division 9.29.13 Gypsum Board for High Occupancy Areas
- Division 9.91.23.10 Interior Painting – Gypsum Wallboard

Part 2 - Products

Components

Gypsum board shall be selected based on the installed application (see below) and as recommended by the Gypsum Association GA-223-96. Gypsum board shall be ⅝-inch thick, unless otherwise noted.

Type	Application	ASTM
Regular	Interior Ceiling	C 1396
Soffit Board	Exterior Soffits and Ceilings	C 931

Joint treatment: U.S. Gypsum Company Perm-a-Tape or equivalent. Protect exposed corners with U.S. Gypsum Company Perm-a-Tape or equivalent moldings embedded in joint compound per manufacturer's recommendations.

Finishes

Finish-sand all areas to smooth, even surfaces suitable for paintings.

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Part 3 - Execution

Installation

Provide and install all necessary components, including furring, as necessary to install gypsum board in accordance with local building code and Gypsum Associations standards (GA-216 and GA-600). Install gypsum board in such a manner as to maintain fire and sound transmission rating.

Apply square edge with the long dimension parallel with supports. Abut sides and edges to vertical framing members, top and bottom plates, or headers. Attach using nails spaced at 8 inches O.C. at all edges, and 8 inches O.C. on intermediate support.

9.90 PAINTING AND COATING

9.90.00 Common Work for Painting and Coating

Part 1 – General

Scope

The work specified in this Section covers the furnishing and installation of protective coating, complete in place. Shop coating and/or factory applied finishes on manufactured or fabricated items may be specified elsewhere. Regardless of the number of coats previously applied, at least two coats of paint shall be applied in the field to all coated surfaces unless otherwise specified herein.

Submittals

Before beginning any painting or coating, submit a list of coatings and manufacturers intended for use for review by the Owner. Include the application each coating is intended for, any surface preparation, number of coats, method of application, and coating thickness.

Provide Safety Data Sheets (SDS) for all materials to be used including solvents. Provide NSF certification for all finishes in potential contact with potable water. Submit this information in accordance with the requirements regarding shop drawings included herein.

Provide owner with schedule of coating operations and inspection timing. Coating inspections will be scheduled based upon Contractor-provided schedule, update schedule weekly or as necessary.

Provide manufacturer's approval of coating system applicator.

If product being used are manufactured by a company other than the specified reference standard, provide complete comparison of proposed products with specified projects including application procedures, coverage rates, and verification that product is designed for intended use. Information must also be provided that demonstrates that the manufacturer's products are equal to the performance standards of products manufactured by Tnemec Corporation, which is the reference standard.

Performance Requirements

All finishes potentially in contact with potable water shall be National Sanitation Foundation (NSF) certified for contact with potable water. Certification from the NSF or UL shall be

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supplied in writing at the time of the submittal process for Finishes. Contractor shall be responsible for verifying all finishes used on the project are compliant with primary and secondary standards of the Safe Drinking Water Act. Any violation shall be remedied at the Contractor's expense.

The completed coating shall produce a minimum dry film thickness in accordance with the specifications as determined by the microtest thickness gauge or comparable instrument. In areas where this thickness is not developed, sufficient additional coats shall be applied to produce it.

Quality Assurance

The Contractor shall be responsible for compatibility of all shop and field applied paint products including the use of primer, intermediate and topcoats by different manufacturers if applicable. For any Contractor initiated substitutions, the Contractor shall verify complete compatibility between coatings provided for the project. If coatings are not compatible per manufacturer's review it shall be the Contractor's responsibility to remove incompatible coatings fully and replace with compatible coating systems.

Paint used in the first field coat over shop painted or previously painted surfaces shall cause no wrinkling, lifting, or other damage to the underlying paint.

The Contractor shall be responsible for obtaining written documentation from equipment/material manufacturers regarding the date at which shop prime coatings are applied and shall strictly adhere to the coating manufacturer's recommendations for recoat time intervals. The Contractor shall submit to the Engineer such documentation upon request.

Storage and Handling

Bring all materials to the job site in the original sealed and labeled containers of the paint manufacturer. Materials shall be subject to inspection by the Owner. Store paint supplies as recommended by the manufacturer and as approved by the Owner.

Extra Materials

Waste Products

The Contractor shall be responsible for the collection, containment, transportation, and disposal of all waste products generated for this project. Cleaning and disposal shall comply with all federal, state, and local pollution control laws. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.

Cleaning and disposal shall comply with all federal, state, and local pollution control laws. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.

Site Conditions

Contractor shall take any and all measures necessary to prevent over-spray of structures and/or components in the field from both preparation and coating work. Should over-spray occur, the Contractor is responsible for all costs associated with any damage that occurs as a result of over-spray.

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Part 2 – Products

Manufacturers

The following coating system manufacturers are approved subject to compliance with the Specifications contained herein:

1. Tnemec Company
2. Sherwin Williams
3. International Paint
4. Or Equal

The specified coating shall be understood as establishing the type and quality of the coating desired. Other manufacturers' products will be accepted provided sufficient information is submitted to allow the Engineer to determine that the coatings proposed are equivalent to those named. Proposed coating shall be submitted for review in accordance with Division 1. Requests for review of equivalency will not be accepted from anyone except the Contractor, and such requests shall not be considered until after the Contract has been awarded.

Substitutions of the coatings of other manufacturers shall be considered only if equivalent systems of coatings can be provided and only if a record of satisfactory experience with the system in equivalent applications is available. Offers for substitutions will not be considered which decrease film thickness, solids by volume or the number of coats to be applied or which propose a change from the generic type of coating specified herein. All substitutions shall include complete test reports to prove compliance with specified performance criteria.

Part 3 – Execution

Examination

The Owner shall inspect and approve all surface preparations prior to application of any coating. Provide 24-hour notice prior to surface inspection needs.

Preparation

Prepare surfaces in accordance with the recommendations of the manufacturer of the coating to be applied to the surface, or the surface preparation requirements of these specifications, whichever are stricter. In general, all surface preparation shall meet Structural Steel Painting Council (SSPC) Surfacing Preparation (SP) guidelines, the National Association of Pipe Fitters (NAPF), American Water Works Association (AWWA) and/or the National Association of Corrosion Engineers (NACE) as noted herein unless more strictly described by coating manufacturer.

Coatings shall only be applied during weather meeting the recommendations of the coating manufacturer. Air and surface temperatures, humidity, and all other environmental conditions shall be within limits prescribed by the manufacturer for the coating being applied, and work areas shall be reasonably free of airborne dust at the time of application and while coating is drying.

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Materials shall be mixed, thinned, and applied according to the manufacturer's printed instructions. Dry Film Thickness (DFT) shall be as stated here in or applied based on coverage rates of square feet per gallon (sq. ft./gal).

Installation/Construction

Paint application shall be in strict accordance with manufacturer's printed instructions except that coating thickness specified herein shall govern. Finished coating on all items shall be clean, undamaged, and of uniform thickness and color.

Coating shall be done in a manner satisfactory to the Owner. The dry film thickness listed in the "Materials" section of this Division must be met, regardless of the applied film thickness or number of coats.

Carefully observe all safety precautions stated in the manufacturer's printed instructions. Provide adequate ventilation and lighting at all times.

The manufacturer's recommended drying time shall be construed to mean "under normal conditions". Where conditions are other than normal because of weather, confined spaces, or other reason, longer drying times may be necessary. The manufacturer's recommendation for recoating time intervals shall be strictly adhered to.

Pipe shall be emptied of water for a minimum of 24 hours prior to surface preparation and painting. Pipe shall not be filled with water until coating is dry. If, in the Engineer's opinion it is not practical to drain the pipes, the water must stand for at least 48 hours to reach ambient temperature prior to coating the pipe. Do not allow water to flow for at least 24 hours after final coating.

Field Quality Control

The prime Contractor shall be completely responsible for coating quality. The Contractor shall provide both wet and dry film gauges and make such available to the Engineer when requested.

If coating inspector finds anomalies and/or defects, the Contractor shall re-prep and recoat those areas per the coating manufacturer's instructions.

Acceptance of the completed coatings shall be based on the proper application and proper preparation of the coated surfaces, and a finished product that meets minimum thickness and does not contain runs, drips, surface irregularities, overspray, color variations, scratches, pinholes, holidays, and other surface signs that detract from the overall performance and/or appearance of the finished project.

Inspection

For metals exposed to exterior atmospheric conditions, first coat of paint or primer must be placed within four hours of passing inspection. Bare steel must be reblasted and reinspected if not successfully coated within this four-hour time frame, at the Contractor's expense.

Use the Pictorial Surface Preparation Standards for Painting Steel Surfaces (VIS-1) by the Steel Structures Painting Council (SSPC) as a visual standard for inspection of surface preparation of metal surfaces. Test-Tex Tape may also be used to verify surface profile.

Each coat shall be inspected prior to application of the next coat. Areas found to contain runs, overspray, roughness, streaks, laps, sags, or other signs of improper application shall be

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repaired or recoated in accordance with the manufacturer's recommendations. Finish coats shall be uniform in color and sheen. Surface preparations and coatings not inspected and approved by owner will be uncovered for inspection and approval at no additional cost to the owner.

Repair/Restoration

The Contractor is responsible for all costs associated with any damage that occurs as a result of over-spray.

Scratched, chipped, or otherwise damaged coatings, including factory coatings, shall be repaired before final acceptance will be given.

Cleaning

If any cleaning of equipment at the site is performed with solvents, such work shall be done over leak-proof linings. Preparation or coating materials may not be disposed of onsite.

9.90.01 Color Schedule

Colors used for finish coatings on process equipment, piping, and building surfaces shall conform to the following schedule. All finishes shall be glossy unless otherwise specified. Finish coatings, which are applied in the shop by the manufacturer, shall conform to this section. Factory coatings which are damaged during shipment or installation shall be recoated in the field in accordance with these specifications.

Items of similar purpose shall be painted the same color. If items come from the factory with a shop applied coating that does not match said color, they shall be field coated to match.

The contractor shall allow no less than 15 working days from the time the Owner is provided with color selections for the Owner to make color choices.

The Owner will develop a color schedule for painted items after award of the contract. Contractor shall provide a pallet of colors from the manufacturer of not less than 30 color choices.

9.90.02 Unpainted Items

Do not coat aluminum or stainless-steel items unless specifically directed otherwise below or as shown on the Plans. Field painting is not required for factory prefinished equipment items (e.g. pumps, motors, blowers, etc.) unless otherwise specified. Do not coat shop epoxied meters or control valves unless noted otherwise on the Plans or herein. Do not coat small diameter pilot systems such as galvanized iron, copper, or brass pipe and fittings associated with control valves unless noted otherwise on the Plans or herein.

Do not coat over nameplates, labels, and identification tags.

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9.91 Painting and Coating Systems

Refer to 9.90.00 for coating application requirements.

9.91.13 Exterior Painting

9.91.13.01 - System 1: Metals – Exterior (Wet Conditions) including Doors and Frames

Part 1 - General

Typical Application

This Section applies to all interior and exterior hollow metal doors, windows, and frames. All hollow metal doors, windows, and frames shall be bonderized, pickled, or phosphatized, which will serve as a primer for and shall be compatible with the finish coat to be applied in the field.

Part 2 - Products

1. Tnemec
   a. Prime Coat: Series 161 Fast Cure Epoxy (3 to 5 Mil DFT)
   b. Finish Coat: Series 73 EnduraShield (3 to 5 Mil DFT)
2. Sherwin Williams

   For products that are supplied in bare (unprimed) metal:
   a. Primer: Corothane 1 Galvapac Zinc Primer B65G11 (2.5 to 3.5 Mil DFT)
   b. Finish Coat: Acrolon 218HS B65-650 Series (3 to 5 Mil DFT)

   For products that are supplied with a shop prime coat:
   a. Primer: Shop
   b. Intermediate: Macropoxy 646FC B58-600 Series (5 to 8 Mil DFT)
   c. Finish Coat: Acrolon 218HS B65-650 Series (3 to 5 Mil DFT)
2. AkzoNobel Devoe
   a. Primer: Fast Set Option: Devran 261QC Epoxy
      i. Cold Cure Option: BarRust 235 Epoxy
      ii. Summer Option: BarRust 231 Epoxy Mastic (4 to 6 Mil DFT)
   b. Finish Coat: Fast Set Option: DevThane 349QC Aliphatic Polyurethane
      i. Commercial Option: DevThane 389 Aliphatic Polyurethane
      ii. Premium Gloss Option: DevThane 379 UVA Aliphatic Polyurethane
      iii. Premium SemiGloss Gloss Option: DevThane 378 UVA Aliphatic Polyurethane. (2 to 3 Mil DFT)

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Part 3 - Execution

Surface Preparation

1. Clean, dry, and free of all dirt, oil, grease, and other contaminants.
2. For new work: SSPC-SP1 solvent cleaned
3. For coating over existing painted surfaces: Remove all loose and damaged coatings. Prepare with SSPC-SP2 hand tool or SP3 power tool cleaning.

9.91.13.04 System 2: Aluminum Plate Exterior (Access Hatches)

Part 2 - Products

Materials

Primer: Tnemec Series N69F Epoxoline	One coat, 4.0 to 6.0 Mil DFT
Non-Skid: Broadcast dry washed silica sand 50-60 mesh into wet prime coat. Let dry and remove excess sand.	
Finish: Tnemec Series 73 EnduraShield	One coat, 3.0 to 5.0 Mil DFT
Primer: Sherwin Williams Macropoxy 646	One coat, 4.0 to 6.0 Mil DFT
Non-Skid: Broadcast dry washed silica sand 50-60 mesh into wet prime coat. Let dry and remove excess sand.	
Finish: Sherwin Williams Acrolon 218 HS	One coat, 3.0 to 5.0 Mil DFT

Part 3 – Execution

Surface Preparation

Sweep Abrasive Blast surfaces to be coated to provide a 2 Mil profile.

Application

Apply in the shop before delivery to the field.

9.91.13.10 - System 3: Wood and Siding - Exterior, Painted

Part 1 - General

Exterior wood surfaces, including, but not limited to trim, soffit, siding, and other similar surfaces.

Part 2 - Products

1. Tnemec
    a. Prime Coat: Series 151-1051 Elasto-Grip (250 to 300 square feet per gallon)
    b. Intermediate Coat: Series 1029 Enduratone (4 to 6 Mil DFT)
    c. Finish Coat: Series 156 EnviroCrete (4 to 6 Mil DFT)

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2. Sherwin Williams
    a. Primer: Exterior Latex Wood Primer (250 to 300 square feet per gallon)
    b. Intermediate Coat: Loxon XP (4.0 to 6.0 Mil DFT)
    c. Finish Coat: Loxon XP (4.0 to 6.0 Mil DFT)

Part 3 - Execution

Surface Preparation

1. Surface clean, dry, and free of contaminates.

9.91.13.12 - System 4: Metals - Metal in Contact with Concrete, Masonry or Dissimilar Metals

Part 1 - General

This section applies to all non-submerged metal surfaces including aluminum, hot-dipped galvanized steel, or other metals, which are conducive to corrosion due to interaction of dissimilar metals or to chemical reaction due to embedment in concrete or masonry grout, and that are not covered as part of another coating system. Also includes buried steel not specifically noted for other coatings.

Part 2 - Products

1. Tnemec
    a. First Coat: Series N69 Hi-Build Epoxoline II (4 to 6 Mils DFT)
2. Sherwin Williams
    a. First Coat: 646 FC B58-600 Macropoxy (4 to 6 Mils DFT)
3. AkzoNobel Devoe
    a. First Coat: Devran 201 Universal Epoxy (4 to 6 Mils DFT)

Part 3 - Execution

Surface Preparation

1. SSPC-SP1 Solvent Cleaning
2. Lightly sand to degloss and provide a surface profile.

9.91.13.13 - System 5: Ferrous Metal including Cast/Ductile Iron and Steel Pipe (Atmospheric Indoors and Outdoors)

Part 1 - General

This Section applies to all ductile/cast iron and ferrous metals, including bituminous coated pipe and materials unless specified otherwise. Do not coat stainless steel materials unless specified otherwise. This Section applies to all pipe materials and equipment, including manufacturer applied coating systems. For the purposes of this coating system, metals which

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are located below the top of the exterior wall within a water bearing structure or are located within a vault or manhole shall be considered as under immersion service conditions.

Part 2 - Products

1. Tnemec
    a. Primer option 1: Series 1 Omnithane (2.5 to 3.5 Mil DFT).
    b. Primer option 2: Series N69 or N140 (2.5 to 3.5 Mil DFT) may be used if the time between prime coat and intermediate coat is less than 60 days. If more than 60 days occurs, surface will need re-preparation per the manufacturer's instructions.
    c. Intermediate Coat: Series N69 Hi-Build Epoxoline II (6 to 8 Mil DFT)
    d. Finish Coat: Series 73 Endura-Shield (3 to 5 Mil DFT)
2. Sherwin Williams
    e. Primer: Corothane 1 Mio-Zinc Primer (2.5 to 3.5 Mil DFT)
    f. Intermediate: Macropoxy 646FC B58-600 Series (6 to 8 Mil DFT)
    g. Finish: Macropoxy 646FC B58-600 Series (6 to 8 Mil DFT)
3. International Paint
    h. Primer:
        i. Fast Set Option: Devran 261QC Epoxy
        ii. Cold Cure Option: BarRust 235 Epox
        iii. Summer Option: BarRust 231 Epoxy Mastic (4 to 6 Mil DFT)
    i. Intermediate Coat:
        i. Fast Set Option: Devran 261QC Epoxy
        ii. Cold Cure Option: BarRust 235 Epoxy
        iii. Summer Option: BarRust 231 Epoxy Mastic (4 to 6 Mil DFT)
    j. Finish Coat:
        i. Fast Set Option: DevThane 349QC Aliphatic Polyurethane
        ii. Commercial Option: DevThane 389 Aliphatic Polyurethane
        iii. Premium Gloss Option: DevThane 379 UVA Aliphatic Polyurethane
        iv. Premium SemiGloss Gloss Option: DevThane 378 UVA Aliphatic Polyurethane. (2 to 3 Mil DFT)

Part 3 - Execution

Surface Preparation

1. Ferrous Metals
    a. SSPC-SP10 Near white blast cleaning

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2. Ductile and Cast-Iron Materials

    a. It is strongly recommended that any ductile iron or cast-iron pipe or materials to have a special exterior coating should be purchased factory primed without the standard asphalt coating. Field removal of asphalt coatings is extremely difficult and overly aggressive preparation can create a damaged surface unsuitable for coating.

    b. All oils, grease, and other contaminants shall be removed using solvent cleaning prior to abrasive blasting or power tool cleaning. Blemishes or staining on the prepared surface are acceptable if such items cannot be removed by light scraping with a knife. SSPC-SP10 blue-gray with surface profile of 2.0 Mil, minimum. Do not burnish the surface. Clean all surfaces of dust and loose residue immediately prior to coating. See NAPF 500-03-04/05.

9.91.23 Interior Painting

9.91.23.10 - System 6: Gypsum Wallboard – Interior, Painted

Part 1 - General

1. Gypsum wallboard ceilings, walls, and other similar surfaces located in a conditioned environment (i.e. building).

Part 2 - Products

1. Tnemec

    a. Prime Coat: Series 151-1051 Elasto-Grip (180 to 400 square feet per gallon)

    b. Finish Coat: Series 113 Hi-Build Tneme-Tufcoat (4 to 6 Mil DFT)

2. Sherwin Williams

    a. Primer: PrepRite ProBlock Int/Ext Latex Primer Sealer B51 Series (180 – 200 square feet per gallon)

    b. Finish Coat: Pro-Industrial Water Based Catalyzed Epoxy B73 Series (4 to 6 Mil DFT)

Part 3 - Execution

Surface Preparation

Surface clean, dry, and free of contaminates.

9.91.23.12 - System 7: Wood – Interior, Painted

Part 1 - General

Interior painted wood surfaces, including, but not limited to trim and other similar surfaces.

Part 2 - Products

1. Tnemec

    a. Primer: Series 151-1051 Elasto-Grip (1.0 to 1.5 Mil DFT)

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b. Intermediate Coat: Series 1029 EnduraTone (2 to 4 Mil DFT)

c. Finish Coat: Series 1029 EnduraTone (2 to 4 Mil DFT)

2. Sherwin Williams

a. Primer: PrepRite ProBlock Int/Ext Latex Primer Sealer B51 Series (1.0 to 1.5 Mil DFT)

b. Intermediate Coat: Sher-Cryl HPA B66-350 Series (2 to 4 Mil DFT)

c. Finish Coat: Sher-Cryl HPA B66-350 Series (2 to 4 Mil DFT)

Part 3 - Execution

Surface Preparation

Surface clean, dry, and free of contaminates.

9.91.33 Submerged and Buried Metals Painting

9.91.33.01 - System 8: Metals in Contact with Raw Water and Drinking Water (Steel pipe interior, steel pump can interior, pump column pipe)

Part 1 – General

Summary

This section applies to all metals in contact with potable drinking water.

References

Coatings shall be NSF 61 approved for use in direct contact with potable drinking water. The NSF 61 approval shall be appropriate for the application.

Part 2 – Products

Materials

1. Tnemec

a. Pipe ½-inch diameter and larger, and tanks 5 gallons and larger

i. Primer: Series 91-H20 (6 to 8 Mil DFT)

ii. Finish Coat: Series 22 Epoxoline (16 to 20 Mil DFT)

b. Pipe 18-inch diameter and larger, and tanks 1,000 gallons and larger.

i. Primer: Series N140 Pota-Pox Plus or Series 141 Potapox 80 (6 to 8 Mil DFT)

ii. Finish Coat: Series N140 Pota-Pox Plus or Series 141 Potapox 80 (6 to 8 Mil DFT)

2. Sherwin Williams

a. Primer: Macropoxy 646 PW (6 to 8 Mil DFT)

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b. Finish Coat: Macropoxy 646 PW (6 to 8 Mil DFT)

3. AkzoNobel Devoe
   a. Primer: BarRust 233H NSF/ANSI 61 Epoxy Coating (6 to 8 Mil DFT)
   b. Finish Coat: BarRust 233H NSF/ANSI 61 Epoxy Coating (6 to 8 Mil DFT)

Part 3 – Execution

Surface Preparation

Ferrous Metal – SSPC SP1 followed by SP10 Near White Blast. Surface profile shall be 2.0 Mil, minimum.

9.97.23 Concrete and Masonry Coatings

Part 1 - General

Scheduling

Most coatings on concrete will require a 28-day concrete curing period prior to coating. Schedule the work accordingly. No additional monetary or time compensation will be given for failure to plan for the required curing duration.

9.97.23.08 – System 9: Buried Steel Pipe Exterior and Concrete Vault Exterior – Bottom and Walls

Part 2 – Products

Materials

1. Tnemec
   a. One coat: Series 46H-413 Hi-Build Tneme-Tar. (16 to 20 Mil DFT)
2. Sherwin Williams
   a. One coat: Hi-Mil Sher-Tar Epoxy. (16 to 20 Mil DFT)
3. International Paint
   a. DevTar 5A High Solids Coal Tar Replacement Epoxy Coating. (16 to 20 Mil DFT)

Part 3 – Execution

Preparation

Allow 28-days cure time for concrete, or until passing the ASTM D 4263 Plastic Mat Test. Surface shall be clean, dry, and free of contaminants.

After Coating, wrap in 40 mil HDPE geofabric to protect the pipe and coating from backfill. Tape geofabric over flanges to adjacent pipe and fittings and insure no damage during backfill and compaction.

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9.97.23.09 - System 10: Concrete and CMU Wall – Interior, Non-Immersion, Mild Condition

Part 1 - General

Interior surface of concrete and CMU walls in a conditioned environment (i.e. building).

Part 2 - Products

Concrete Masonry Unit (CMU) Walls

1. Tnemec
    a. Prime Coat: Series 1254 Epoxoblock (24 to 26 Mil DFT) Apply as needed to provide a smooth, continuous, pinhole-free, void-free film.
    b. Finish Coat: Series 280 Hi-Build Tneme-Glaze (8 to 12 Mil DFT)
2. Sherwin Williams
    a. Primer: Cement-Plex 875 (60-80 square feet per gallon)
    b. Finish Coat: Pro-Industrial Hi-Bild WB Catalyzed Epoxy B71-100 (4 to 6 Mil DFT)
3. International Paint
    a. Primer: BloxFil 4000 Acrylic Block Filler or Devran 224HS Epoxy Block Filler (75-100 square feet per gallon)
    b. Finish Coat: International Paint DevFlex 4216 SemiGloss Acrylic Light Industrial Enamel or DevFlex 4206QD SemiGloss Acrylic Quick Drying Light Industrial Enamel or DevFlex 4208QD Gloss Acrylic Quick Drying Light Industrial Enamel (2 to 3 Mil DFT)

Concrete Walls

1. Tnemec
    a. Prime Coat: Series 1254 Epoxoblock (4 to 6 Mil DFT) Apply as needed to provide a smooth, continuous, pinhole-free, void-free film.
    b. Finish Coat: Series 280 Hi-Build Tneme-Glaze (6 to 8 Mil DFT)

Part 3 - Execution

Surface Preparation

1. Clean, dry, and free of contaminants and passing a wet mat test in accordance with ASTM D4263 Plastic Mat test.
2. Substrate shall be grouted or otherwise filled prior to painting.
3. ***Acid wash surfaces prior to coating with a solution approved by the coating manufacturer.***

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9.97.23.10 - System 11: Concrete and CMU Wall – Exterior Above Grade

Part 1 - General

Exterior surface of above grade concrete and CMU walls. This coating system is intended to function as a clear water repellent.

Part 2 - Products

1. Tnemec
    a. One Coat: Chemprobe Dur-A-Pell GS (100 sq. ft./gallon)
    b. Saturate without washdown.
2. Sherwin Williams
    a. One coat: Loxon 40 percent Silane Water Repellant. (125-175 sq. ft./gallon -coverage based on smooth precast concrete. See product data sheet for coverage on other concrete surfaces.)
    b. Saturate without washdown.
3. AkzoNobel Devoe
    a. One coat: RainGuard Blok-Lok. (60-125 sq. ft./gallon depending on substrate – see product data sheet for coverage on other concrete surfaces.)
    b. Saturate without washdown.

Part 3 - Execution

Surface Preparation

Clean, dry, and free of contaminants and passing a wet mat test in accordance with ASTM D4263 Plastic Mat test.

Acid wash surfaces prior to coating with a solution approved by the coating manufacturer.

9.99.33 Specialty Metal Coatings

9.99.33.07 – System 12: Vertical turbine pump bowls, pump impellors (Submerged Raw and Potable Water)

Part 1 - General

This section applies to pump bowl interior and exterior. The coating shall be designed for submerged conditions. The coating shall be NSF certified for direct contact with potable drinking water.

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Part 2 - Products

Materials

1. 3M Scotchkote - fusion bonded epoxy (12 to 16 Mil DFT)
2. Sherwin Williams - Sher-Plate PW (10 to 12 Mil DFT)
3. International - BarRust 233H NSF High Solids Low Temperature Curing Epoxy Coating (10 to 12 Mil DFT)

Part 3 - Execution

Preparation

Surface Preparation

SSPC SP1 followed by SP10 Near White Blast, Surface profile shall be 2.0 Mil, minimum.

Repairs

Manufacturer shall supply NSF approved patch kit for field repairs.

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Division 10
Specialties

10.00 GENERAL

This division covers that work necessary for fabricating and installing all furnishings and accessories as described in these specifications and as shown on the Plans.

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

10.05 Common Work for Specialties

Part 1 - General

Submittals

Submittal information shall be provided to the Owner for the following items:

- Equipment Signs
- Pipe Markings
- Danger Signs

10.10 INFORMATION SPECIALTIES

10.14 Signs and Labels

10.14.1 Common Work for Signs and Labels

Part 2 - Products

Materials

Unless otherwise specified, text shall be white on a background color shown below.

Purpose	Plate Color
General	Black
Warning	Red
Electrical	Black
Raw Water	Purple
Chemical	Orange

Part 3 - Execution

Installation

Install signs/markers directly on the devices in a location that does not interfere with the device operation or maintenance. If the device is too small or otherwise impractical to mount marker, locate marker as close as possible to the device on an adjacent surface.

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Provide and mount, as directed, equipment signs for the following:

Purpose	Location	Text
Pressure switches and transmitters	Pump Room	Per Plans
Clean and raw water taps	Pump Room	Potable Tap, Raw Tap
Raw Water Suction	Pump Room	Raw Water Suction
Raw Water Discharge	Pump Room	Raw Water Discharge
Chemical valves	Vault	Chlorine Dioxide
Warning	Vault	NFPA 704
Light switches	Pump Room, Electrical Room	Pump Room Lights, Electrical Room Lights
Electrical panels and disconnects	Electrical Room	Per plans
Pumps	Pump Room	Pump 1, Pump 2, Pump 3
Doors	Exterior Doors Interior Door	Electrical Room (2) Pump Room (2)

10.14.2 Equipment Signs

Part 2 - Products

Materials

Equipment signs shall be plastic-laminated 1-inch high, by required length, by ⅛-inch thick, with ½-inch high letters in N-2 Standard Gothic characters.

10.14.3 Pipe Markers

Part 2 - Products

Materials

Pipe markers shall be fabricated from outdoor grade acrylic plastic, and equal to Seton Setmark Type SNA pipe markers. Markers shall conform to standards for pipe and conduit identification (ANSI A13.1-1981).

10.14.4 Danger Signs

Part 1 - General

Summary

The Contractor shall provide danger signs per the schedule(s) on the Plans.

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Part 2 - Products

Manufacturers

Danger signs shall be Seton Identification Products or approved equal. When stated on the Plans, provide specified model number or approved equal.

Provide and install NFPA 704, chemical identification and danger hazardous chemical signs as required by Code.

Components

Hazardous Materials signs shown on the Plans to comply with National Fire Protection Association standard 704 (NFPA 704) shall be corrosion resistant for indoor installation and corrosion and UV resistant for outdoor installation.

Chemical identification and "Danger Hazardous Chemical" signs shall be corrosion resistant.. ***Mount to exterior of hatch and ceiling of hatch next to ladder in the Chlorine Dioxide Injection Vault.***

Part 3 - Execution

Installation

Mount signs securely in locations shown on the Plans or directed in the field with Owner representative present.

10.14.5 Door Labels

Part 2 - Products

Materials

Door labels shall be 2-inch tall font, easily readable at 20 feet from door. Labels shall be engraved PVC, with blue plate and white lettering. Labels shall be securely attached to the exterior of all doors with stainless steel metal screws, at 5 feet from the bottom of the door.

Part 3 - Execution

Installation

Provide door labels as noted on the Schedule above.

10.14.8 Electrical and Control Equipment

Part 2 - Products

Materials

Name plates and service legends shall be phenolic-engraved, rigid, laminated plastic type with adhesive back. Letter height shall be $^{5}/_{16}$-inch unless specified otherwise on the Plans. Labeling shall clearly identify the associate component. Color shall be black background with white letters.

Tags shall be securely attached. Adhesive backed tags shall also have at least two brass screws for positive fastening.

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Part 3 – Execution

Installation

Provide engraved nameplates indicating load served, voltage, and phase for every circuit breaker, panel board, switchboard, motor control center, motor starter, disconnect switch, and fused switch.

All components provided under this specification, both field- and panel-mounted, shall be provided with permanently mounted nametags.

Provide a name tag for each piece of equipment and for each circuit and/or control device associated with the equipment.

Provide a nameplate for each control center unit door.

Warning nameplates shall be provided on all panels and equipment which contain multiple power sources which may have energized circuits with the main disconnecting means in the off position.

10.14.9 Pump Signs

Part 2 - Products

Materials

Provide a 2-inch high, temperature resistant metal or vinyl number or name on each pump or pump motor.

Part 3 - Execution

Installation

Number shall face the pump control panels and be placed so as not to be obscured from other equipment. Confirm with Engineer the proper numbering or naming of each pump.

10.40 SAFETY EQUIPMENT

10.44.16 Fire Extinguisher

Part 2 - Products

Components

Portable, wall-mounted, 10-pound, dry-chemical fire extinguisher shall be listed and approved by Underwriters Laboratories. The fire extinguisher shall contain a dry chemical agent which is effective in extinguishing Class A, B, and C fires (tri-class), and shall be rated 2A-10B-C or greater.

Part 3 - Execution

Installation

Install extinguisher no higher than 5-feet above floor and in accordance with applicable codes. Provide a fire extinguisher attached to the interior wall near each exit door to outside.

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Division 11
Equipment

11.00 GENERAL

This division covers that work necessary for providing and installing all equipment as described in these specifications and as shown on the Plans.

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

11.05 Common Work for Equipment

Part 1 - General

Related Sections

- Division 1.81 Seismic Restraint Requirements

Submittals

Submittal information shall be provided to the Owner for the following items:

- Pumps and Motors
- Pump Anchor Bolts
- Heaters
- Ventilators
- Louvers
- Dampers
- AC Unit

11.10 PUMPS

11.10.1 Common Work for Pumps

Part 1 - General

Summary

This section covers work necessary to provide the pumps, complete with motors and accessories, described herein and as shown on the Plans.

Related Sections

- Division 1.75.1 Schedule
- Division 1.82 Pressure Ratings
- Division 9.99.33.07 Pump bowls and impeller casing
- Division 9.91.23.01 Coatings – Exposed Metals, Indoors

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- Division 10.14.9 Pump Signs
- Division 11.19 Pump Anchor Bolts
- Division 11.20.1 Common Work for Pump Motors

References

- HI - Hydraulic Institute.
- ASTM - American Society for Testing and Materials.
- AISI - American Iron and Steel Institute.
- ANSI - American National Standards Institute.

Performance Requirements

Power required to operate the pump(s) shall not exceed the motor nameplate horsepower regardless of any flow and head tolerances listed in this specification, unless allowed otherwise in the Pump Motors section.

The design and performance requirements listed for each pump must be met, with no exceptions. Pumps that do not meet all of the conditions will be rejected.

Pump parts in contact with potable water shall be lead free complying with either NSF 61 ANSI 372 tested or NSF 61 Annex G compliant. Submit NSF 61 and lead free information with the pump submittal.

Submittals

Submittal information shall be provided for each individual pump. Submit lead free information with pump submittal information.

Product Data:

- A minimum of 10 installations with similarly sized and configured pumps in equivalent fluid applications. Include location, contact name, and number.
- Specifications and data describing all pump parts, pieces, and components. Include information on materials of construction and proposed coating systems.
- Performance curves showing total dynamic head (TDH) in feet, efficiency, and net-positive-suction head required (NPSHR) versus output in gallons per minute (GPM). All losses from the drive shaft, seal, coupling and other mechanical losses shall be included in the pump efficiency data presented. Catalog or software generated curves may be submitted for preliminary approval and ordering.
- Additional curves for VFD pumps, curves for speeds at 60, 70, 80, and 90 percent of full speed.
- Provide documentation on assembled pump and motor unit natural frequency. Natural frequency shall not occur within 20 percent of speed above or below the pump's operating speed range of: 50 to 100 percent of full rpm rating.
- Minimum required submergence (ft) between the flow ranges of 4,000 and 8,000 gpm.

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- Complete list of all pump system components and accessories to be provided.
- Calculations showing compliance with bearing life and shaft deflection.

Shop Drawings:

- Provide detailed dimensional drawings showing outline dimensions, lengths, overall sizes, materials, and weights for each pump unit and associated accessories.

Closeout Submittals: Provide the following submittals prior to project closeout:

- Operations and Maintenance Manual
- Manufacturer Signed Warranties with pump serial numbers

Schedule

Provide delivery time in time from approval of shop drawings/submittal. All equipment shall be delivered within 18 weeks or less from approval of complete submittal information.

Quality Assurance

The pump manufacturer shall accept unit responsibility for the motor/pump assembly.

Ensure that pumps selected are locally serviceable and replacement parts are readily available.

Delivery, Storage, and Handling

Pumps shall be delivered, stored, and handled in accordance with manufacturer recommendations.

Fit within the Building and Mechanical Piping

The pump and motor provided by the Contractor shall fit within the confines of the building as shown on the plans and the pump and motor shall be removable thru the roof hatches via crane. If pump or motor dimensions do not allow for this use with adequate clearance of at least 1 foot from top of motor to ceiling or 8-inches around any bolt with layout matching the plans, modifications to the structural and mechanical layout shall be completed by the Contractor at no additional cost to the Owner.

Warranty

All pumping equipment described in this section and provided under this contract shall be warranted against defects in materials and workmanship for a period of two years after date of project acceptance.

Following pump and motor installation, supplier shall furnish services of a qualified manufacturer's representative to inspect pump units and inform Owner, prior to field testing, of any defects or concerns regarding condition of each unit and its installation at the job site. Upon resolution of any defects or concerns (if any) and work performed by the Contractor at their expense, manufacturer's warranty shall then be in full effect with no reservation or qualifications other than those stated in the manufacturer's warranty. Upon completion of

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pump installation, manufacturer shall provide written certification that equipment is fully warranted as installed.

Extra Materials

Provide any special tools required for pump or motor maintenance.

Part 2 - Products

Manufacturers

The following manufacturers are pre-approved for use on this project. The Contractor may submit another brand for review. Follow the procedures under Division 1.33.2.1 and 1.33.2.2.

Vertical Turbine

Goulds
Floway
Peerless

Components

For pumps in domestic water applications, all pump components, coatings, and lubricants shall be compatible for use in potable drinking water in accordance with U.S. Food and Drug Administration (FDA) or National Sanitation Federation (NSF) rules and regulations.

The pump manufacturer shall be certified to the ISO 9001 standard for design and manufacture of vertical turbine pumps.

All pump system components are to come from the pump manufacturer and shall include:

- Motor
- Solid motor shaft
- Solid line shaft
- Bowl assembly
- Column assembly
- Discharge head
- Couplings
- Pump can
- Intake strainer
- Vortex suppressor or straightening vanes
- All other necessary appurtenances for complete unit assembly.

Accessories

Provide removable guards to protect personnel from rotating components. Guards to meet the minimum requirements of WAC 296-806-20042.

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All pumps are to include an engraved non-corrosive metal nameplate on the exterior of the pump head or body (duplicate attached to pump support flange or shipped loose if submersible), readily accessible without requiring any disassembly. The nameplate shall include, at a minimum, the following information:

- Pump Manufacturer
- Pump Model Number
- Pump Serial Number
- Impeller Number
- Impeller Trim
- Number of Stages
- Design TDH (feet)
- Design Flow (gpm)
- Supplier Name and Phone Number
- Date of Manufacture

Source Quality Control

Factory Pump Performance Testing and Certification

Factory testing curves and data on each pump must be provided prior to pump delivery. Variations between factory tests and previously submitted catalog curves may be cause for rejection. Factory testing of the pump may use a dynamometer or calibrated motor.

Laboratory completing the tests shall be Hydraulic Institute (HI) 40.7 approved.

A performance test as described in the latest edition of HI Pump Tests (ANSI/HI 14.6 Centrifugal and Vertical) shall be performed, submitted to the Engineer, and approved for each pump prior to shipment to the construction site. Pumps shall be tested at the factory to Hydraulics Institute standards, except as modified below.

- Test speed must be within 20 percent of the rated speed, unless prior written approval is given by the Engineer.
- HI 14.6.5.7.1: No less than three additional test points beyond the five points listed in the HI standard are required. Two of these points between shutoff head and design point, and one point to the right of the design point.
- HI 14.6 Appendix K, 11.6.10: Model tests are not allowed unless prior approval is given by Engineer. Supplier shall submit a written request to perform a model test with procedures outlined for Engineer's review.
- A certified data sheet and performance curve shall be provided for each pump in similar fashion to HI 14.6 Appendix H pump test summary of information. At a minimum provide:
    - Information per HI standards.

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- TDH (ft) vs. Flow (gpm)
- Power (hp) vs. Flow (gpm)
- NPSHR (ft) vs. Flow (gpm) (catalog data is acceptable)
- Motor Input Power
- Hydraulic Efficiency (%) vs. Flow (gpm)

Graphs must be submitted and approved prior to shipment of pumps.

Preliminary curves shall be provided to the engineer prior to performing official factory tests for verification of performance criteria and pump selection.

Performance shall adhere to the tolerances of HI 14.6 Acceptance Grade 1B (greater than 134 hp).

Part 3 - Execution

Preparation

Domestic water pumps shall be disinfected per AWWA A-100 prior to installation. After disinfecting, immediately flush and rinse the pumps with clean water to remove the high chlorine concentration solution. This includes the impellers and interior of bowls, casings, and pump cans.

Installation/Construction

Install pump units in accordance with manufacturer's specifications and direction. Installation shall be supervised and approved by manufacturer's representative prior to operating or field testing units.

Adjust pump assemblies so that driving units are properly aligned, plumb, and level with the driven units and all interconnecting shafts and couplings. Flexible couplings shall not be used to compensate for any misalignment.

Connect suction and discharge piping to the pump in a manner which prevents strain on pump flanges.

Field Quality Control

See Division 1.75.1 Scheduling for scheduling and notification requirements.

A qualified and authorized representative of the pump manufacturer shall conduct and/or supervise the field testing. Prior to acceptance of installed pumps, manufacturer's representative shall demonstrate proper operation of pumps at capacities stated. Upon completion of pump installation and testing, manufacturer's representative shall provide written certification that equipment is installed correctly and fully warranted.

Contractor shall be responsible for calibration, startup, and initial performance to meet specifications herein. A field test shall be made to give an indication of the performance of the new pump when it is operating under actual field conditions and to establish the acceptance of the pump furnished and installed. The field test shall be performed in the presence of the Engineer after the piping and controls have been installed.

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A performance test similar to those described in the latest edition of Hydraulic Institute's (HI) Pump Tests (ANSI/HI 14.6 Centrifugal and Vertical) shall be performed, submitted to the Engineer, and approved for each pump.

The field test shall be performed to the accuracy obtainable with the testing equipment installed as a part of the piping and instrumentation. If sufficient field devices are not available, the Contractor shall provide testing gauges and meters as needed. At a minimum, the following are needed:

- Verify alignment of pump and motor shafts are within manufacturer requirements.
- Suction pressure gauge
- Discharge pressure gauge
- Flow meter (use meter at water treatment plant, Contractor may calibrate it if desired)
- Electric meter(s), per phase to measure voltage and current (Amps)

Results shall be within plus or minus 1 percent of the tolerances listed above under Source Quality Control.

Testing shall be completed under the observation of the Owner and Engineer. At that time, the following data shall be collected for each pump:

- TDH vs. Flow at a minimum of three points which include: 10-percent of shutoff head, open to system, and approximately 50 percent design flow with throttled discharge valve. Additional points may be required at the discretion of the Engineer.
- Voltage and current for each point tested.
- Vibration readings shall be taken at the locations described in Hydraulics Institute standard 9.6.4.3.2. Vibrations shall be read in the three orthogonal planes, with the maximum reading governing the results. If the vibration tests fail, the manufacturer and/or Contractor shall modify the equipment and/or installation and retest until the standards are met. Submit three copies of the vibration test results to the Engineer. The manufacturer's representative shall provide proper, calibrated instrumentation to verify maximum completed unit vibration amplitude.

Maximum allowable completed unit vibration amplitude (pump and motor installed) shall be as shown below. (Velocity measurements are in/sec RMS)

Short-set Vertical Turbine Pumps	
Power	Vibration
(hp)	(in/sec)
101-200	0.21

Upon completion of pump installation and testing, manufacturer shall provide written certification that equipment is fully warranted installed. Certification shall be provided that

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pumps meet all requirements set forth in these specifications and submittal literature. The pump installer shall also provide a written report of all test conditions and results.

Pump suction can and header shall be pressure tested to 150 psi prior to installation of the pump. Provide temporary caps and fittings as necessary to perform test. The can and header shall hold pressure with zero loss for a period of 15 minutes. A factory test will be acceptable if written certification of test results is provided.

Repair

Repair and retest units failing any field test. If unit fails second field test, unit will be rejected and supplier shall furnish a unit that will perform as specified.

11.11 Raw Water Pumps

Part 1 - General

Performance Requirements

The head-capacity curve shall have a continual rise in head from maximum to minimum flow. Curves which have intermediate high or low points will be rejected.

11.11.2 Vertical Turbine Pumps

Part 1 - General

Summary

This section covers that work necessary for providing and installing vertical turbine pumps, complete with motors and accessories, described herein and as shown on the Plans.

Related Sections

- 9.91.23.01 Indoor metals coating (pump head exterior; above-grade pump can exterior)
- 9.91.33.01 Metals in contact with drinking water coating (pump can interior; headers interior)
- 9.91.13.12 Buried Steel (pump can and headers exterior)
- 9.99.33.07 Pump bowls
- 9.99.33.07 Pump Impellors
- 11.10.1 Common Work for Pumps
- 11.20 Pump Motors

References

- HI - Hydraulic Institute 2.1 – 2.6, 9.1 – 9.8, 14.6

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Design and Performance Requirements

The vertical turbine pumps shall have the following operation characteristics:

Raw Water Pump (200 horsepower), 18-inch diameter equal to Goulds VIC-FLFM 18LHXC, 1 stage with 10.38-inch impeller trim. 18-inch short set column and 24-inch discharge flange.

Operating Point No.	Discharge "Q" (gpm)	Head "TDH" (ft)	Min. Pump Efficiency (%)	NPSHr (ft)
1	2,000	130	38	13
2	4,250	103	70	14
3*	6,500	88	83	27
4	8,000	59	77	45

* Duty Point

The operating points listed are for water at 45 degrees Fahrenheit.

Submittals

Submit detailed dimensional drawing for pump can and pump foundation and installation as applicable.

Factory Pump Performance Testing and Certification: Provide factory performance testing for each of the following pumps: Raw Water Pumps 1, 2 and 3.

Part 2 - Products

Manufactured Units

Pump shall be vertical turbine, can mounted type.

Components

The pump motor will be controlled by a VFD, all pump components shall be sized and selected for variable speed operation.

Head

Pump head shall be fabricated steel with positive sealing base plate for mounting of pump as shown on the Plans. A discharge flange shall be incorporated in the pump head, designed for through bolting of 150-pound ASA standard pipe flanges as shown on the Plans. Pump head shall have taps for discharge gauging and one 2-inch NPT access port for sampling and level measuring equipment between the outer wall of the head and the water box. Provide two access openings to the seal, each protected with an expanded metal screen attached to the head with two piano hinges and a locking clip hasp. Pump head to have a pressure rating at least 50 psi greater than the pressure conditions at full shut-off head.

Head shall allow for mechanical seal removal without having to remove the motor.

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Column

The column pipe shall be carbon steel, schedule 40, furnished in interchangeable sections not over five feet in length. Ten-inch and larger columns shall use standard flanges.

Column pipe shall be coated per Division 9.91.33.01 of these specifications.

The column shall have bronze bearing retainers, drop-in style for flanged column pipe. Each bearing retainer shall contain a water lubricated, cutless, rubber bearing designed for vertical turbine pump service.

Line Shaft

The line shaft shall be turned, ground, and polished precision 416 or 17-4PH stainless shafting of ample size to operate the pump without distortion or vibration. ***Line Shaft shall be solid, not hollow and 1.75-inches in diameter***. The shaft shall be furnished in interchangeable sections not over five feet in length and shall be coupled with ***steel couplings machined from solid bar steel with spacers to allow for removal and installation of the seal.***

A chrome oxide coated journal shall be placed on each shaft at the bearing point. The journal OD will be substantially flush with the shaft OD. (Recess not to be deeper than diameter corresponding to the root diameter of shaft threads.) Glued on sleeves are not acceptable.

The line shaft shall be selected such that the elongation due to weight and hydraulic thrust shall not exceed the axial clearance of impellers in the pump bowls. Size of shaft shall be no less than that determined by AWWA Specification E103, Section 4.4.

Head shaft shall be a 2-piece design with coupling located between pump and motor for ease of installation.

The coupling shall be a 3-piece design for adjusting impeller clearance and to allow for service of the mechanical seal.

Bowl and Impeller Assemblies

Bowl bearings shall be Vesconite coated, water-lubricated, and designed for vertical turbine pump service.

Pump bowls shall be constructed from close-grained cast iron and coated on the interior with ceramic, porcelain or per Division 9.99.33.07. Each bowl shall have a replaceable impeller seal ring to prevent slippage of water between bowl and impeller. Bowls shall be coated on the exterior per Division 9.99.33.07.

Impellers shall be fabricated from aluminum-bronze (ASTM B148 or as otherwise approved by the Engineer) materials with an enclosed or semi-enclosed design, and both statically and dynamically balanced. Impellers shall be attached to pump shaft by a positive locking stainless steel tapered impeller collet and shall be capable of vertical adjustment by external means. For shaft diameters larger than 2.5 inches, keys and thrust ring retainers shall be used.

If approved by the Engineer, the suction impeller may be a "low NPSH" style to meet the NSPH design requirements.

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Seals

Line shaft seal shall consist of a mechanical seal type installation. All motor and pump components shall be designed to meet the tolerances recommended by the mechanical seal manufacturer. ***Provide one spare seal for the station including John Crane Smartflow IG unit.***

Seal shall be John Crane Dual O-Ring 5620USP (Up Stream Pumping) or approved equal. Provide a Safematic SmartFlow IG on outlet and checkvalve on inlet side of each seal or equal. Route discharge water to floor drain adjacent each seal with flexible copper pipe. Set drainpipe 4-inches off the floor.

Strainer

Provide pump intake screen strainers having a net inlet opening of not less than four times the area of the suction pipe. Strainer shall be stainless steel. Strainer shall be basket type.

Pump Can

Pump cans shall be welded steel with top plate for mounting pump head. Welded steel pump can shall be constructed as shown in the Plans and steel pieces shall be constructed as dimensioned to exact tolerances of +/- 1/16-inch. Welds shall be constructed in accordance with ASME Welding Code. Contractor shall be responsible for compliance to this tolerance and correct any dimensions or welding that does not meet this specification at their expense. All connections shall be watertight. Contractor shall be responsible for repairing any leaks found during testing.

Steel pump can shall be constructed in accordance with AWWA C200. Steel pipe shall be fabricated from ASTM A53 Grade E or S. Shop drawings shall clearly indicate wall thickness, diameter, and pressure rating. Shop drawings shall be submitted to the Engineer for review and approval prior to material order. Pump can wall shall be of at least "Standard" (3/8 inch) pipe schedule thickness.

Contractor shall supply written certification that entire pump can assembly is capable of the hydrostatic testing pressure as noted in Division 1.82.

Pump cans shall be provided by the same supplier as the pumps. Pump can shop drawings shall be reviewed and approved by the pump manufacturer representative prior to fabrication. Approval shall be provided in writing during pump submittal.

Pump can top flange shall have outer diameter holes for concrete anchorage and inner diameter threaded taps for pump head connection.

Provide straightening vanes on the pump can interior.

Finishes

See Related Sections. Coat the following items:

- Discharge head
- Pump bowl interior
- Pump bowl exterior

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- Column pipe
- Pump can interior
- Pump can exterior

11.12.3 Sump Pump

Part 1 - General

Performance Requirements

Minimum performance of 40 gpm at 19 foot lift. Motor shall be single phase 115 V, 3/10 hp.

Part 2 - Products

Manufacturers

Sump pump: equal to Zoeller 57 Series.

Materials

Provide a sump pump with all optional metal parts made of cast iron. Sump pump shall be controlled by integral float switch.

11.19 PUMP ANCHOR BOLTS

Part 2 - Products

Materials

Pump anchor bolts shall be Deco Heavy Duty Adjustable Anchors or approved equal. Provide removable mounting stud for easy pump installation and removal. Anchor must be adjustable to ½-inch in any direction prior to tightening bolt. Bolts shall be compatible with pump can flange, concrete support block and pump head.

11.20 PUMP MOTORS

11.20.1 Common Work for Pump Motors

Part 1 - General

Related Sections

- Division 9.91.23.01 Coatings – Exposed Metals, Indoors
- Division 11.10.1 Common Work for Pumps

References

- HI - Hydraulic Institute.
- ASTM - American Society for Testing and Materials.
- AISI - American Iron and Steel Institute.
- ANSI - American National Standards Institute.

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- IEEE – Institute of Electrical and Electronics Engineers.

Submittals

Submittal information shall be provided for each individual motor.

Product Data:

Specifications and data describing all motor parts, pieces, and components. Include information on materials of construction and proposed coating systems.

Motor data including type, torque, RPM, no-load current, full-load amps, service and power factors, and motor efficiency at full-load.

Provide catalog data for each motor showing the following information:

- Horsepower vs. Load
- Power factor vs. Load
- Efficiency vs. Load or Wire-to-Water Efficiency vs. Load
- Vibration vs. Load
- Speed vs. Load

Where variable speed drive motor is required, provide performance curves and motor efficiency at the following percentages of full load: 25 percent to 100 percent, by 25 percent increments.

Complete list of all motor components and accessories to be provided. All motor system components are to come from the pump manufacturer.

Calculations showing compliance with bearing life and shaft deflection.

Shop Drawings:

Detailed dimensional drawings showing outline dimensions, lengths, overall sizes, materials, and weights for each motor and associated accessories.

Closeout Submittals: Provide the following submittals prior to project closeout:

- Operations and Maintenance Manual
- Manufacturer signed warranties with serial numbers

Quality Assurance

Ensure that motors selected are locally serviceable and replacement parts are readily available.

Motors shall be dynamically balanced at the factory and shall have maximum vibration amplitude of 0.001-inch peak-to-peak.

Delivery, Storage, and Handling

Motors shall be delivered, stored, and handled in accordance with manufacturer recommendations. Store in a dry, enclosed environment and in an upright position.

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Design Requirements

Motors shall operate on a 3-phase, 460 volt, 60-cycle power supply.

Maximum speed of 1,770 revolutions per minute (rpm).

Provide a premium efficiency motor with efficiency at design point not less than shown in Table C405.8 (1), current edition (document can also be found through www.neec.net). Efficiency as determined by IEEE Standard 112, Test Method B. Motors shall be designed for a continuous cycle.

Motors shall be inverter duty rated for Variable Frequency Drive applications per NEMA MG1 Part 31.

Motors shall be sized such that power draw in the normal operating range of the pump shall not exceed the nameplate size. Power draw shall not encroach into the service factor. Motor size selection shall include all losses, including motor and pump bearings.

The pump operational range shall be 54-per cent to 100-percent of full speed.

Thrust bearings: design life not less than 40,000 hours. Upthrust protection of 30 percent of the down thrust or as required to support pump upthrust at startup, whichever is greater, shall be provided in the bearings.

Warranty

All equipment described in this section and provided under this contract shall be warranted against defects in materials and workmanship for a period of two years after date of project acceptance.

Following motor installation, supplier shall furnish services of a qualified manufacturer's representative to inspect units and inform Owner, prior to field testing, of any defects or concerns regarding condition of each unit and its installation at the job site. Upon resolution of any defects or concerns (if any) and work performed by the Contractor at their expense, manufacturer's warranty shall then be in full effect with no reservation or qualifications other than those stated in the manufacturer's warranty.

Upon completion of motor installation, manufacturer shall provide written certification that equipment is fully warranted as installed. A combined pump-motor warranty will be acceptable in lieu of separate warranties.

Maintenance

Provide any special tools required for motor maintenance. Provide enough lubricant for one service change.

Part 2 - Products

Accessories

All motors are to include an engraved non-corrosive metal nameplate on the exterior of the motor, readily accessible without requiring any disassembly. The nameplate shall include, at a minimum, the following information. Common abbreviations shown in brackets [ ].

- Manufacturer

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- Motor type [TYPE]
- Model Number [MN, MODEL, MOD.NO]
- Serial Number [SN, SERIAL, SER NO]
- Frame size [FRAME]
- NEMA design letter [DESIGN]
- Insulation class or rated temperature rise [INS, CLASS]
- Maximum ambient temperature [AMB]
- Nominal Power (hp) [HP, OUTPUT]
- Time rating [RATING]
- Locked rotor kVA code [CODE]
- Service Factor [SF]
- Voltage [VOLTS]
- Phase [PH]
- Frequency (Hz) [CYCLES]
- Full load amps [FLA]
- Full load speed (rpm) [SPEED, FL RPM]
- Nominal Efficiency (%) [NEMA NOM EFF]
- Date of Manufacture
- Special ratings (Inverter duty, NFPA, Class 1 Division 1, UL, etc.)

Connection between motor and head shaft shall be through manufacturer's recommended coupling, complete with non-release protection (if non-reversing ratchet is not specified), to prevent pump shaft from unscrewing in the event of phase reversal. Each motor shall have lifting lugs.

Motor shaft shall be compatible with the pump shaft and mechanical seal specified.

Finishes

Pump motors shall be furnished with a prime coat or finished epoxy coat of the manufacturer's standard finish. Stainless steel casings need not be coated. Motors with only a primer coating shall be finish coated in the field with a product suitable for the environment and the motor temperature range, submit to Engineer for approval.

Part 3 - Execution

Examination

Contractor shall determine if special lifting equipment is necessary for installation of the motors.

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Installation/Construction

Install units in accordance with manufacturer's specifications and direction.

Field Quality Control

Installation shall be supervised and approved by manufacturer's representative prior to operating or field testing units. A field test shall be conducted and/or supervised by the pump or motor manufacturer's representative after the piping and controls have been installed. Upon completion of installation and testing, manufacturer's representative shall provide written certification that equipment is fully warranted installed.

Contractor shall be responsible for calibration, startup, and initial performance to meet specifications herein. A field test shall be made to give an indication of the performance of the new motor when it is operating under actual field conditions and to establish the acceptance of the motor furnished and installed. The field test shall be observed by the Engineer after the piping and controls have been installed. Testing shall be completed in accordance with the requirements provided above.

The Contractor shall provide calibrated and certified measuring devices to measure voltage, current, and power factor for each pump motor after they have been installed. The manufacturer's representative shall provide proper, calibrated instrumentation to verify maximum completed unit vibration amplitude.

The following data shall be collected for each motor:

- Motor current (amp) draw vs. Flow.
- Vibration vs. Speed.

Repair and retest units failing field test. If unit fails second field test, unit will be rejected, and supplier shall furnish a unit that will perform as specified.

11.21 Non-Submerged Pump Motors

Part 1 - General

Related Sections

- Division 11.20.1 Common Work for Pump Motors

Part 2 - Products

Manufactured Units

Motors shall be designed, manufactured, and tested according to latest revised standards of NEMA MG-1. Motors: full or reduced voltage starting (as shown), inverter-duty rated for use with VFD, squirrel cage induction type. Shaft shall be solid with steady bushing on the motor lower end to provide proper tolerances for the mechanical seal. Motor shall have a non-reverse ratchet mechanism. Ratchet shall be of drop-in ball type (pins and springs will not be allowed).

Motors shall be sized to drive loads encountered and shall be drip-proof, with a maximum ambient temperature rating of 40 degrees Celsius and a 1.15 service factor. Motors shall have Class F insulation (115 degrees Celsius maximum allowable temperature rise) with an actual

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field temperature rise of NEMA Class B (90 degrees Celsius). All windings shall be vacuum-impregnated.

Motors for use with VFDs shall be provided with either insulated bearings, ground brushes, or a shaft (bearing) grounding ring. Shaft grounding ring equal to AEGIS.

11.90 OTHER EQUIPMENT

11.92 SealSafe System

Part 1 – General

Seal safe system shall be based on Safety Plan 32 seal flush systems as described by John Crane Mechanical Seal Safety Plans. The system shall be submitted with the pump and motor as a complete submittal for review by the Engineer. The pump manufacturer's representative shall provide a written statement that this system is approved for installation and inspected and approved during testing and startup.

Working and testing pressures for the system shall be shown in Division 1.82. All components shall be capable of these pressures.

Part 2 - Products

Copper Pipe and Fittings

Copper Tubing shall be drawn, Type K,

Fittings shall be soldered or NPT as required by system components. Compression fittings are allowed if they meet or exceed pressure 150 psi.

Unions shall be provided adjacent to ball valves upstream of Sealsafe units for ease of maintenance.

Solder

Solder shall be completed by a Washington State licensed plumber using 95-5 Tin-Antimony Solder.

Ball Valves

Ball valves shall be NPT size to match adjoining piping and equal to Apollo with brass body and full port opening. Valve handle shall be quarter turn lever perpendicular to valve body to close. Orient so handle freely moves through the travel path.

Hoses

Hoses shall NSF approved textile reinforced hose capable of 30 psi test pressure and sized as required to fit Sealsafe connections. Provide 304 stainless steel hose clamps, 1 per barbed connection.

Wye Strainers

Wye strainers shall be 3/4-inch bronze body Watts Series LF777S with threaded connections, Strainer shall be #20 mesh 304 Stainless steel. Wye strainers shall be installed so that one can

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be in operation with the other offline for maintenance. Strainers shall be rated for 1 gpm minimum, per each unit.

Bag Filter Assembly

Bag filter shall be a 5-micron filter assembly equal to John Crane Delta SH-10 (G) filter housing assembly (GA-213742) or equal with 5-micron filter cartridge. Unit shall contain a filter housing assembly SH-10, Filter cartridge 4535K73, differential pressure gauge and retaining ring tool. Provide bypass around bag filter with ball valves each side of filter and single ball valve on bypass for maintenance. Filter shall be capable of passing 5 gpm. Provide fittings to connect to copper pipe, as necessary. Provide 4 spare 5-micron filter cartridges that fit the housing.

Pressure Reducing Valve

Provide two (2) ¾-inch pressure reducing valves to reduce incoming potable line from 125 psi maintain a downstream pressure of between 25 to 10 psi in parallel with ball valves. Valve shall be bronze body and NSF approved. One valve in service at any one time. Place PRV after wye strainers and bag filter. Provide pipe, fittings, and union for maintenance. PRV equal to Cla-Val as represented by Greaves Company, Inc. La Conner, WA.

Reduced Pressure Backflow Prevention Device

Reduced Pressure Backflow Prevention Device (RPBPD) shall be Foundation for Cross Connection Control approved for backflow prevention. RPBPD shall be installed with ball valves on each side and union for easy removal. Place before Sealsafe system inside pump room as shown on the plans equal to Apollo Valves RP4A. Note 10 psi pressure loss thru unit at low flow.

Seal Flush Monitor

Seal Flush Monitor shall be equal to Safeunit Seal Water Control and Monitoring Unit Model SFP. ***Alarm shall be sent to Telemetry if flow is above 2 gpm (reverse alarm to standard) and shall shut down Raw Water Pump if pressure of supply line is less than 4 psi.***

Provide Unistrut and anchorage as shown on the plans.

Pressure Gauges

Gauge accuracy shall be ± 0.5 percent of full scale.

Marsh, 3D Instruments or approved equal.

Gauges shall be analog stem mount type with 2½-inch scale face, glycerin filled and completely suitable for measuring potable water. Connection shall be 1/4-inch threaded with ball valve, or block and bleed valve, to allow for gauge servicing. Wetted parts shall be brass or bronze. The full-scale pressure range for each gauge shall be 0-160 psi upstream of PRV and 0-30 psi downstream of PRV.

Part 3 - Execution

Seal safe system shall be inspected and tested with a representative of John Crane or equal. Provide time for inspection, testing, startup, and training of operation with Owner's personnel.

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All parts and pieces shall be reviewed by the contractor to confirm compatibility. System shall operate leak free and supply up to 2 gallons per day to each pump when in operation.

11.95 Heating, Ventilating, and Air-Conditioning

11.95.1 Common Work for HVAC

Part 3 – Execution

Install per HVAC units per strict conformance with manufacturer recommendations. Brackets and support frames if needed shall be provided in order to properly install the HVAC equipment meeting manufacturer requirements.

HVAC representative shall visit the project site once manufactured units are shipped and on site to review installation procedures with Contractor. HVAC representative shall certify with written letter to Engineer that installation of HVAC equipment meets manufacturer's requirements.

11.95.34 Fans

11.95.34.1 Wall Ventilators

Part 1 – General

Design and Performance Requirements

See Ventilator Schedule on Plans and Functional Control description for design and performance requirements.

Related Sections

- Division 17.53.2 - Cooling Thermostat
- Division 17.08 – HVAC Functional Control

Submittals

Submit detailed product information including specifications, sizing information, performance curves, dimensional drawings, accessories, and other information relevant to this project.

Part 2 – Products

Manufacturers

The following manufacturers are considered to be acceptable "or equals" unless otherwise noted on the Plans or herein.

- ACME
- Fantech
- Penn Ventilation
- Greenheck
- Pottorff

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Accessories

Provide all accessories needed for a complete installation including wall and roof thimbles, backguards, and mounting sleeves.

Part 3 – Execution

Install per manufacturer recommendations.

Provide a disconnect switch for each unit.

11.95.80 Decentralized HVAC Equipment

11.95.81.26 Split System Air Conditioner

Part 1 – General

Design and Performance Requirements

See schedule on Plans and Functional Control description for design and performance requirements.

Part 2 – Products

Manufacturers

The following manufacturers are considered to be acceptable "or equals" unless otherwise noted on the Plans or herein.

- Mitsubishi P-Series

Part 3 – Execution

Install per manufacturer recommendations.

11.95.83.33 Radiant Space Heaters

Part 1 – General

Related Sections

- Division 17.53.3 - Heating Thermostat

Design Requirements

Furnish and install wall-mounted space heater(s) as shown on the Plans.

Part 2 – Products

Manufacturers

Heaters shall be as specified on the Plans. Equals will be accepted.

Components

Space heaters shall be electric air element type of the size and location shown on the Plans. Provide with a universal mounting bracket, a disconnect switch and mounting hardware. Provide contactors in heater to interface with control relays and 480V power supply.

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Heater shall be provided with built-in thermostat. Thermostat shall have an adjustable range from 40 – 90 degrees Fahrenheit. Set thermostat at 60 degrees Fahrenheit.

Part 3 – Execution

Installation

Mount bottom of heater(s) 6-feet, 6-inches from finished floor unless specified otherwise on the Plans. Provide clearance from walls, ceiling, and obstacles as recommended by the manufacturer.

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Furnishings – Not Used This Contract

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13.47.13 – CATHODIC PROTECTION

13.45.13.13 Cathodic Protection for Underground Piping

Part 1 – General

Description

This work consists of requirements for corrosion control materials and construction methods for the discharge piping from the vertical 90-degree bend flanges in in the pump station to the CCP connections.

Provide and install the corrosion control system specified herein.

Abbreviations

NACE - National Association of Corrosion Engineers.

Definitions

Exothermic Welding and Pin Brazing - A specialized process used for electrical connections to the exterior of pipe and fittings.

Transmission Mains - Piping systems with minimal service connection, includes conduits, interties, supply mains, and pump mains.

Submittals

1. Products - Provide submittals for all products referenced in this section.
2. Testing - Submit written documentation of experience as a professional engineer regularly performing cathodic protection work or certification as a NACE Cathodic Protection Specialist for all personnel performing field testing.
3. Test reports - Submit 3 copies of all field test reports.

Part 2 - Materials

Exothermic Welds and Pin Brazing

Weld Materials

Molds, cartridges, and all required materials for exothermic (copper) welding shall be as produced by "Cadweld", Erico Products, Inc., or approved equal. Provide molds and cartridges of a size and material as recommended in writing by the manufacturer. Molds for exothermic welding shall be graphite; ceramic molds are not acceptable.

1. Ductile Iron Pipe - For connection to ductile iron pipe, use "Cadweld" XF-19 alloy weld metal or approved equal.
2. Steel Pipe - For connection to steel pipe, use "Cadweld" F-33 alloy weld metal alloy or approved equal.

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Terminals

All wires used with exothermic welds shall have formed sleeve terminals and shall be welded using the reduced weld size and special weld mold for formed terminals, as specified in writing by the manufacturer. The formed terminals may be factory fabricated or may be field formed using sleeves and a hammer die.

Pin Brazing

Pin Brazing - Pins, studs, lugs and ferrules shall be as recommended in writing by the manufacturer for the wire size, pipe material, and pin braze machine settings.

Weld Caps

Furnish weld caps of high-density plastic, 10 mils (minimum) thickness Handy Cap IP, as manufactured by Royston Laboratories, or approved equal. Provide caps that incorporate a dome for the weld, a tunnel to contain the lead wire from the weld connection, and a base plate to cover the prepared pipe surface. Weld caps shall be provided pre-filled with mastic/adhesive and have an integral primer for adhesion to the pipe or structure. Weld caps shall be sized for the exothermic or pin brazed connection.

Galvanic Anodes

Supply galvanic anodes of the quantity, composition, dimensions, metal weight, and packaged backfill as shown or noted on the drawings.

Magnesium Anodes

Provide magnesium anodes, nominal 20-inches long and nominal 30-pound bare metal weight. Magnesium anodes shall meet the requirements of ASTM B-843-M1C High Potential Magnesium Alloy and ASTM G97 with an open circuit potential of (-)1.7VDC to CSE and a current efficiency of 50-percent. The anodes shall be prepackaged in a permeable cloth bag containing the manufacturer's prescribed backfill and the packaged anode shall be a nominal of 2.5 times the bare anode weight. The anode lead wire shall be solid copper wire, AWG #12 or #10, with TW, THHN-, or USE-type insulation, and the connection to the anode shall be silver soldered by the manufacturer and shall be of an un spliced length specific to the application but not less than 15 feet.

Test Stations

Supply test stations of the quantity and type as shown and noted on the drawings.

Test Station

Flush-mounted test stations shall be as shown on the plans. PVC pipe shall fit in the valve box. Submit valve box, cover lid and PVC pipe for review and approval.

Wire

Wire for test stations and joint bonds larger than AWG #10 shall be single-conductor, stranded copper, with USE-type insulation. Wire AWG #10 or smaller shall be solid not stranded, with TW-, THHN-, or USE-type insulation. Provide the wire size as specified or shown on the plans.

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Split Bolts and Insulation for Split Bolt Connections

Provide bronze split bolts, sized for the wire to be joined; insulating putty, 3M Scotchfill or approved equal; and vinyl electrical tape, 3M Scotch Super 33 or approved equal.

Insulation for Dielectric Isolation

Insulating Flange Joints

Flange insulation shall include a full-face insulating gasket between socket slip flanges, a full-length insulating sleeve for each bolt, and two insulating washers and two steel bearing washers for each flange bolt.

1. Sleeves and Washers - Insulating sleeves and washers shall be Pyrox G-10. Both the insulating washers and the steel washers shall fit over the outside diameter of the sleeve and shall fit within the bolt facing of the flange.
2. Gaskets - Gaskets shall be full faced, Styrene Butadiene Rubber (SBR), Nitrile (Buna-N), Neoprene, polytetrafluoroethylene (PTFE), or compressed vegetable fiber. Gaskets shall have adequate dielectric properties, 300V/mil minimum, and shall be suitable for the operating and test pressures as described in Division 1.82.
3. Joint Assembly - An insulating joint assembly shall consist of 2 flange by plain end or 2 flange by mechanical joint (FLG x PE or FLG x MJ) adapters, a full face insulating gasket, with full length insulating sleeves, 2 insulating washers, and 2 steel bearing washers for each flange bolt.

Insulating Copper Service Fittings

Fittings shall have insulators integral to the body of the fitting, as manufactured by Meuller Company or approved equal. The design of the fitting shall include a mechanical restriction to prevent the copper tube from passing through the insulation.

Insulating Seals for Vault Walls and Floor Slab

Insulating seals shall consist of compression disks and pressure plates made of dielectric materials. Insulating seals shall be Model C Insulating Type as manufactured by Link Seal or approved equal.

Polyethylene Encasement

Polyethylene Encasement for DI Pipe

Furnish 4 mil Type 2 high density cross laminated polyethylene film in accordance with AWWA C105 tube type encasement. Polyethylene sheet is not acceptable. Furnish polyethylene encasement from the same manufacturer that supplies the ductile iron pipe.

Thin Film Coatings

See Division 9.97.23.08 for buried welded steel pipe coatings

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Mortar, Grout, Grout Band

Mortar and grout shall be a chloride free Portland cement and sand mix with not less than 1-part cement to 3-parts sand or a proprietary cementitious chloride free mix approved in writing by the pipe manufacturer. The grout band shall physically contain the mortar/ grout and prevent moisture loss.

Part 3 - Execution

Corrosion Protection

Transmission Mains

Transmission mains are piping systems with minimal service connections including conduits, interties, supply mains, and pump mains. Transmission mains shall be made electrically continuous with welded joints or joint bonds, shall be dielectrically isolated at all connections, and shall be dielectrically isolated as shown on the plans.

1. Test stations shall be provided at dielectric isolation joints adjacent concrete cylinder pipe connections.
2. Transmission mains made of ductile iron pipe shall have polyethylene tube encasement and anodes. Steel transmission mains shall have thick tar coating and anodes. Mortar-coated steel and concrete cylinder pipe (CCP) transmission mains shall have continuous mortar coating as shown on the plans.

Exothermic Welding and Underground Electrical Connections

General

Unless otherwise specified, all electrical connections to the pipe shall be by exothermic welding or pin brazing. Properly cover exothermic or pin brazed welds with weld caps or in the case of mortar coated steel or Concrete Cylinder pipe (CCP), tape the exposed copper of weld and wire with vinyl electric tape then encase in mortar. Provide sufficient space between adjacent exothermic welds to install a full-sized weld cap on each weld. Repair all damaged pipe coating in accordance with the manufacturer's recommendations. Prior to coating, test all exothermic or pin brazed welds by striking with a hammer in a manner approved by the Owner representative.

Pipe Joint Bonds

Provide pipe joint bonds to assure electrical continuity except where electrical isolation is specified. Connections to the pipe shall be by exothermic welding or by pin brazing. Bond wires shall be un-spliced wire with field connections made in the trench. Alternatively, "pig tails" can be pre-welded or pin brazed to the pipe; then the pigtails will be spliced together in the trench with split bolt connectors. Joint bonds with lug terminals can be field connected to pin brazed threaded studs. To permit inspection of the welds and pin brazing and to prevent damage to the weld caps, apply all protective coating after the joint is in place and complete. Insulate the split bolt and all exposed copper wire by encapsulating with electrical insulation putty, Scotchfill® Insulating Putty or approved equal, molding the connection smooth, and

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then wrapping the connection at 50-percent overlap with vinyl electrical tape, Scotch Super 33 or approved equal.

Joint Bond Configuration

There shall be a minimum of 2 parallel joint bond wires, AWG #2, at each pipe joint. Valves and fittings may be bypassed by bond wires, but the valve or fitting must be made electrically continuous with the pipeline by a single wire, AWG #2 or AWG #4 that connects directly to a pipe section or connects to a joint bond wire (header run) with a split bolt connection. An assembly of valve and fittings may have a single bond wire (tap) from each component piece split bolt connected to a header run (AWG #2) that connects at each end, directly to a pipe section by exothermic weld or by split-bolt connection to a joint bond wire.

Wiring

All wiring is to be splice-free, except where splices are specified or shown or as approved. Coil or snake all buried wire with sufficient slack to prevent stress from backfill operations and earth settlement. Extend all wire at test stations a minimum of 30-inches above finished grade or install in rigid conduit. Repair any damage to the wire insulation with self-adhering butyl rubber electrical tape, Scotch No. 130C or approved equal, and over wrap with vinyl electrical tape, Scotch No. 33 or approved equal. Spirally apply each layer at 50-percent overlap. This repair method is not applicable to repair of any wire in an impressed current system.

Split Bolt Connections

Split bolt connections shall be limited to the connection of 2 wires. 3 or more wires at 1 split bolt are not allowed. Connection of taps to header runs may be accomplished by stripping an appropriate length of insulation from the header without cutting the wire and connecting the tap at that point with a split bolt for each tap.

Galvanic Anode Installation

General

Place anodes below the pipe invert as shown on the plans. Do not place the anodes within 3 feet of a neighboring metallic structure. When anodes are distributed along the pipeline, alternate the perpendicular offset from one side of the pipe to the other.

Location

Install the anode in clean, native backfill and not in the select bedding material. Locate anodes a minimum of 5 feet apart. Thoroughly soak the anode in water prior to installation. Evenly distribute anodes along main and branch line installations. Anodes may be grouped at the ends of short runs of pipe; maintain 5 foot minimum distance between anodes.

Connection

The anode lead wire shall be exothermically welded to the pipe. Alternatively, the anode shall be connected to a joint bonding wire by using a split-bolt connection.

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Distances between anodes are nominal lengths and anode connections shall be made at pipe joints.

Test Station Installation

Isolation Joint Test Stations (TSIJ)

Provide a test station at all buried insulated flanges and insulating couplings, except insulated connections on copper services. Provide a test station at the dielectric isolation between mortar coated steel or CCP lines and dielectrically isolated branch lines. Insulating Joint Test stations shall have (2) AWG #8 wires welded to each side of the dielectric joint, (4) wires total.

Dielectric Isolation

General

Provide pipe isolation with insulating flange joints where shown on the plans. Copper services shall be isolated with corp stops designed with integral insulation. Use insulating wall seals at all concrete wall penetrations.

Polyethylene Encasement Sleeve Wrapped and Tape Wrapped

Polyethylene Encasement Installation

Install polyethylene encasement, tube type, on all ductile iron pipe and appurtenances on DI pipe and fittings between the CCP connections and the steel discharge header at the Raw Water Pump Station. Install one length of polyethylene tube encasement for each length of pipe in accordance with AWWA C105, Method A. Every 6 feet along the pipe, secure the polyethylene tube encasement with tape full circumference. The use of polyethylene sheets will not be allowed.

Install 40-mil geo-membrane around mechanical joints and similar connections where the polyethylene can be punctured or ripped. Tape the ends and seams of the geo-membrane with PVC tape and then cover the pipe joint with the adjoining polyethylene encasement.

Concrete Cylinder Pipe (CCP)

Transmission mains shall have continuous mortar coating over all in-line valves, fittings, and other appurtenances, regardless of underlying coating, except when the application of a dielectric coating and installation of anodes at a valve, fitting or other appurtenance is allowed in lieu of mortar coating.

Testing and Verification

Quality Assurance

The portion of the work that involves the installation and testing of the galvanic cathodic protection system shall be conducted by a professional corrosion engineer regularly performing cathodic protection work or by an individual who is registered or certified by the National Association of Corrosion Engineers (NACE) as a cathodic protection specialist. Submit verification of registration or certification for written approval prior to the start of the work.

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Field Verifications

The professional corrosion engineer or specialist in cathodic protection shall field verify the adequacy of the Contractor's personnel in handling and placing anodes and monitoring coupons, performing exothermic welding, installing split bolt connectors, repairing coatings including weld caps, and measuring dielectric isolation and bonding.

The professional corrosion engineer or specialist in cathodic protection shall at the start of the work provide a list of qualified Contractor personnel and only these listed individuals shall perform such work for the Contractor.

Testing During Construction

Test all isolation joints after installation and prior to backfilling.

Continuity and Isolation Testing

Perform testing as follows:

1. General - Test all sections of pipe and appurtenances that are cathodically protected and dielectrically isolated for electrical continuity and dielectric isolation after all Contractor connections have been made.
2. Test Current Response - Measure the response of the pipe to the application of cathodic protection test current. If the application of the test current causes the pipe-to-soil potential to become more negative, electrical continuity of the pipeline, service runs, and appurtenances is indicated between that point and the point at which the test rectifier negative connection was made. The response of the potential shall be of a magnitude to demonstrate low resistance joint bonds. Electrical isolation across insulating fittings shall be indicated by the pipe-to-soil potential being more positive or only slightly negative in relation to the structure connected to the test rectifier.

Lack of Continuity or Isolation

If electrical continuity or electrical isolation is not achieved, locate the deficiency and complete the necessary repairs. The professional corrosion engineer or specialist shall retest the system before final acceptance.

Repairs

Make all repairs necessary to correct any deficiencies and repair any joint not passing the electrical continuity or isolation test at no cost to the Owner.

Final System Testing

Final system testing shall be performed prior to the hydrostatic testing of each segment and prior to substantial completion. Final testing shall be performed directly by the professional corrosion engineer or specialist in cathodic protection and witnessed by the Owner and shall include the following as a minimum:

1. Test and Service Locations - Provide pipe-to-soil potential measurements for all test stations, the 4 90-degree bends in the Pump Station discharge and copper service line for the pressure transducer. Include date of measurement taken.

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2. Continuity and Isolation Measurements - Provide a report consisting of continuity and isolation measurements and other data for all cathodically protected sections of pipe.
3. Documentation - Provide electronic pdf of a report documenting all testing and installation of cathodic protection system. The professional corrosion engineer shall stamp or the cathodic protection specialist shall sign the report. Include the specialist's NACE registration or certification number.

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Conveying Systems – Not Used This Contract

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Division 15
Mechanical

15.00 GENERAL

This division covers the work necessary for furnishing and installing mechanical appurtenances and accessories as described in these Specifications and shown on the Plans.

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following subsections whether directly referenced or not.

15.05 Common Work for Mechanical

Part 1 - General

Summary

Provide the necessary piping, plumbing, fittings, and appurtenances to make all piping systems complete, tested, and ready for operation as specified herein and as shown on the Plans. Some fittings that are necessary for the complete piping system installation and operation may not have been shown. Provide fittings, pipe, and appurtenances necessary, whether shown on the Plans or not, to make all piping systems complete, tested, and ready for operation.

Some pipe supports, thrust blocking, and tie rods are not shown on the Plans. Provide pipe supports, thrust blocking, and tie rods for pipes as required by accepted design criteria to support and restrain the loads encountered.

Related Sections

- Division 1.81 Seismic Restraint and Anchorage
- Division 1.82 Pressure Ratings
- Division 10.14.3 Pipe Markers

References

All products in contact with the raw water to be NSF 61 certified and low-lead (less than 0.25 percent) content in compliance with NSF/ANSI 372.

Submittals

Submittal information shall be provided to the Owner for the following items:

- Ductile iron pipe
- Ductile iron fittings
- Steel pipe and fittings
- Copper pipe and fittings (see Division 11 for Sealsafe system requirements)
- PVC pipe and fittings
- Underdrain pipe
- Isolation valves

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- Floor drains and cleanouts
- Hose bibs
- Pressure gauges
- Chemical piping system components
- Other mechanical components listed in this division or required by the Engineer

Part 2 – Products

Materials

All valves, meters, hydrants, specialties, appurtenances, and other such mechanical and plumbing components that are of similar purpose shall be of a single manufacturer and model line. Do not "mix and match" unless specifically stated otherwise or allowed by the Engineer. The intention of this requirement is to maintain consistency across all components installed on the project for function, maintenance, aesthetics, and details of installation.

15.10 BURIED PIPE INSTALLATION

Part 1 – General

Site Conditions

Existing soils are unclassified except where specifically identified on the Plans or specification.

Part 3 - Execution

Preparation

Stringing of pipes in advance of pipelaying may occur but may not create a traffic hazard or block access to roads, driveways, or private property without approval from the local traffic authority and affected property owners. Pipe shall not be strung out more than two calendar weeks in advance of installation. Any pipe or materials that will not be installed for two calendar weeks must be stockpiled at a site procured by the Contractor or as provided in this contract.

Contractor shall pothole ahead of pipe-laying a sufficient distance at known utility crossings and where noted on the plans to allow room to make vertical adjustments as necessary to avoid existing utilities. Should the Contractor fail to pothole identified utility crossings, any subsequent adjustments necessary shall not be cause for cost or time claim. If the area potholed is in a travelled area and will be reopened to traffic more than one day in advance of pipelaying through the zone, the hole shall be patched with hot or cold mix, the cost of which shall be incidental.

Provide the results of potholing to the Owner no less than two working days in advance of utility installation. Contractor shall provide a written record of size, materials, and locations for found utilities to an accuracy of 0.5 foot horizontal and 0.1 foot vertical. Failure to record locations clearly and legibly will result in non-payment.

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Installation

Install pipes to the depth shown on the trench detail, unless superseded by depth shown on the profile.

All non-metallic pipe, including service and air valve lines, shall include a tracer wire taped every 5 feet to the pipe. Wrap wire around pipe 3-inch diameter and smaller. Loop tracer wire to the surface in accessible locations such as valve boxes, meter vaults, or other surface access. If no access is available for a distance of more than 1,500 feet, provide a valve box specifically for the tracer wire. Wire shall be solid UF, 12AWG minimum for 2,000 foot runs and less, or 10AWG for runs longer than 2,000 feet.

Keep openings in pipe closed during the progress of work. Install plugs to prevent water and debris from entering pipe. No payment will be made to clean pipe.

15.11 Open Trench Pipe Installation

15.11.05 Common Work for Pipe Installation

Part 3 - Execution

Installation

For push-on joint PVC pipe, joints shall not be pushed home. Stop the assembly when the marked insertion line is at the face of the bell. This is to allow for thermal expansion if the pipe is installed in cold weather. If the pipe has been pushed home, pull back to expose the insertion line.

15.11.11 Water Main Installation

Part 1 - General

References

Use materials and installation methods in accordance with the latest edition of the Uniform Plumbing Code and local codes and regulations that are applicable. Install ductile iron water mains in accordance with the American Water Works Association (AWWA) C600. Install PVC water mains in accordance with AWWA C900 and C905.

Scheduling

Connections to existing mains shall be made only after notification to the Owner as described in Division 1. Connections to existing mains may only be performed on Tuesdays, Wednesdays, or Thursdays unless permission is obtained otherwise from the Engineer. Connections shall not be performed on Owner recognized holidays.

See Division 1 for water system shutdown allowances. If the Panorama Zone requires a shutdown the shutdown shall be 6 hours or less and fall between the hours of 9 AM and 4 PM. The Owner will notify customers no less than 24-hours in advance of service interruption. If, in the opinion of the Owner, the Contractor has not adequately scheduled the work to occur within these timeframes, the Owner may cancel the service interruption. No time or monetary compensation will be provided for such cancellation.

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Part 3 - Execution

Installation

Install pipes in accordance with the manufacturer's recommendations. Use types and sizes of pipes as specified herein and/or as shown on the Plans. Where small pipe sizes are omitted from the Plans and not mentioned in the specifications, use sizes corresponding to code requirements and as required by equipment and plumbing fixtures and appurtenances. Properly size any undesignated pipe sizes for the functions to be performed.

Carefully lay pipe and supports at proper lines and grades. Follow the piping runs shown on the Plans as closely as possible, except for minor adjustments to avoid architectural and structural features. Make major relocations, if required, in a manner acceptable to the Engineer.

Keep openings in pipes closed during progress of work.

Form thrust blocking so that bolts, joints, gaskets, and flanges of adjacent joints are clear of concrete allowing bolts and joints to be dismantled without removing concrete. All concrete blocking shall have a minimum compressive strength of 4,000 psi unless identified otherwise in Division 3.31.3 or on the Plans.

Pipe passing through concrete walls or slabs shall be made watertight.

Trench shall be excavated to a sufficient width to allow for pipe installation, compaction equipment, and shoring when necessary. Maximum trench width will not exceed 36-inch plus OD for 4-inch and larger pipe, or 24-inch plus OD for 3-inch and smaller pipe for pay items or related materials including but limited to crushed surfacing, patching, import bedding, import backfill, and rock excavation.

Bedding shall be mechanically compacted in lifts no greater than 12-inches from base to springline and from springline to top of pipe using a jumping jack or sheepsfoot. Hoe-packs, sheepsfoots, and vibratory rollers shall not be used within 12-inches above the pipe. Trench backfill shall be compacted in lifts not exceeding 18-inches loose-thickness.

Field Quality Control

No permanent connections to the existing water system shall be made until the new water main has been tested and approved by the Engineer. No temporary connections of the untested, unapproved new water main to the existing water system shall be made without the installation of a double check valve and or backflow prevention assembly between the new water main and the existing water system. The Contractor shall verify the size, material, and location of the existing main at the connection point prior to installing the new water main.

The Contractor shall provide all labor and equipment for earthwork, trench safety, and materials for connections. The Contractor will provide the labor to make the final connection to the existing water system.

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15.11.50 Trench Patching

Part 1 - General

Scheduling and Sequencing

The Contractor shall be required to patch all trenches installed within the existing pavement with Commercial Hot Mix Asphalt to the depth as shown in the Plans. Trench patches shall be installed no later than one calendar week following excavation.

Maintenance

Crushed surfacing shall be inspected and repaired daily. Temporary patching, regardless of material used, shall be incidental to the project cost. No additional payment will be made.

Part 3 - Execution

Field Quality Control

Pavement patching that must be removed and replaced due to any failed testing will not warrant additional payment.

15.13 Above Grade Mechanical Installation

15.13.02 Exposed Piping Installation

Part 1 – General

Summary

This section is for exposed major pressure pipe systems such as booster stations, lift stations, treatment facilities, control valve vaults, etc. Testing of minor service plumbing systems shall follow the IPC/UPC.

Part 3 - Execution

Installation

When systems include drain ports that operate automatically, provide ancillary drainage plumbing. Route pilot, air valve, pump seal, and other drains to the structure drain using schedule 40 PVC with diameter equal to the device drain outlet diameter, but no smaller than ½-inch. Copper pipe may be used only with Engineer approval. Multiple drain lines may be connected together if approved by the Engineer. Secure to fixed structures or large pipe using pipe clamps. Do not install drainpipe where it will be a tripping hazard or interfere with normal maintenance. Slope downwards to termination. Terminate the outlet two times the drainpipe diameter above the drain grate or funnel and cover end with #24 stainless or aluminum screen. Install a union near the start of each drainpipe to allow disassembly without cutting.

Preparation

The Contractor shall provide all required personnel and equipment and complete all tests required to demonstrate the integrity of the finished installation for the approval of the Owner and all agencies having jurisdiction.

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The pipe and fittings shall be secured to prevent movement under pressure. The Contractor shall furnish and install temporary blocking where permanent blocking is not required and remove it after testing.

All pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and other equipment necessary for performing the test shall be furnished and operated by the Contractor. Gauges used in the test may be required to be certified for accuracy at a laboratory by the Owner.

Tests/Inspection

Hydrostatic Pressure Testing

All water systems and appurtenances shall be tested under a hydrostatic test pressure equal to that specified under Division 1.82 of these Specifications. The Engineer has the right to require more stringent test criteria than stated in this specification or in the pressure rating section the Engineer determines that field conditions warrant such measures.

Pump cans (aka barrels) for can-mounted pumps and buried piping below and within 5-feet of the structure shall be hydrostatically pressure tested prior to foundation construction.

The piping systems shall be filled with water and allowed to stand under pressure for a minimum of 24 hours to allow air to escape and/or allow the lining of the pipe to absorb water. The Owner will furnish the water necessary to fill the pipelines for testing purposes at a time of day when sufficient quantities of water are available for normal system operation. The Contractor is responsible for the proper disposal of any waste, including water.

Visible leakage is unacceptable and shall be corrected. Should the test section fail to meet the specified pressure test successfully, the Contractor shall locate and repair the defects and then retest the pipeline at his own expense.

Prior to calling out the Owner or Engineer to witness the pressure test, the Contractor shall have all equipment completely set up and ready for operation and shall have successfully performed the test to assure that the pipe is in a satisfactory condition. The Owner shall witness the test; if the test does not pass inspection for any reason, additional trips required to witness another test shall be done at the Contractor's expense.

Before applying the specified test pressure, air shall be expelled completely from the system.

The test shall be accomplished by pumping the piping system up to the required pressure; stop the pump for a minimum of 15 minutes up to a maximum of 60 minutes as directed by the engineer, and then pump the main up to the test pressure again. During the test, the section being tested shall be observed to detect any visible leakage. A clean container shall be used for holding water for pumping pressure on the system being tested. This makeup water shall be sterilized by the addition of chlorine to a concentration of 50 mg/l (ppm).

Sections to be tested shall be isolated and pumped to test pressure. Test pressure shall be sustained for a minimum of 30 minutes with no loss in pressure throughout the test duration with Engineer present and on site throughout test duration. If test results show drop of pressure, Contractor shall repair leaks and retest until testing is passed in presence of Engineer.

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Engineer shall bleed off pressure from pump to piping connection once test is passed to verify system piping was tested.

Cleaning

After preliminary purging of the system, swab chlorinate the new portions of the water system in accordance with AWWA C651 for flushing and disinfecting water mains, and in accordance with all other pertinent rules and regulations. Operate each valve during chlorination period to provide contact. Upon completion of sterilizing, thoroughly flush the entire water system at a velocity of 3 feet per second, allowing four complete exchanges of contents. Do not discharge chlorinated material to storm or surface water systems without thoroughly neutralizing the chlorine residual remaining in the water in accordance with AWWA C655 for field de-chlorination.

As this pump station is raw water, no sampling will be required. The piping shall be cleaned to remove oil residue and construction debris, disinfected, and flushed with a screened outlet to verify no construction debris are found. Owner's representative shall be scheduled at least one (1) calendar week in advance of flushing and witness the cleaning, disinfection, and flushing plan in action. Submit flushing plan to the Owner for review and approval. Control water as to not allow erosion off site.

15.18 Buried Piping Inspection and Testing

15.18.02 Buried Water System Inspection and Testing

Part 3 - Execution

Preparation

The Contractor shall provide all required personnel and equipment and complete all tests required to demonstrate the integrity of the finished installation for the approval of the Owner and all agencies having jurisdiction.

The pipeline trench shall be backfilled sufficiently to prevent movement of the pipe under pressure. All thrust blocks shall be in place and sufficiently cured to reach design strength before testing. The Contractor shall furnish and install temporary blocking where permanent blocking is not required and remove it after testing.

All pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and other equipment necessary for performing the test shall be furnished and operated by the Contractor. Gauges used in the test may be required to be certified for accuracy at a laboratory by the Owner.

Cleaning

After preliminary purging of the system, swab chlorinate the new portions of the water system in accordance with AWWA C651 for flushing and disinfecting water mains, and in accordance with all other pertinent rules and regulations. Operate each valve during chlorination period to provide contact. Upon completion of sterilizing, thoroughly flush the entire water system at a velocity of 3 feet per second, allowing four complete exchanges of contents. Do not discharge chlorinated material to storm or surface water systems without thoroughly

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neutralizing the chlorine residual remaining in the water in accordance with AWWA C655 for field de-chlorination.

As this pump station is raw water, no sampling will be required. The piping shall be cleaned to remove oil residue and construction debris, disinfected, and flushed with a screened outlet to verify no construction debris are found. Owner's representative shall be scheduled at least one (1) calendar week in advance of flushing and witness the cleaning, disinfection, and flushing plan in action. Submit flushing plan to the Owner for review and approval. Control water as to not allow erosion off site.

Tests/Inspection

Hydrostatic Pressure Testing

All water mains and appurtenances shall be tested under a hydrostatic test pressure equal to that specified under Division 1.82 of these Specifications. The Owner has the right to require more stringent test criteria than stated in this Specification or in the pressure rating section if it is determined that field conditions warrant such measures.

An acceptable test of pipe and fittings buried under or adjacent to proposed concrete slabs or other structures must be performed prior to construction of the structure.

The mains shall be filled with water and allowed to stand under pressure for a minimum of 24 hours to allow air to escape and/or allow the lining of the pipe to absorb water. The Owner will furnish the water necessary to fill the pipelines for testing purposes at a time of day when sufficient quantities of water are available for normal system operation. The Contractor is responsible for the proper disposal of any waste, including water.

Pipe joints, fittings, and valves shall be exposed for inspection as is practical. Any visible leakage detected shall be corrected by the Contractor to the satisfaction of the Owner regardless of the allowable leakage specified above. Should the test section fail to meet the specified pressure test successfully, the Contractor shall locate and repair the defects and then retest the pipeline at his own expense.

Prior to calling out the Owner or Engineer to witness the pressure test, the Contractor shall have all equipment completely set up and ready for operation and shall have successfully performed the test to assure that the pipe is in a satisfactory condition. The Owner shall witness the test; if the test does not pass inspection for any reason, additional trips required to witness another test shall be done at the Contractor's expense.

Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants.

The test shall be accomplished by pumping the main up to the required pressure; stop the pump for a minimum of 15 minutes up to a maximum of 60 minutes as directed by the engineer, and then pump the main up to the test pressure again. During the test, the section being tested shall be observed to detect any visible leakage. A clean container shall be used for holding water for pumping pressure on the main being tested.

Sections to be tested shall be isolated and pumped to test pressure. Test pressure shall be sustained for a minimum of 60 minutes with no loss in pressure throughout the test duration with Engineer present and on site throughout test duration. If test results show a pressure

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drop, Contractor shall repair leaks and retest until testing is passed in presence of Engineer. Engineer shall bleed off pressure from pump to piping connection once test is passed to verify system piping was tested.

15.18.03 Valve Testing

Part 3 - Execution

Testing

All valves shall be pressure tested. Do not exceed the rated working pressure of the valve when operating the valve. Bleed off test pressure prior to operating. Test all valve bonnets for tightness.

Valve clusters shall be pre-assembled and tested as a unit. Provide end plugs, blind flanges, assembly kits, and all appurtenances necessary for pressure testing. Valve testing shall use the following procedure.

1. Close the valve.
2. Install plug or flange (with test port).
3. Connect test apparatus and pump.
4. Pressurize to test pressure or manufacturer's listed test pressure if less.
5. There shall be zero drop in pressure or visible leakage for one minute. This includes leaking through the stem packing.
6. If test fails, check for defects, correct, and retest. Valves that do not pass testing will be replaced by the Contractor at no additional cost to the Owner.

Post-Installation

Test all valves for water tightness under differential working pressure. To perform this test, pressurize pipe section with valve in place, close valve and relieve pressure on seat side of the valve. The valve shall not pass water during a 5-minute test period.

Operate all valves at least once from closed-to-open-to-closed positions while valve is under working (not test) pressure.

15.20 PIPE AND FITTINGS

15.21 Common Work for Pipe and Fittings

Part 2 - Products

Components

Under no circumstance shall the fasteners be of lesser strength or higher corrosive potential than the materials being connected. In the event that dissimilar metals are adjacent (for example: stainless steel flange connecting to ductile iron flange) a dielectric insulation kit shall be used.

Fasteners for pipe and fittings: Per AWWA standards unless otherwise specified. All relevant subsections of AWWA C100, C200, and C500. All bolts and studs shall be long enough so

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that no less than two threads extend beyond the face of the nut. Non-submerged flange bolts to be ASTM A307 Grade A, zinc plated.

Finishes

For conditions other than submerged, all nuts and bolts shall be zinc plated, and suitable for above and below grade locations as required. Where above grade/exposed piping is specially coated, the connecting nuts and bolts shall be coated using the same system.

Part 3 - Execution

Construction

All piping and related equipment to be joined together shall be connected as shown on the Plans, specifications, as recommended by the manufacturer or as required by standard industry practices if not otherwise specified.

15.21.02 Shackle Restraints

Part 1 - General

Definitions

Anchor fastener: The item which connects to the fitting and which the shackle rod passes through. Such as a 90° eye bolt or shackle plate.

Weathering steel: Steel alloy designed to resist corrosion. Often referred to using the genericized trade name Cor-Ten.

Submittals

Provide submittal for anchor fastener which includes strength rating in pounds. For shackle plates, include dimensional drawing.

For high strength rods (cold drawn or weathering steel), provide submittals showing rod material and yield strength.

Part 2 - Products

Components

Anchor fasteners must be a steel alloy. Ductile iron, cast iron, or any material deemed brittle in the opinion of the Engineer are not allowed.

Verify anchor fastener is appropriate for anchor location.

All buried shackled thrust restraint systems shall be stainless steel or weathering steel. Exposed shackles, such as in a vault or mechanical room, may be non-weathering steel but if so must be coated with epoxy paint system. Clean rust prior to painting any rods.

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Material (* = weathering steel)	Yield Strength	Corrosion Resistant
ASTM A36	Low (28 ksi)	No
ASTM A307	Low (30 ksi)	No
Type 304 SS	Low (30 ksi)	Yes
ASTM A588 *	High (45 ksi)	Yes
ASTM A709 GR 50W *	High (50 ksi)	Yes
ASTM A242 *	High (50 ksi)	Yes
ASTM F3125 A325 Type 1	High (90 ksi)	No
ASTM F3125 A325 Type 3 *	High (90 ksi)	Yes

All components of any stainless steel or weathering steel system shall include only stainless steel or weathering steel components. Bolts, nuts, washers, rods, and other components shall be one material and not intermixed.

Shackle systems must provide mechanism to prevent unthreading. Exposed shackles shall use double nuts. Buried shackle systems may use double nuts, single nut with tack weld, or single nut with center punch on outside rod thread.

Washers must be provided at anchor fasteners. Install anchor fasteners on the opposite side of the flange or mechanical joint from the rod.

Shackle system shall be manufactured by Star National Products (Ohio) or approved equal.

Part 3 - Execution

Installation

For standard elongation restraint, space shackles roughly equally around the pipe.

When restraint is intended to allow deflection movement without expansion, such as at a pump or tank connection, concentrate rods along the neutral axis of deflection. In other words, if vertical deflection is allowed, place rods along horizontal axis. Confirm with Engineer proper orientation.

Nuts shall be finger tightened to snug, then tightened by wrench one full turn. Do not overtighten.

Field Quality Control

For high strength rod, labels from packaging showing rod material must be shown to the Engineer in the field. If package labels are not available, Engineer has the right to assume rods are not high strength and may require installation of additional rods and field coating.

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15.22 Metal Pipe and Fittings

15.22.02 Ductile Iron Pipe and Fittings

Part 1 - General

Design Requirements

Ductile iron pipe shall have thickness designed in accordance with ANSI/AWWA C150/A21.50 and shall be based on laying conditions and internal pressures to meet the requirements of Division 1.82 unless listed as more stringent below.

The pipe thickness shall not be less than Class 52.

Part 2 - Products

Manufactured Units

Pipe shall be cement-lined and asphaltic coated in accordance with ANSI Standard A21.4 (AWWA C104) unless otherwise specified and shall conform to ANSI Standard A21.51 (AWWA C151).

Rubber gasket pipe joints are to be push-on-joint (Tyton) or mechanical joint (MJ) in accordance with ANSI Standard A21.11 (AWWA C-111), unless otherwise specified.

Flanged joints shall conform to ANSI Standard B16.1.

When requested, furnish certification from the manufacturer of the pipe and gasket being supplied that inspection and all of the specified tests have been made, and the results comply with requirements of this standard.

Ductile Iron Fittings

All fittings shall be ductile iron where possible. Steel fittings will not be accepted. Ductile iron fittings shall be short-body, cement-lined, and for the pressure rating noted in Division 1.82. Metal thickness and manufacturing processes shall conform to applicable portions of ANSI Standards A21.20, A21.11, B16.2, and B16.4.

Standard cement lining shall be in accordance with ANSI Standard A21.4 (AWWA C104).

Mechanical joint (MJ), ductile iron, compact fittings 3-inches through 24-inches, and 54- inches through 64-inches shall be in accordance with AWWA C153.

Flanged pipe spools shall be fabricated from minimum Class 53 wall thickness pipe and conform to ANSI/AWWA C115/A21.15 with the exception that flanges shall be fabricated from ductile iron unless otherwise specified in the Contract Documents. Interior shall be cement lined.

Ductile iron flange (FL) fittings shall be in accordance with AWWA C110 and fabricated from ductile iron unless otherwise specified in the Contract Documents with a bolt pattern to match adjacent pipe. Gasket material for flanges shall be EPDM, neoprene, buna-n, chlorinated butyl, or cloth-inserted rubber. Gaskets shall be full-face type. Gaskets shall be a minimum ⅛-inch thick. EPDM compound if used shall be chloramine resistant. EPDM shall be have no more than 20-percent volume change after 6 weeks per ASTM D6284 testing

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Type of ends shall be specified as mechanical joint (MJ), restrained joint (RJ), true restrained joint (TRJ), plain end (PE), or flanged (FL).

Finishes

For above grade and exposed pipes, including those inside structures, prepare surfaces and coat the exterior per Division 9.91.13.13.

For below grade DI discharge piping polywrap all pipe and fittings from CCP connection to the Raw Water Pump Station connection to the steel discharge header.

For below grade DI suction piping, standard asphaltic lining exterior is required.

Part 3 - Execution

Installation

The Contractor shall provide tools and equipment, including any special tools required for installing each particular type of pipe used.

The amount of deflection at each pipe joint shall not exceed 3-degrees per joint (11 inches over 18 feet), or the manufacturer's printed recommended deflections, whichever is less.

15.22.03 Steel Pipe and Fittings

Part 1 - General

Design Requirements

The Contractor shall supply written certification that flanged ends welded to the steel pipe and welded pieces shall be capable of the hydrostatic testing pressure as noted in Division 1.82.

Welded steel pipe shall be constructed as shown in the Plans and steel pieces shall be constructed as dimensioned to exact tolerances of $\pm$ $^{3}/_{32}$-inch.

Steel pipe shall be constructed in accordance with AWWA C200. Steel pipe shall be fabricated from steel manufactured to meet the requirements of ASTM A53, Type E or S, minimum Grade B. Design stress shall be half the yield stress of the steel.

Steel pipe and fittings 26 inches in diameter and smaller shall conform to ANSI Standard D36.10 and ASTM A53, Type SE or Grade B with a thickness to meet the pressure rating section of these specifications.

Steel flanges smaller than 4-inch per ANSI B16.1, Class 125. Steel flanges 4-inches and larger per AWWA C207. All flanges rated for the specified working and hydrostatic testing pressures.

AWWA C207 Flanges			
Flange Class	Diameter	Working Pressure	Maximum Test Pressure
D	4-inch to 12-inch	175 psi	218 psi
D	14-inch and larger	150 psi	187 psi

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Submittals

Shop drawings shall be submitted to the Engineer for review and approval prior to material order. Shop drawings shall clearly indicate wall thickness and diameter.

The Contractor shall submit previous experience of a minimum of two steel welding projects similar to this one. As part of the submittal, the Contractor shall supply specification of previous projects and written documentation that the construction met the specification.

Part 2 - Products

Finishes

Coat exterior and interior per **Division 9**.

Source Quality Control

Welds shall be constructed in accordance with ASME Welding Code. The Contractor shall be responsible for compliance to this tolerance and correct any dimensions or welding that does not meet this specification at their expense.

Internal bracing shall be provided for shipment if needed to maintain pipe shape.

See Division 11 for Pump Can details.

Part 3 - Execution

Field Quality Control

The Contractor shall provide tools and equipment, including any special tools required for installing each particular type of pipe used. Pipe that is out-of-round shall be reshaped using methods provided by the pipe manufacturer. The Engineer reserves the right to reject pipe that is excessively out-of-round or damaged during reshaping.

15.22.06 Copper Pipe and Fittings

Part 1 - General

Design Requirements

Copper piping and tubing shall meet the requirements of ASTM B-88. Solder fittings shall meet the requirements of ANSI B16.22. Flared fittings per ANSI B16.26 and allowed only for working pressure less than 150 psi. Lead content of solder shall be no more than 0.2 percent.

Part 2 - Products

Materials

Buried, not under structures:

Type K soft pipe with compression fittings (Ford Quick-Joint, Mueller 110, or equal).

Buried, under structures:

Type K soft pipe with compression fittings (Ford Quick-Joint, Mueller 110, or equal).

Type K hard pipe with soldered fittings.

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Exposed, interior:

Type L hard pipe with soldered fittings.

Soft pipe may be used only where approved by the Engineer or shown on the plans. Soldered fittings for all sizes. Flared fittings only on 1/2-inch and smaller soft pipe.

Concealed, interior:

Type L hard pipe with soldered fittings.

Fittings encased in concrete or CMU block: Soldered only.

Part 3 - Execution

Installation

Under structures, use unbroken pipe lengths to avoid fittings whenever possible.

Runs shall be parallel and perpendicular with floors and walls unless positive drainage is required. When Engineer allows soft copper for exposed pipe, straighten any curved or bent pipe for straight sections longer than 6-inches.

15.22.08 Restrained Joint Pipe and Fittings (RJ)

Part 1 - General

Summary

This specification is for RJ wedge-action style restraints. This type of restraint shall not be used where the Plans or specifications require True Restrained Joints (TRJ). Other terms used for TRJ may include "Bead-locked" or "Fabricated Restrained Joints".

Performance Requirements.

All naturally unrestrained joints subject to unbalanced forces shall be restrained to resist testing and operational forces. Restraints shall be rated for the testing and operational pressures. Restraints shall be designed specifically for the material and purpose of the pipe and joint.

Submittals

Provide manufacturer's information describing applicability and performance ratings.

Part 2 - Products

Manufacturers

EBAA Iron "Mega-Lug", Romac "Romagrip" or approved equal. If the Owner has construction standards addressing the type of restraints allowed, those standards shall take precedence over this specification unless specifically identified otherwise on the Plans.

Components

Set-screw type restraint is not permitted. Locking gasket type restraint is not permitted. Provide the quantity of restraints required for fully restraining all design forces.

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Finishes

Mechanical Joint restraints in all buried applications, and in exposed areas when not being field coated, shall be coated at the factory with fusion bonded polyester based coating (EBAA Mega-bond, Romac Romabond or approved equal).

Part 3 - Execution

Preparation

Verify that the pipe surface where the restraints will affix is not damaged or corroded prior to installation. Any such damaged pipe shall be cut off and disposed of. Clean any dirt or debris from the surface of the pipe.

Installation/Construction

Install per the restraint manufacturer's instructions. Bolted style restraints shall be tightened in an alternating pattern in stages, do not tighten circumferentially. If bolted restraint does not come with break-off head bolts, a torque wrench must be used. If pipes require deflection at the joints, perform the deflection prior to final tightening of the restraints. Do not exceed the manufacturer's maximum deflection recommendations.

Installation of restrained joint push-on pipe that will be deflected must be installed per the manufacturer's instructions. In general, this requires the pipe to be inserted into the bell at a straight alignment, but not pushed home. The pipe can then be deflected. If the manufacturer's instructions provide differing, or additional instructions, those instructions shall be followed.

Bedding material must include sufficient fines for proper soil-to-pipe adhesion and shall not be a rounded gravel, pea gravel, washed rock, or other poorly graded material. Compaction of bedding around restrained pipe shall be performed in maximum 8-inch lifts using mechanical compaction equipment.

Repair

If restraints are removed for any reason, the restraints shall be disposed of and not reused. The section of pipe to which the restraints were secured shall be cut off and disposed of.

15.22.09 True Restrained Joint (TRJ) Pipe and Fittings

Part 1 - General

Related Sections

- Division 15.22.02 Ductile Iron Pipe and Fittings

Design Requirements

Ductile iron pipe shall have thickness designed in accordance with ANSI/AWWA C150/A21.50 and shall be based on laying conditions and internal pressures to meet the requirements of Division 1.82 unless listed as more stringent below.

The pipe thickness shall not be less than that of Class 52 pipe.

Submittals

Submit layout drawings of all restrained sections.

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Part 2 - Products

Manufactured Units

Fabricated Restrained Joint pipe (aka True Restrained Joint) shall be ductile iron manufactured in accordance with requirements of ANSI/AWWA C151/A21.51. Fabricated (True) Restrained Joint pipe shall be Griffin Pipe SnapLok, Pacific States Cast Iron Pipe Company Thrustlock, US Pipe TR-Flex, or approved equal.

Ductile Iron Fittings

Type of ends shall be specified as true restrained joint (TRJ) and be of the same brand and model as the adjoining pipe.

Finishes

For above grade and exposed pipes, including those inside structures, prepare surfaces and coat the exterior per specification Division 9.91.13.13.

Part 3 - Execution

Installation

The Contractor shall provide tools and equipment, including any special tools required for installing each particular type of pipe used.

Short lengths of TRJ pipe supplied by the manufacturer shall be used whenever possible to provide the proper spacing of valves, tees, or special fittings. After a restrained section has been assembled, the joints shall be extended to their full length prior to backfilling. The preferred method for TRJ pipe installation is to place the fitting or valve first, then lay TRJ pipe away from the fitting or valve. Any cuts necessary to close gaps shall be made on the adjoining standard push-on joint pipe, not on the restrained sections. Alternate methods for installation must be approved by the Engineer. "Field Kits" will not be allowed unless prior approval is given by the Engineer.

Bedding material must include sufficient fines for proper soil-to-pipe adhesion and shall not be a rounded gravel, pea gravel, washed rock, or other poorly graded material. Compaction of bedding around restrained pipe shall be performed in maximum 8-inch lifts using mechanical compaction equipment.

15.23 NON-METAL PIPE AND FITTINGS

15.23.12 PVC Pipe for Drain, Waste, and Vent (DWV)

Part 2 – Products

Design Requirements

Polyvinyl chloride for drain waste and vent (PVC-DWV) material for pipe fittings and couplings shall conform to ASTM D-1784, Type 1, Grade 1, with 2,000 psi design stress. Pipe shall be Schedule 40 or 80 in accordance with ASTM D-1785 and D2665 as shown on the Plans. Pipe shall be dual labeled.

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Part 3 - Execution

Installation

Pipe bedding shall be clean granular material with no organics and no rocks larger than ½-inch for angular rock or ¾-inch for round-rock. Any cellular core pipe that is damaged in any way shall be removed and replaced with sound pipe.

15.30 VALVES

15.31 Common Work for Valves

Part 1 – General

Design and Performance Requirements

Valves noted on the Plans or in other parts of the Specifications shall meet the requirements herein. Valves shall be designed for the intended service.

Valve suppliers shall review the design and certify that the valve provided in the submittal is appropriate for the application and will operate as shown and described. Any discrepancies from the design and the valves shall be brought to the Engineer's attention during the bidding process. Valves that do not operate as specified and per normal industry standards shall be replaced or modified so that they operate within the design parameters at the Contractor's expense.

Pressure rating shall be per Division 1.82 unless shown otherwise.

Part 2 – Products

Components

If shear pins are installed with any valve, the manufacturer shall certify the shear pin(s) to fail between 95 to 99 percent of the operator shaft failure torque. Provide concrete supports for operators where required, as shown on the Plans.

Buried valves shall be equipped with an AWWA 2-inch wrench nut with a minimum of 12 turns required to close the valve, unless otherwise noted on the Plans. Exposed valves shall be equipped with lever actuator for valves 3 inches and smaller, or handwheel actuator for valves 4 inches and larger, unless otherwise noted on Plans. Valves located at elevations higher than 6 feet above the finished floor shall be equipped with chainwheel operator.

Buried valves where the operator nut is more than 3 feet below the valve box lid shall be provided with a solid shaft valve nut extension to reach between 18-inch and 36-inch of the ground surface. Extension shall attach to the nut with a set screw. Diameter of extension shall be appropriate for the valve size and length of extension, but under no circumstances shall be less than 1 inch for 4-foot-long extension rods, or 1.25 inch for rods longer than 4 feet. Extension shall function without excessive twisting.

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Part 3 - Execution

Installation

Install valves in strict accordance with the manufacturer's instructions and as shown on the Plans. Verify alignment and adjustments after installation. Provide buried valves with all operators or valves boxes installed so that wrenches or operators perform freely and without binding or other interference. Bed and backfill buried valves according to the requirements of the pipe to which they are attached.

15.32 Isolation Valves

15.32.02 Resilient Wedge (Seat) Gate Valves

Part 1 – General

Design Requirements

All gate valves for water lines 2 inches and larger shall be of the resilient, wedge-type, non-rising stem and shall meet or exceed the performance requirements of AWWA C509 or AWWA C515-Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service, unless shown otherwise. Valves shall be suitable for installation with the type and class of pipe being installed. The wedge shall be fully encapsulated with vulcanized SBR rubber. Ends to be as specified. Valve opening direction shall be counterclockwise.

Part 3 - Execution

Field Quality Control

Where valves will be installed in a horizontal orientation and for valves 16-inch and larger in any orientation, operate the valve over the full range of travel in both directions prior to installation in the presence of the Owner to verify gate travels smoothly and without binding. Service or replace valves that do not travel smoothly.

Installation

Install valves in strict accordance with manufacturer's instructions and as shown on the Plans. Verify alignment and adjustments after installation. Provide buried valves with all operators or valve boxes installed so that wrenches and operators perform freely and without binding or other interference. Bed and backfill buried valves according to requirements of the pipe to which they are attached.

15.32.03 Butterfly Valves

Part 1 – General

Design Requirements

Butterfly valves shall be tight-closing rubber seat type with a minimum 150 psi working pressure rating. Valves 3-inch and larger must meet full requirements of AWWA Standard C504. Valves smaller than 3-inch shall be high performance valves specifically designed for shutoff and throttling control of liquids and gas. Valve components shall withstand an operator input torque of 300 foot-pounds without damage.

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Part 2 – Products

Manufacturers

- M&H 4500
- Dezurik BAW
- Mueller LineSeal III
- Pratt Groundhog (buried) or In-Plant (above grade flanged or wafer).

Manufactured Units

Three-inch and larger valve bodies shall be cast iron ASTM A-126 Class B or ductile iron. Provide valve disc constructed of cast iron ASTM A48, Class 40 or ductile iron ASTM 536, Grade 65-45-12. The disc seating edge shall be solid stainless steel. Sprayed mating seat surfaces are not acceptable. Valves smaller than 3-inch shall have 316 stainless steel body and disc and shall be lug style. The seat shall be of acrylonitrile-butadiene or EPDM for water; or as appropriate for other services. Valve bearings shall be sleeve-type and corrosion-resistant. Valve bearings shall be of traveling nut type and shall open left.

Supply valves with the valve operator on the side of the valve shown on the Plans.

Provide fusion bonded epoxy or two-part liquid epoxy coating to all internal and external surfaces.

Part 3 – Execution

Installation

Install per manufacturer's instructions. If the disc does not operate freely, install valve spacers to provide clearance. Beveling the interior of the pipe will only be allowed if approved by the Engineer.

All butterfly valves shall be test operated prior to burial in the presence of the Owner's representative to prove full open and closing capability. Testing procedure: Close the valve prior to applying test pressure. Do not operate the valve under test pressure. Bleed off pressure to below the working pressure rating prior to operating the valve.

15.33 Check Valves

15.33.04 Globe Silent Check Valves

Part 2 – Products

Manufacturers

Valves shall be as recommended for service equal to Dezurik APCO Silent Check Valve (CSC) globe 600A style.

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Manufactured Units

Globe style silent check valves shall be the non-slamming, silent glove style. The valve plug must be center-guided at both ends with a through integral shaft and spring loaded for guaranteed silent shutoff operation.

The spring must be helical or conical. The seat and plug shall be hand replaceable in the field for ease of maintenance. The seating surface shall be resilient. The flow area through the body shall be equal to or greater than the cross-sectional area of the equivalent pipe size.

All materials of construction shall be certified in writing to conform to ASTM specifications and as follows.

- Plug and Seat; 316 Stainless Steel with seat surface of EPDM
- Spring: Stainless Steel
- Body: Ductile Iron
- Flange connections: ANSI B16.1 125
- Factory certified hydrostatic shell and seat test

Finishes

Exterior Paint: Factory applied fusion bonded epoxy.

Interior: NSF61 approved for potable water contact.

15.40 PIPING SPECIALTIES

15.40.01 Dismantling Joint

Part 1 – General

Design Criteria

Dismantling joint shall be accessible and capable of repeated installations and removals and capable of the testing and working pressures as specified in Division 1.82. Joint adjustment range of no less than 2-inches for 12-inch diameter and smaller pipe, and 3-inches for 14-inch diameter and larger pipe. Joint assembly to include limiting rods to prevent pull-out.

Part 2 – Products

Manufacturers

Dismantling joint shall be Romac DJ400 with limit rods or equal.

Part 3 – Execution

Installation

Install per the manufacturer's instructions. Set the assembly at the midpoint of the adjustment range unless specifically called out otherwise on the Plans.

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15.40.03 Pipe, Valve, and Conduit Supports

Part 1 - General

Summary

This section includes providing pipe supports, hangers, guides, and anchors.

Related Sections

- Division 1.81 Seismic Restraint
- Division 05.05.23 Bolts and other Connectors

References

Pipe supports furnished under this section shall comply in all respects with the requirements of the following standards.

- ANSI/ASME B31.1 Power Piping
- ANSI/MSS SP-58 Pipe Hangers and Supports - Materials, Design and Manufacture
- ANSI/MSS SP-69 Pipe Hangers and Supports - Selection and Application

Performance Standards

Piping systems, including connections to equipment, shall be properly supported to prevent deflection and stresses. Supports shall comply with ANSI/ASME B31.1, except as otherwise indicated.

Size hanger rods, supports, clamps, anchors, brackets, and guides in accordance with ANSI/MSS SP 58 and SP 69.

Support plumbing drainage and vents in accordance with the Uniform Plumbing Code.

Submittals

Pipe Hanger/Support Design Calculations

Shop drawings of engineered pipe hangers/supports, including details of concrete inserts. Drawings shall include location plan showing location of the hanger/support in relation to the structure and/or equipment.

Part 2 – Products

Manufacturers

Pipe supports, hangers, guides, and anchors shall be Anvil, Unistrut, Tolco, Standon, or equal.

Flange supports shall be equal to Standon Adjustable Model S89 Flange Support. Pipe supports shall be equal to Standon Adjustable Model S92 Pipe Support. Both flange and pipe supports shall be equal to those manufactured by Material Resources, Hillsboro, Oregon.

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Components

Provide and install all equipment necessary for compete support systems including, but not limited to, base, riser pipe, anchor bolts, hanger rod, support cradle or clamp, and fasteners.

All supports, rods, clips, etc. shall be 316 L stainless steel, except for use with chemical feed systems (see Division 15.80). All chemical feed systems' support channels, fittings and clamps shall be vinyl/glass fiberglass. Bolts shall be in accordance with 05.05.23.

Except as otherwise noted, pipe support components shall comply with the types in ANSI/MSS SP-58.

Engineered Supports: Pipe hangers, supports for piping and conduits (raceways), and all spring support assemblies shall be completely engineered.

Freestanding Piping: Freestanding pipe connections to equipment, including chemical feeders and pumps, shall be firmly attached to fabricated steel frames made of angles, channels or I-beams anchored to the structure. Exterior, freestanding overhead piping shall be supported on fabricated pipe stands, consisting of pipe columns anchored to concrete footings, with horizontal, welded steel angles, and U-bolts or clamps installed to secure piping.

Point Loads: Any meters, valves, heavy equipment and other point loads on PVC, fiberglass and other plastic pipes shall be supported on both sides according to the manufacturer's recommendations to avoid pipe stresses. Supports on plastic and fiberglass piping shall be equipped with extra wide pipe saddles or stainless-steel shields. No support shall have metal pieces in contact with plastic process piping.

Finishes

Unless otherwise noted, all fabricated pipe supports, other than stainless steel or non-ferrous supports, shall be blast-cleaned after fabrication and hot-dip galvanized in accordance with ASTM 123. Other than stainless steel and non-ferrous supports, supports shall be coated in accordance with Division 9.91.13.1.

Part 3 - Execution

Installation

Piping shall be rigidly anchored to walls, slabs, and ceilings by means of suitable pipe supports, wall brackets, or pipe hangers.

Pipe supports, hangers, brackets, anchors, guides, and inserts shall be installed in accordance with the manufacturer's installation instructions and ANSI/ASME B31.1. All concrete inserts for pipe hangers and supports shall be coordinated with the formwork.

Stand-on Pipe Support: Adjust support, secure to pipe and secure to floor as recommended by the manufacturer.

Riser Supports: Risers shall be supported on each floor with riser clamps and lugs, independent of the connected horizontal piping.

Support Spacing: Pipe supports shall be placed to meet the following maximum spacing, unless otherwise noted or shown on the Plans: maximum vertical support spacing of 5 feet, and maximum horizontal support spacing of 10 feet. Support shall be provided at horizontal

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bends, base of risers (vertical bends), floor penetrations, connections to pumps, blowers, and other equipment, valves, and appurtenances. Support spacing shall meet the local plumbing code where applicable. Support spacing may be increased from that noted above provided adequate calculations are provided supporting the change.

Support Anchorage: Concrete anchors shall be as specified in Division 3, Concrete Anchors. All channel strut type supports shall have a minimum of 2 anchors per support.

Suspend pipe hangers from hanger rods, secure with double nuts.

Securely anchor copper and plastic pipe, valves, and headers to prevent movement during operation of valves. Anchor pipe between expansion loops and direction changes to prevent axial movement through anchors.

Provide ductile iron elbows or tees supported from floors with base fittings. Support base fittings with metal supports, or when indicated on the Plans, concrete piers.

Do not use chains, plumbers' straps, wire, or similar devices for suspending, supporting, or restraining pipes.

Install riser clamps at floor penetrations and where indicated on the Plans.

Field Quality Control

Pipe supports and hangers shall be positioned in such a way as to produce an orderly, neat piping system. All hanger rods shall be vertical, without offsets. Hangers shall be adjusted to line up groups of pipes at the proper grade for drainage and venting, as close to ceilings or roofs as possible, without interference with other work.

Properly support, suspend, or anchor exposed pipe, fittings, valves, and appurtenances to prevent sagging, overstressing or movement of piping and to prevent thrusts or loads on or against connected pumps, blowers, or other equipment.

15.40.04 Dielectric Fittings and Adapters

Part 3 - Execution

Installation

Provide dielectric adapters including but not limited to corp stops, flange gaskets and di-electric bolt kits between dissimilar types of metal pipes, valves and fittings including Steel Fl to DI and DI to copper.

15.60.01 Common Work for Pressure Measurement

Part 1 – General

Related Sections

- Division 17 - Electronic Pressure and Level Devices

Design Requirements

Pressure and level measurement devices shall be scaled and rated for the application.

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Part 3 – Execution

Installation

All devices shall be installed to be field serviceable without taking the facility out of service. Readouts shall be positioned to be easily read from a standing position and central to the room, unless otherwise allowed by the Engineer.

15.61 Pressure Gauges

Part 1 – General

References

- ASTM B40.1 Grade 2A

Performance Requirements

Gauge accuracy shall be ± 0.5 percent of full scale.

Submittals

Provide catalog sheets showing dimensions, pressure range, accuracy, and optional accessories.

Part 2 – Products

Manufacturers

Marsh, 3D Instruments or approved equal.

Materials

Gauges shall be analog stem mount type with 4½-inch scale face, glycerin filled and completely suitable for measuring raw water. Connection shall be ½-inch threaded. Wetted parts shall be brass or bronze. The full-scale pressure range for each gauge location shall be as follows:

Location	Full Scale	Normal Operation Range
Pump suction	0-30 psi	5-20 psi
Pump discharge	0-160 psi	40-70 psi
Sealsafe inlet before RPBFPA	0-160 psi	100-130 psi
Sealsafe after prv	0-30 psi	10 psi

Provide a diaphragm protector suitable for raw water. Diaphragm equal to Marsh 13040, stainless steel with flushing port.

Accessories

Unless shown otherwise on the Plans, provide a block and bleed valve for each pressure gauge. Transcat 600/700 series, stainless steel, or approved equal.

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Part 3 - Execution

Installation

Install gauges as shown on the Plans. Support gauges adequately.

Field Quality Control

Gauges will be compared to each other in the field. Differences of more than 1.5% will be cause for rejection. Contractor will replace with accurate gauge(s) at no additional cost to the Owner. Contractor to build a temporary testing manifold if the facility piping does not permit direct comparison of gauges in place.

15.41.3 Concrete Cylinder Pipe Connections to Steel Pipe

Part 1 - General

Submittals

Connection to the Concrete Cylinder Pipe (CPP) shall be performed by a company experienced in this type of work. The following shall be submitted:

1. 10 examples of previous concrete cylinder pipe connections with contact names and phone numbers for reference. Site supervisor shall be involved on 75-percent of these past projects.
2. Weld procedure. Longitudinal welds shall be back gouged.
3. Welder qualifications for butt strap welds. Cylinder thickness on some types of concrete pressure pipe can be as thin as 18 gauge, (0.05-inches), and some concrete pressure pipe cylinders were made with higher-strength cold-rolled steel. Only welders with experience on concrete pressure pipe shall repair pipe with thin cylinders or cylinders of high strength steel.
4. Flange connection type. Flanges shall be full face type socket flange (1/2 bore).

A detailed procedure shall be provided via submittal to the Engineer for review. The following general procedure shall be used as a reference.

1. Remove exterior mortar coating without damage to the steel pipe.
2. Tack weld existing reinforcing wires to the cylinder. Wires are cut to allow for butt strap connections.
3. Repair reinforcing wires.
4. Install tap test ports.
5. Weld Butt Straps inside, outside, and longitudinally.
6. Repair mortor and cover all steel to preconstruction condition or thicker.
7. Pressure test installed piping to include first DI fitting(s).
8. Install cathodic protection system as shown on the plans.

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Design Criteria

Connection shall be constructed to the standards of AWWA C200, C206, C207, and C208 and shall be mortar coated to match existing pipe. Steel butt straps shall be reinforced as necessary to meet the required pressure rating.

All components shall be rated for pressures as specified in Division 1.82.

Part 3 - Execution

Construction

Owner's representative must be present during procedure.

Contractor is responsible for verifying existing pipe size and material. Contractor shall coordinate their work with the Owner's schedule.

Work shall be completed per the schedule for shutdowns as described in Division 1.72.

15.70 PLUMBING

15.71 Common Work for Plumbing

Part 2 – Products

Components

Joints and Connections

- Steel and Brass: Use factory-cut pipe threads where possible; otherwise, cut pipe ends square, remove all fins and burrs, and cut full-depth tapered threads. Apply joint compound to male threads only and engage so that no more than three threads remain exposed.
- Copper: Make all joints in copper tubing with 95-5 tin-antimony solder applied in strict accordance with manufacturer's recommendations. Flared connections are only allowed in exposed locations.
- Hubless: Install a neoprene gasket and stainless steel clamp and shield coupling joint assemblies with bolts alternatively and incrementally tightened to a minimum 60 inch-pounds torque. Use a single set-point torque wrench manufactured specifically for this purpose. Do not use screwdrivers or other types of wrenches. Re-torque bolts after 24 hours.
- Solvent cement: Use solvent cement approved by pipe and fitting manufacturer and apply in accordance with the manufacturer's installation procedures.

Fixtures and Trim

Use chromium-plated brass bolts, nuts, and washers where exposed; otherwise, use brass or bronze bolts, nuts, and washers. Make connections gas-tight and water-tight. Do not use bulk material, including putty and plastics, for gaskets.

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Trim shall match metal parts used with fixtures. Trim shall be stainless steel, except when provided with plumbing fitting by the manufacturer. Exposed trim shall have a satin type finish. Escutcheons shall be provided at each point where pipe or other fittings enter the wall.

Part 3 - Execution

Examination

Prior to work of this section, carefully inspect installed work of other trades and verify that such work is complete to the point where this installation may properly commence. Verify that plumbing may be installed in strict accordance with all pertinent codes and regulations. In the event of a discrepancy, do not proceed with the installation and immediately notify the Owner.

Installation

Install and locate pipe, fittings and accessories as shown on the Plans. Waste piping vents shall be surface mounted and protrude through the roof. Provide individual vents for each fixture.

Rigidly support wall hung fixtures by means of metal supporting members so that no stress is transmitted to connections.

Do not cut into or reduce the size of any load-carrying member without prior approval of the Engineer. Install pipes to clear all beams and obstructions.

Locate water hammer arresters in accordance with the manufacturer's recommendation.

Provide uniform pitch of at least $^{1}/_{8}$-inch per foot, or as otherwise noted, for all horizontal waste and drain piping within the building. Pitch all vents for proper drainage.

Cushion all traps and bearings to minimize transfer of sound; firmly anchor all pipes in position.

Vertical stacks shall be supported at floors with clamp anchors as required to relieve joint stresses.

Conceal all piping unless otherwise shown on the Plans.

Provide and conceal air chambers the same size as the branch line at each water connection to a plumbing fixture.

Inspection

Test all plumbing fixtures for proper and smooth operation when in use.

Make sure fixtures are thoroughly clean and free of any foreign material.

15.80 CHEMICAL PIPING SYSTEMS

Part 1 – General

The work and materials described in this section include pipe, valves, and fittings installation for conveying ClO_2 (Chlorine Dioxide) solution.

It is required that the proper materials be used, and that skilled and experienced pipe fitters construct the chemical injection piping. Pipe, fittings, primers, and cements used shall be

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suitable for carrying the listed chemical. All final joints on the piping system must be strong, watertight, free from stresses and ready for a 20-year life of daily use.

As part of the submittals, the Contractor shall list the name(s) of the pipe fitter(s) that will perform the installation, and the chemical piping installations, including chemical names and concentrations, they have performed. Installers shall be experienced at the installation of chemical piping systems and shall have performed at least 5 separate installations. Submittals shall also indicate the compatibilities of the wetted materials with the chemical used and the applicable pressure ratings even when matching the specifications.

Related Sections

- 1.82 Pressure Ratings
- 15.40.3 Pipe, Valve and Conduit Supports

Submittals and Design

1. Provide annotated product information on all pipe, fittings, valves, and accessories to be used. All pipe, fittings, valves, and accessories shall be rated for the applicable working and testing pressures as indicated herein. All wetted materials provided, including gaskets, seals, diaphragms, etc. shall be compatible with the chemical used in the application. All wetted materials used shall include a chemical compatibility chart to be submitted for approval. Provide submittal information on primer and solvent cement showing compatibility with specified chemicals and pressures.
2. The Contractor shall submit the manufacturer's written installation methods to the Engineer for approval prior to installing PVC pipe and fittings. The installation instructions shall include application methods and equipment; primer contact times and application quantities; cement curing time and application quantities; and all other special construction requirements.

Part 2 – Products

General

Unless otherwise noted on the Plans or specified herein, all pipe, fittings, valves, and accessories conveying the chemicals listed shall be as follows:

Chemical	Plastics	Metals*	Elastomers
Chlorine Dioxide solution	PVC PVDF PTFE PFA	Titanium (where available) Hastelloy C (elsewhere)	FKM/FPM**

***** Due to incompatibility, no stainless steel parts shall be in contact (i.e. wetted) with Chlorine Dioxide solution.

****** More than one formulation of FKM (or FPM) is manufactured. FKM is often referred to as viton based on the registered trademark Viton®. Some formulations of FKM/FPM may not be compatible with Chlorine Dioxide solution.

The Contractor shall verify the suitability of the specified materials prior to bidding and submittals. Any discrepancies shall immediately be brought to the attention of the Engineer.

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Where discrepancies are noted, the Contractor shall assume that the more corrosion resistant material shall be used.

Pipes and Fittings

Polyvinyl Chloride (PVC) Pipe and Fittings

Polyvinyl chloride (PVC) pipe, fittings and couplings shall conform to ASTM F-441, F-437 and F-439. Pipe shall be Schedule 80.

The objective of the primer and cement shall be to form a fused PVC weld between the PVC pipe and fittings. The Contractor shall submit, for the Engineer's approval, the names of the proposed primer and cement and the PVC pipe manufacturer's written recommendations stating the selected primer's and cement's suitability for use with the listed chemical. All primer and cement shall be new.

Valves

True Union Ball Valves

Provide true union ball valves fabricated from materials suitable for the intended chemical application and as specified above. All ball valves must be of the True Union type. The manufacturer of all ball valves must complete all components prior to the factory assembly, test, and packaging of those valves. Modification of assembled valves by any manufacturer or vendor is unacceptable. The ball valve bodies must be permanently marked externally with NSF (symbol of NSF International), indicating approval for use with potable water and one opposing directional arrow flow. Valves shall be equal to Chemtrol, George Fischer (+GF+), ASAHI/America or Engineer approved equal.

True Union Ball Check Valves

Provide true union ball check valves fabricated from materials suitable for the intended chemical application and as specified above. All ball check valves shall be of the True Union type. Ball check valves shall be listed by NSF for use in potable water systems. Valves shall be equal to Chemtrol, George Fischer (+GF+), ASAHI/America or Engineer approved equal.

(Combination) Back-Pressure Sustaining and Anti-Siphon Valve

Provide a combination back-pressure sustaining and anti-siphon valve as shown on the Plans. The purpose of the valve for this project is to prevent the chance of unwanted dosing of the chemical into the raw water main by siphoning. Valves shall be fabricated from materials suitable for the intended chemical application and as specified above. The valve shall be a Griffco, in the size shown on the Plans, or approved equal, and designed for in-line operation, unless otherwise shown on the Plans. The pressure setting for the valve will be determined by the Owner after flow testing of the raw water pumps is completed.

Appurtenances

Pressure Gauge

Provide each pressure gauge with a diaphragm (chemical) seal per Section 15.60. Pressure gauges shall have a 4-½" face.

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Chemical Injector

A chemical injector shall be installed at the location shown on the Plans. The injector's solution tube shall protrude one-third of the pipe diameter into the water main. Provide all necessary couplings for fastening at the chemical piping and the water main tap.

The chemical injector shall be a SAF-T-FLO Heavy Service Retractable Injection Quill model HS-200, or Engineer approved equal, with a stainless steel valve/gland (not wetted by chemical), two limit chains, a 2" water main tap connection and a 1-½" solution tube that has a 45-degree beveled tip. All wetted chemical injector materials, such as the solution tube, shall be compatible with the chemical listed above.

Provide and fasten to the chemical injector isolation valve a stainless steel tag and chain. The tag shall be imprinted with a description of the chemical solution being injected. The letters shall be engraved and a ¼-inch high.

Part 3 – Execution

All piping shall be cut square, deburred, and cleaned of all dirt, grease, and oils before joining.

Once installed, all piping shall be flushed to clear the lines of debris. Prior to making the connections at the existing chemical piping and the injection point, pressure test the proposed chemical piping using potable water. Upon passing water pressure test, make the connections at the existing chemical piping and the injection point, and pressure test under normal operating conditions for a 24-hour period. Correct all leaks and drips at the conclusion of each test. At the determination of the Engineer, pressure test may have to be repeated if a large number of leaks or drips are repaired. All valves and appurtenances shall be set based on manufacturers' recommendation and the operation pressures identified.

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Division 16
Electrical

16.00 GENERAL

The Contractor shall provide all labor, material, tools, equipment and services required to complete the furnishing, installation, wiring, connection, calibration, adjustment, testing and operation of all electrical equipment, devices and components as indicated and implied by the plans and specifications.

Sections in these specifications titled "*Common Work for*. . ." shall apply to all following sections whether directly referenced or not.

The Contractor shall reference Section 1.33.2 regarding substitutes and "or-equals.

16.05 Common Work for Electrical

Part 1 - General

Summary

Plans are diagrammatic and indicate general arrangements of systems and equipment, except when specifically, dimensioned or detailed. The intention of the plans is to show size, capacity, approximated location, direction and general relationship of one work phase to another, but not exact detail or arrangement.

Permits and Fees

The Contractor shall coordinate and provide all permits, licenses, approvals, inspections by the authority having jurisdiction and other arrangements for work on this project and all fees shall be paid for by the Contractor. The Contractor shall include these fees in the bid price.

Related Sections

See the following sections for items that may be provided and/or installed with other electrical equipment.

- Division 8.90 Motorized louvers/dampers
- Division 10.14.8 Signs for electrical equipment
- Division 11.20 Pump motors
- Division 11.95.34 Fans
- Division 17.50 Sensors and controls

Codes and Standards

Provide all electrical work in accordance with latest edition of National Electrical Code, National Electrical Safety Code, Washington State Electrical Code, and local ordinances. If any conflict occurs between government adopted code rules and these specifications, the codes are to govern. All electrical products shall bear a label from a certified testing laboratory recognized by the State of Washington. Recognized labels in the State of Washington are UL, ETL, and CSA-US.

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Definitions

Dry Locations: All those indoor areas which do not fall within the definitions below for wet, damp, or corrosive locations and which are not otherwise designated on the Plans.

Wet Locations: All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Plans.

Damp Locations: All spaces wholly or partially underground, or having a wall or ceiling forming part of a channel or tank unless otherwise designated on the Plans.

The words "plans" and "drawings" are used interchangeably in this specification and in all cases shall be interpreted to mean "Plans".

The word "provide" shall be interpreted to mean furnish and install.

Submittals

Provide submittals of each item specified in this division to engineer for approval in accordance with Division 1 of these specifications. Submittals for motor control centers, motor control panels, control panels, instrumentation panels, and pump control panels shall include at a minimum: a wiring diagram or connection schematic, and an interconnection diagram.

Wiring Diagram or Connection Schematic

1. This plan or plans shall include all of the devices in a system and show their physical relationship to each other including terminals and interconnecting wiring in assembly. This diagram shall be in a form showing interconnecting wiring only by terminal designations (wireless diagram).

Interconnection Diagram

1. This diagram shall show all external connections between terminals of equipment and outside points, such as motors and auxiliary devices. References shall be shown to all connection diagrams which interface to the interconnection diagrams. Interconnection diagrams shall be of the continuous line type. Bundled wires shall be shown on a single line with the direction of entry/exit of the individual wires clearly shown. All devices and equipment shall be identified. Terminal blocks shall be shown as actually installed and identified in the equipment complete with individual terminal identification. All jumpers, shielding and grounding termination details not shown on the equipment connection diagrams shall be shown on the interconnection diagrams. Spare wires and cables shall be shown.

Submittal information shall be provided to the Owner for the following items:

1. Utility Meter Enclosure
2. Service Switchboards
3. Surge Protective Device (SPD)
4. Switchboard
5. Variable Frequency Drives

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6. Branch Circuit Panelboard
7. Circuit Breakers
8. Conduit and Fittings
9. Outlet and Junction Boxes
10. Electrical Handholes and Vaults
11. Wire and Cables
12. Switches and Receptacles
13. Light Fixtures
14. Automatic Transfer Switch
15. Other Electrical Components listed in this Division and/or required by the Engineer.

Project Conditions

See Division 1 regarding shutdowns allowed for utility power installation and for generator requirements required during the shutdown.

Construction Power

See Division 1.51

Part 2 - Products

Source Quality Control

Provide adequate space and fit for the electrical installation, including, but not limited to, determination of access-ways and doorways, shipping sections, wall and floor space, and space occupied by mechanical equipment. Provide electrical equipment that fits in the areas shown on the Plans. All equipment shall be readily accessible for maintenance, shall have electrical clearances in accordance with National Electric Code (NEC) and shall be installed in locations which will provide adequate cooling.

Do not use equipment exceeding dimensions indicated or equipment or arrangements that reduce required clearances or exceed specified maximum dimensions unless approved by the Engineer.

Identification of Listed Products

Electrical equipment and materials shall be listed for the purpose for which they are to be used, by an independent testing laboratory. When a product is not available with a testing laboratory listing for the purpose for which it is to serve, the inspection authority may require the product to undergo a special inspection at the manufacturer's place of assembly. All costs and expenses incurred for such inspections shall be included in the original contract price.

Materials

Use equipment, materials and wiring methods suitable for the types of locations in which they will be located, as defined in Definitions above.

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All materials and equipment specified herein shall, within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

Components

Fasteners for securing to walls, floors, and the like shall meet the requirements of Division 05.05.23.

NEMA Rating

Unless otherwise noted, provide enclosures as follows:

1. Indoors Unclassified Locations: NEMA Type 12
2. Outdoors and/or Wet Locations: NEMA Type 4X
3. Electrical Rooms: NEMA Type 1

Accessories

Wire Identification

1. Identify each wire or cable at each termination and in each pull-box using numbered and lettered wire markers. All electrically common conductors shall have the same number. Each electrically different conductor shall be uniquely numbered. Identify panelboard circuits using the panelboard identification and circuit number. Identify motor control circuits using the equipment identification number assigned to the control unit by the motor control center manufacturer and the motor control unit terminal number. Identify other circuits as approved by the Engineer. Identify each wire or cable in each pull-box with plastic sleeves having permanent markings. Conductors between terminals of different numbers shall have both terminal numbers shown at each conductor end. The terminal number closest to the end of the wire shall be the same as the terminal number.

Finishes

Refer to each electrical equipment section of these specifications for painting requirements of equipment enclosures.

Part 3 - Execution

Installation

General

1. Complete the wiring, connection, adjustment, calibration, testing and operation of mechanical equipment having electrical motors and/or built-in or furnished electrical components in accordance with electrical code, UL listing requirements and manufacturer's instructions. Install electrical components that are furnished with mechanical equipment.
2. Provide the size, type and rating of motor control devices, equipment and wiring necessary to match the ratings of motors furnished with mechanical equipment.
3. Complete the procurement, installation, wiring, connection, calibration, adjustment, testing and operation of all electrical devices, components accessories and equipment

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which is not shown or specified but which is nonetheless required to make the systems shown and specified properly functional.

Workmanship

1. Assign a qualified representative who shall supervise the electrical construction work from beginning to completion and final acceptance.
2. Provide all labor using qualified craftsmen, who have had experience on similar projects.
3. Ensure that all equipment and materials fit properly in their installations.

Field Services

1. Provide field services of qualified technicians to supervise and check out the installation of the equipment, to supervise and check out interconnecting wiring, to conduct start-up and operation of the equipment, and to correct any problems which occur during testing and start-up.

Installing Equipment

1. Provide the required inserts, bolts and anchors, and securely attach all equipment and materials to their supports.
2. Install all floor-mounted equipment on 3½-inch high reinforced concrete pads.
3. Install all equipment and junction boxes to permit easy access for normal maintenance.

Cutting, Drilling, and Welding

1. Provide any cutting, drilling, and welding that is required for the electrical construction work.
2. Structural members shall not be cut or drilled, except when approved by the Engineer. Use a core drill wherever it is necessary to drill through concrete or masonry. Perform patch work with the same materials as the surrounding area and finish to match.

Metal Panels

1. Mount all metal panels, which are mounted on, or abutting concrete walls in damp locations or any outside walls ¼-inch from the wall and paint the back side of the panels with a high build epoxy primer with the exception of stainless-steel panels. Film thickness shall be 10 Mils minimum.

Seismic Requirements

1. See Division 1.81

Load Balance

1. Balance electrical load between phases as nearly as possible on panelboards, motor control centers, and other equipment where balancing is required.
2. When loads must be reconnected to different circuits to balance phase loads, maintain accurate record of changes made, and provide circuit directory that lists final circuit arrangement.

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Field Quality Control

Minor Deviations

1. The electrical plans are diagrammatic in nature and the location of devices, fixtures, and equipment is approximate unless dimensioned. On the basis of this, the right is reserved by the owner to provide for minor adjustments and deviations from the locations shown on the Plans without any extra cost. Deviations from the Plans and/or specifications required by code shall also be done, subsequent to Owner's approval, without extra cost.
2. Plans indicate the general location and number of the electrical equipment items. When raceway, boxes, and ground connections are shown, they are shown diagrammatically only and indicate the general character and approximate location. Layout does not necessarily show the total number of raceways or boxes for the circuits required. Furnish, install, and place in satisfactory condition all raceways, boxes, conductors, and connections, and all of the materials required for the electrical systems shown or noted in the contract documents complete, fully operational, and fully tested upon the completion of the project.

Project Record Plans

1. A set of Plans shall be maintained at the job site showing any deviations in the electrical systems from the original design. A set of electrical Plans, marked in red to indicate the routing of concealed conduit runs and any deviations from the original design, shall be submitted to the Engineer for review at the completion of the project prior to final acceptance.
2. After testing and acceptance of the project the Contractor shall furnish in the O&M manuals an accurate connection schematic and interconnection diagram for every service entrance panel, pump control panel, motor control center, and instrumentation panel provided this project.

Cleanup and Equipment Protection

Equipment Protection

1. Exercise care at all times after installation of equipment, motor control centers, control panels, etc., to keep out foreign matter, dust debris, and moisture. Use protective sheet metal covers, canvas, heat lamps, etc., as needed to ensure equipment protection.

Cleaning Equipment

1. Thoroughly clean all soiled surfaces of installed equipment and materials upon completion of the project. Clean out and vacuum all construction debris from the bottom of all equipment enclosures.

Painting

1. Repaint any electrical equipment or materials scratched or marred in shipment or installation, using paint furnished by the equipment manufacturer.

Final Cleanup

1. Upon completion of the electrical work, remove all surplus materials, rubbish, and debris that accumulated during the construction work. Leave the entire area neat, clean and acceptable to the Owner.

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2. Lamps and fluorescent tubes shall be cleaned, and defective units replaced at the time of final acceptance.

16.10 ELECTRICAL SITE WORK

16.10.1 Common Work for Electrical Site Work

Part 1 – General

Description of Work

The work included in this section consists of furnishing and installing conduit, fittings, handholes, pull vaults, warning tape, cables, wires, and related items, complete as specified herein and as indicated on the Plans for a complete and functional underground electrical system. Special vaults, grounding, trench backfill requirements may be specified with the particular equipment or electrical system involved.

Part 2 – Products

General

Materials and equipment shall conform to the respective specifications and standards; and to be the specifications herein. Electrical rating shall be as indicated on Plans.

Raceways and conduit shall be provided per Section 16.70.

Wire and cable shall be provided per Section 16.60.

Part 3 – Execution

Construction

Provide all excavation, trenching, backfill and surface restoration required for the electrical work.

Trenching shall be to depths as required by Code, particular installation, or as shown on the Plans. Trench width and length as required by the installation or as shown. Trench bottom shall be free of debris and graded smooth. Where trench bottom is rock or rocky or contains debris larger than 1 inch or material with sharp edges, over excavate 3 inches and fill with 3 inches of sand. Separation between new electrical utilities and other utilities shall be 12 inches minimum, except gas line separation shall be 12 inches both vertical and horizontal. Perform crossing of concrete or asphalt only after surface material has been saw cut to required width and removed.

Backfill around raceways shall be 3-inches of pea gravel or sand for systems of 600 volt or less. Provide red marker tape over raceways below grade. Place backfill material to obtain a minimum degree of compaction of 95 percent of maximum density at optimum moisture content. Moisten backfill material as required to obtain proper compaction. Do not use broken pavement, concrete, sod, roots or debris for backfill.

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16.10.2 Underground Marking Tape (Detectable Type)

Part 2 – Products

Manufacturers

Tape shall be Brady "Detectable Identoline – Buried Underground Tape", or equal.

Materials

Underground marking tape shall be for location and early warning protection of buried power and communication lines. Tape shall be detectable by a pipe/cable locator or metal detector from above the undisturbed ground. Tape shall be nominally 2 inches wide with a type B721 aluminum foil core laminated between two layers of 5 Mil thickness polyester plastic. The plastic color shall be red for electrical lines and orange for telephone lines.

Part 3 – Execution

Installation

Unless noted otherwise on Plans, approved underground marking tape shall be installed in the trench 12 inches above and directly over the conduit or raceway.

16.10.3 Handholes and Pull Boxes

Part 2 – Products

Manufacturers

Handholes and Pull boxes shall be Utility Vault Co. or approved equal unless specified otherwise on the Plans.

Materials

Provide handholes of reinforced precast concrete, or injection molded composite plastic material. Handholes shall include a base, a body, extensions and a cover. Handholes with a perimeter of 10 feet or more (e.g., 3 feet by 2 feet) shall have both pulling irons and cable racks. All hardware shall be stainless steel, or hot-dip galvanized after fabrication; cable racking and hardware, however, shall be non-metallic and corrosion resistant. If no handhole size is shown on the Plans, size units per NEC or provide 12 inches by 24 inches by 18 inches deep, whichever is larger.

All handholes located in areas subject to vehicular traffic or where identified on Plans shall be ASSHTO, H-20 rated in accordance with ASTM C857.

The lids to all pull boxes and vaults shall be permanently marked for its intended use, "signal" for all signal and instrumentation handholes and "electrical" for all power handholes. Letter shall be a minimum of 3-inches high.

Part 3 – Execution

Installation

Conduits entering handholes shall have grounding bushings installed and the conduit ends shall be sealed with Permagum sealing compound. Where conduits enter through sides of

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handholes, the penetration shall be made watertight. Use a core drill wherever it is necessary to drill through concrete. Perform patch work with the same materials as the surrounding area and finish to match.

Pull boxes shall be provided at least every 150 feet on long straight runs. Spacing shall be reduced by 50 feet for each 90-degree bend.

Install handholes flush with finished grade in all paved areas, roadways and walkways. All handhole edges shall be flush with final surface.

16.15 Electrical Grounding

16.15.1 Common Work for Electrical Grounding

Part 1 - General

References

Service and equipment grounding shall be per Article 250 of the NEC.

Performance Requirements

Verify that a low-resistance ground path is provided for all circuits so an accidental contact to ground of any live conductor will instantly trip the circuit.

Part 2 - Products

Components

The grounding systems shall consist of the ground rods, grounding conductors, ground bus, ground fittings and clamps, and bonding conductors to water piping and structural steel as shown on the Plans.

System components shall be as allowed in the NEC unless specified otherwise below:

1. Ground Rods: Ground rods shall be cone pointed copper clad Grade 40 HS steel rods conforming to ASTM B228. The welded copper encased steel rod shall have a conductivity of not less than 27 percent of pure copper.
2. Ground Conductors: Buried conductors shall be medium-hard drawn bare copper; other conductors shall be soft drawn copper. Sizes over No. 6 AWG shall be stranded. Coat all ground connections except the exothermic welds with electrical joint compound, non-petroleum type, UL listed for copper and aluminum applications.
3. Ground Rod Boxes: Boxes shall be a 9-inch diameter precast concrete unit with hot-dip galvanized traffic cover. Boxes shall be 12-inches deep minimum. Covers shall be embossed with the wording "Ground Rod".

Part 3 - Execution

General Grounding Installation

When available a UFER ground per latest edition of NEC shall be provided as the primary means to ground the electrical system.

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Ground electrical service neutral at service entrance equipment to supplementary grounding electrodes.

Ground each separately derived system neutral to nearest effectively grounded building structural steel member or separate grounding electrode.

Provide a ground rod box for each ground rod to permit ready access to facilitate testing.

Provide a ground wire in every conduit carrying a circuit of over 110 volts to ground.

Make embedded or buried ground connections, taps and splices with exothermic welds. Coat ground connections.

Bond metallic water piping at its entrance into each building.

Motor Grounding Installation

Extend equipment ground bus via grounding conductor installed in motor feeder raceway. Connect to motor frame.

When using nonmetallic flexible tubing install an equipment grounding conductor connected at both ends to noncurrent-carrying grounding bus.

Vault and Handhole Grounding

Exposed noncurrent-carrying metal parts of equipment, conductor supports or racks, conduits and other metal appurtenances, including any metal cover and its supporting ring, shall be bonded together and connected to a common ground. The size of the grounding means shall be as prescribed in the NEC. Where the grounding means is exposed, the grounding conductor shall be not smaller than #8 AWG copper.

Ground Connections

Above grade ground connections shall be exothermic weld, mechanical, or compression-type connectors; or brazing.

Below grade ground connections shall be exothermic weld.

Install all ground connections is strict accordance with connector manufacturer's recommendations and methods.

Testing

Following completion of the grounding electrode system, if installed, measure ground resistance at each ground rod using the three-rod method. Submit results to engineer prior to final acceptance by the Owner.

Perform testing per NETA Standard ATS paragraph 7.13. Testing methods shall conform to NETA Standard ATS using the three-electrode method for large systems. Conduct tests only after a period of not less than 48 hours of dry weather.

Furnish to the Engineer a test report with recorded data of each ground rod location. See Division 16.95.4.

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16.20 UTILITY SERVICE

16.21 Electrical Service

Part 1 – General

Description of Work

Work consists of installation of new 2500 amp, 480-volt, 3 phase underground service, pad-mounted transformer and service entrance equipment. The existing transformer and utility service shall be removed.

Scheduling Work with the Utility Company

The Contractor shall be fully and completely responsible for all scheduling and coordination with the utility company. The Contractor shall coordinate and schedule power outages, power service for operation and construction, and power service as may be required prior to Certification of Occupancy.

The Contractor shall make all necessary applications for service with the utility and shall notify the Owner in writing of any obligations that the Owner must fulfill for service to be started, installed, or modified.

Contractor/Utility Interface Responsibilities

The electrical utility providing service to these facilities is Puget Sound Energy.

During design, contact was made with Customer Service Representative, Karin Kersteter. who can be contacted by telephoning 360-319-3337. The division of responsibilities stated below has been determined by coordination with the serving utility. The Contractor shall comply with all utility company standards and requirements.

All utility charges for and related to the final permanent service to the facility will be paid by the Owner, directly to the utility company and shall not be included in the Contractors bid price.

Contractor shall notify the Engineer/Owner of any changes to the responsibilities between the electrical utility and the Contractor as outlined in these specifications prior to submitting a bid. Any change(s) in responsibilities not brought to the attention of the Engineer prior to bidding will not be cause for additional payment.

The Contractor shall notify the Owner (in writing) of any obligations or forms that the Owner is responsible to provide for service.

The Contractor shall:

Provide trench, backfill, and restoration for installment of the underground primary power from the utility pole to the proposed pad-mount transformer.

Install new raceway and conductors for secondary service from the pad-mount transformer location to the proposed service switchboard including trenching, backfill and restoration. Terminate service conductors at the service entrance panel or switchboard.

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Install utility meter enclosure, raceway, and conductors for utility revenue metering as shown on the Plans.

The Utility Company shall:

Extend proposed overhead primary power from the existing primary service connection point to the proposed utility pole.

Provide and install proposed primary power utility pole. Excavation and restoration for installation of proposed utility pole shall be provided by the Contractor.

Extend proposed overhead primary power from the existing primary service connection point to the proposed utility pole.

Remove existing utility power pole.

Remove existing pad-mount transformer and replace with proposed pad-mount transformer; reuse existing transformer vault.

Install new primary raceway and conductors from the primary service to the proposed pad-mount transformer including all raceways, conductors, and cable terminators. Trench, backfill, and restoration shall be provided by the Contractor.

Terminate conductors on the primary and secondary side of the transformer.

Install current transformers (CT) in CT metering section of the switchboard.

Install a utility revenue meter in the proposed main revenue metering enclosure installed by the Contractor.

Project Conditions

Before submitting a bid, the Contractor shall become familiar with all the electrical service requirements that may affect the execution of their work.

Standards and Codes

Work involving service installation shall be done in accordance with the service utilities standards and the NEC.

Service equipment shall be listed and labeled by UL as "suitable for use as service equipment".

Part 2 - Products

16.21.2 Electrical Utility Meter Enclosure

Manufacturers

Meter enclosure shall be a Circle AW or equal and as required to meet the requirement of the serving utility. Installation shall be in vandal proof NEMA 3R enclosure with a lockable hinged door. Meter shall include a metal vandal screen that can be purchased from serving utility.

Materials

Contractor shall coordinate with Puget Sound Energy on the type of metering required and shall provide all labor and material necessary to meet Puget Sound Energy requirements.

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16.30 BASIC PANEL EQUIPMENT AND DEVICES

16.31 Operating and Indicating Devices

Part 1 - General

Operating and indicating devices minimum rating shall be NEMA 13. Operator devices mounted in outdoor panels, corrosive areas or where exposed to moisture shall be NEMA 4X.

Part 2 – Products

16.31.1 Digital Power Meter

Manufacturers

The digital power meter shall be an Allen-Bradley, Powermonitor 5000, or equal.

Minimum Features

A digital 3-phase power monitor with remote capabilities and associated sensors shall be provided as indicated on the Plans. The digital power meter shall be capable of measuring at a minimum the following parameters:

1. Voltage (line-neutral)
2. Voltage (line-line)
3. Voltage unbalance
4. Current
5. Current unbalance
6. Neutral amps
7. Real power
8. Reverse and single-phase detection
9. Reactive power
10. Apparent power
11. Power factor
12. Frequency
13. Auxiliary voltage

Power meter shall have an RJ-45 Ethernet port for communicating with the facility control system. Power meter shall communicate with the control system via EtherNet/IP communications protocol. A Modbus TCP/IP to EtherNet/IP protocol converter shall be installed by the switchboard manufacturer to achieve EtherNet/IP communications if EtherNet/IP is not native to the power meter. An industrial Ethernet switch and 24 VDC power supply shall be installed in the switchboard power meter section for connecting the

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power meter display and pump station control system communications network to the power meter.

16.31.2 Run Time Meters

Manufacturers

HECON GO series or equal.

Manufactured Units

Hour meter (elapsed time meters) shall be 2-inch by 1-inch nominal size, rectangular case type for flush panel mounting. The meter face shall be of the style that most closely resembles the panel indicating instruments if provided and shall have black trim with white or aluminized face. The meters shall have a 6-digit non-resettable register with the last digit indicating tenths of an hour.

16.31.3 Start Count Meters

Manufacturers

HECON GO series, Redington Model 3400-2010 or equal.

Manufactured Units

Start counters shall be 2-inch by 1-inch nominal size, rectangular case type for flush panel mounting. The meter face shall be of the style that most closely resembles the panel indicating instruments if provided and shall have black trim with white or aluminized face. The meters shall have a 6-digit resettable register.

16.31.4 Indicating Lights

Manufacturers

Heavy-Duty, Watertight, and Corrosion-Resistant Type:

- Eaton/Cutler-Hammer, Type E34
- Square D Co., Type SK
- Allen Bradley, Type 800H
- General Electric Co., Type CR 104P

Manufactured Units

Indicating lights shall be NEMA type 4/4X/13, corrosion resistant, water-tight, oil-tight, full voltage, push-to-test, high visibility 28 chips LED type. Pilot lights shall be rated for the proper operating voltage. Appropriate lens caps shall be provided as shown on Plans.

16.31.5 Selector Switch

Manufacturers

Heavy-Duty, Watertight, and Corrosion-Resistant Type:

- Eaton/Cutler-Hammer, Type E34

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- Square D Co., Type SK
- Allen Bradley, Type 800H
- General Electric Co., Type CR 104P

Manufactured Units

Selector switches shall be NEMA type 4/4X/13, corrosion-resistant/watertight/oil-tight, type selector switches with contacts rated for 10 amperes continuous at proper operating voltage. Operators shall be black knob type. Units shall have the number of positions and contact arrangements and spring return function (if any) as shown on Plans. Units shall be single-hole mounting, accommodating panel thicknesses from $^{1}/_{16}$-inch minimums to ¼-inch maximum.

16.31.6 Pushbuttons

Manufacturers

Heavy-Duty, Watertight, and Corrosion-Resistant Type:

- Eaton/Cutler-Hammer, Type E34
- Square D Co., Type SK
- Allen Bradley, Type 800H
- General Electric Co., Type CR 104P

Manufactured Units

Pushbuttons shall be NEMA type 4/4X/13, corrosion-resistant/watertight/oil-tight, type push buttons with momentary contacts rated for 10-ampere continuous at proper operating voltage. Button color shall be as specified in control panels and shall have a full guard. Pushbutton contact arrangements shall be as shown on Plans. Size of pushbuttons as indicated on the Plans.

Special Functions

Pushbutton for "emergency stop" applications shall have maintained contacts and red mushroom head operators.

16.32 Panel Relays

Part 1 – General

General

Relays shall be provided as necessary to perform switching functions required of control panels and other control circuits as shown on the Plans and described in the technical specifications. Appropriate relay type and associated contacts shall be selected based on the application from the control wiring diagrams or the functional description. Where timing relays and control relays require additional contacts, provide auxiliary control relays properly sized for the application.

All contacts and relays shall be NEMA rated and UL recognized.

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The electrical life expectancy for the relay shall be over 500,000 operations at 120V AC, 10 amp; (over 200,000 operations at 120V AC, 10 amp for SPDT, 3PDT, and 4PDT). The mechanical life expectancy for the relay shall be over 50,000,000 operations.

Part 2 – Products

16.32.1 Control Relays

Manufacturers

- Square D Class 8501, Type K or R
- Allen Bradley 700 Type HA or HB
- IDEC RH Series; or equal

Manufactured Units

Relays for general purpose use shall be DPDT or 3PDT, 10-amp contacts with the appropriate coil voltage for the application. Relays shall be plug-in type with matching socket. All relays shall have LED indicators to signal when the coil is energized. Relay coils shall be rated for continuous duty.

16.32.3 Time Delay Relays

Manufacturers

- Allen Bradley 700 Type HR
- IDEC GE1, RTE or GT3 Series; or equal

Manufactured Units

Time delay relays shall be multi-function, multi-range with plug-in base, pin style terminations timing and timed out LED indicators, and calibrated scales. Relays shall have minimum 0.5 seconds to 60 minutes, 8 selectable timing ranges, 5-amp contacts. Select coil voltage for the application. Units shall be sealed to prevent entry of contamination in the form of dust, dirt, or moisture.

Appropriate relay shall be selected based on application from the control wiring diagrams.

Minimum accuracy (plus or minus) shall be as follows:

1. Repeat accuracy – ½ percent.
2. Timing change over full voltage range – ½ percent change over full temperature range.
3. Scale tolerance – 5-percent.

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16.35 Control Panel Accessories

16.35.1 Terminal Blocks

Part 2 – Products

Manufactured Units

Terminal blocks shall be one-piece, molded, plastic blocks with screw-type terminals and barriers rated for 600 volts. Terminals shall be double-sided and supplied with removable covers to prevent accidental contact with live circuits. Terminals shall have permanent, legible identification, clearly visible with the protection cover removed.

Part 3 – Execution

Installation

All wires between panel-mounted equipment and other equipment shall be terminated at terminal blocks. Switches shall be terminated at the terminal blocks with crimp-type, pre-insulated, ring-tongue lugs. Lugs shall be of the appropriate size for their terminal block screws and for the number and size of the wires terminated. All wires shall be labeled with the circuit number and common function.

16.35.2 Nameplates

Part 2 – Products

Manufactured Units

Standard nameplates shall be made of $^{1}/_{16}$-inch thick machine engraved laminated phenolic having black letters not less than $^{3}/_{16}$-inch high on white background. One-inch high lettering shall be used for the large nameplates required for the control panels and motor control centers.

Part 3 – Execution

Installation

Nameplates shall be provided on all electrical devices including but not limited to motor control equipment, MCC cubicles, control stations, junction boxes, panels, motors, instruments, switches, indicating lights, meters, and all electrical equipment enclosures. Each motor control center compartment and control panel shall have a nameplate designating the equipment and its identifying number and size or rating. Data shall be as shown on the Plans and reviewed via the submittal process. Nameplates shall have name, number and/or function as is applicable for clear identification.

Provide one large nameplate for each motor control center and/or control panel identifying the equipment as indicated on the Plans.

Nameplates on steel panels shall be secured with stainless steel drive screws. Where it is proposed that nameplates will be secured with pressure sensitive tape or bonding cement, the process and samples shall be submitted to the Engineer for acceptance.

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Nameplates shall be provided for identifying all operator interface (lights, switches, etc.) and other devices that are located outside or inside the panels.

Nameplates shall be provided for identifying all relays and devices that are located inside the panels.

Special Functions

Provide warning nameplates on all panels and equipment, which contain multiple power sources. Lettering shall be white on red background.

16.36.1 Surge Protection Device (SPD)

Part 2 – Products

General

The SPD shall be compatible with the electrical system voltage, current, system configuration, and intended applications.

Manufacturers

The SPD shall be manufactured by the switchboard manufacturer and shall be bus-mounted.

Manufactured Units

Protect the electrical service with an SPD device as shown on the Plans. The SPD shall be mounted in the pump station and connected with the shortest conductors possible. The SPD shall meet the following:

1. Provide surge current withstand up to 200 kA per phase (minimum).
2. Short circuit current rating of 200 kAIC (minimum).
3. A ten-year free replacement warranty.
4. Enhanced UL 1283 Transient Tracking Filter.
5. Status indicator lights for each phase and one service LED.

16.40 LOW VOLTAGE MOTOR CONTROL EQUIPMENT

16.41.2 Standard Motor Starter Units

Part 1 - General

Design Requirements

Each unit shall consist of a motor circuit protector and a magnetic starter. The combination shall have an interrupting rating of not less than 42,000 amperes symmetrical at 480 volts. Each unit shall have a control terminal board and other components as shown on Plans.

Starters shall be of NEMA, not IEC design. That is, starters shall have molded coils, replaceable contacts, and metal mounting plate. Starters shall have provisions for accepting up to seven (7) auxiliary contacts and one (1) overload alarm contact.

All starters shall be size 1 or larger and no intermediate sizes (such as 1¾) will be acceptable.

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Pilot devices shall be per Division 16.30 Basic Panel Device and Equipment.

Part 2 – Products

Manufactured Units

Overload protection is to be provided by a solid-state overload relay that shall be self-powered. Each overload shall be adjustable over a full 2:1 FLA adjustment range. A tamper proof cover shall be provided. The standard overload shall provide Class 20. The overload relay must provide phase loss protection. The overload must be ambient insensitive. The overload relay must have a trip-free, normally-closed contact with a visible trip indication and N.O. isolated alarm contact. The overload shall have a method of being manually tripped for test purposes. Size the overload heaters to protect the motor actually installed with allowance for power factor correction, if applicable.

Terminal blocks shall be mounted within the unit and located near the front for accessibility. They shall not be located at the rear of the vertical wireway. Power terminal blocks shall be provided. On non-plug-in (frame mounted) units, terminal blocks need not be pull-apart style. On plug-in units, control terminal blocks shall be pull-apart style.

Starter units shall contain the number of auxiliary contacts, unit-mounted devices, indicating lights, control relays, and other devices as shown on the Plans.

16.45 Variable Frequency Drive (Provided by Control System Integrator – Refer to Division 17)

Part 1 - General

Summary

The Variable Frequency Drive (VFD) system shall contain all components required to meet the performance, protection, safety, and certification criteria of this specification.

References

- National Fire Protection Association - NFPA 70 - US National Electrical Code.
- National Electrical Manufacturers Association - NEMA 250 - Enclosures for Electrical Equipment.
- Underwriters Laboratory Inc. – UL 508.
- Canadian Standards Association International – CAN/CSA-C22.2 No. 14-05.
- International Electrical Code - IEC 146.
- Institute of Electrical and Electronics Engineers, Inc. - IEEE 519 - IEEE Standard Practices and Requirements for Harmonic Control in Electrical Power Systems.
- Seismic Standards ASCE 7-10, IBC, CBC, ICC_ESAC156, IEEE 693 and California OSHPD.

Submittals

Submit under provisions of Sections 16.05.

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Shop Drawings - Approval

1. Elevation Drawings: Include dimensional information and conduit routing locations.
2. Unit Descriptions: Include amperage ratings, enclosure ratings, fault ratings, nameplate information, and so on, as required for approval.
3. Wiring Diagrams:
    a) Power Diagram: Include amperage ratings, circuit breaker frame sizes, circuit breaker continuous amp ratings, and so on, as required for approval.
    b) Control Diagram: Include disconnect devices, pilot devices, and so on.
4. Major components list.

Product Data Sheets

1. VFD and Operator Interface publications.
2. Data sheets and publications on all major components including, but not limited to, the following:
    a) Contactors
    b) Circuit breaker and fuse (power and control)
    c) Control power transformers
    d) Pilot devices
    e) Relays/Timers

Test procedures shall be per the manufacturer's standards.

Closeout Submittals (Operation and Maintenance Manuals)

Shop Drawings – Final as shipped

3. Elevation Drawings: Include dimensional information and conduit routing locations.
4. Unit Descriptions: Include amperage ratings, enclosure ratings, fault ratings, nameplate information, and so on, as required for approval.
5. Wiring Diagrams:
    a) Power Diagram: Include amperage ratings, circuit breaker frame sizes, circuit breaker continuous amp ratings, and so on, as required for approval.
    b) Control Diagram: Include disconnect devices, pilot devices, and so on.
    c) Diagrams shall updated based on any modifications and shall be accurate depicting point-to-point wiring.
6. Major components list.

Product Data Sheets

7. VFD and Operator Interface publications.

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8. Data sheets and publications on all major components including, but not limited to, the following:
    a) Contactors
    b) Circuit breaker and fuse (power and control)
    c) Control power transformers
    d) Pilot devices
    e) Relays/Timers

Test procedures shall be per the manufacturer's standards.

Operation and Maintenance Data

9. Service and Contact information
10. VFD and Operator Interface User Manuals
11. Troubleshooting / Service Manuals

Quality Assurance

Qualifications:

12. Manufacturers:
    a) The VFD and all associated optional equipment shall be UL listed or recognized.
    b) The VFD shall contain a UL label attached on the inside of the enclosure cabinet.
13. Suppliers:
    a) All inspection and testing procedures shall be developed and controlled under the guidelines of the Supplier's quality system and must be registered to ISO 9001 and regularly reviewed and audited by a third-party registrar.
    b) The VFD shall be factory pre-wired, assembled and tested as a complete package.

Storage and Handling

Contractor shall coordinate the shipping of equipment with the manufacturer.

Contactor shall store the equipment in a clean and dry space at an ambient temperature range of -25 degrees Celsius to 55 degrees Celsius (-13 degrees Fahrenheit to 130 degrees Fahrenheit).

The Contractor shall protect the units from dirt, water, construction debris, and traffic.

Design Requirements

Drive(s) shall be of the size, capacity and quantity as shown on the Plans. VFD supplier shall confirm motor HP, amperage, service factor and operating requirements with motor supplier.

The VFD motor controller shall convert 480 Volt, 3-phase, 60 Hertz utility power to adjustable voltage (0 - 460V) and frequency (0 - 60 Hz.) 3-phase, AC power for stepless motor speed control with a capability of 10:1 speed range. All general options and modifications shall mount within the standard adjustable frequency controller enclosure.

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The controller(s) shall be suitable for use with any standard NEMA-B squirrel-cage induction motor(s) having a 1.15 Service factor. At any time in the future, it shall be possible to substitute any standard motor (equivalent horsepower, voltage, and current) in the field.

The variable frequency control shall operate satisfactorily when connected to a bus supplying other solid-state power conversion equipment which may be causing up to 10 percent total harmonic voltage distortion and commutation notches up to 36,500-volt microseconds, or when other VFDs are operated from the same bus. Manufacturers shall certify at submittal time that their equipment will function satisfactorily under these circumstances.

Individual or simultaneous operation of the VFDs shall not add more than 5 percent total harmonic current distortion to the normal bus, nor more than 10 percent while operating from standby generator per IEEE 519, 2014. Prior to project completion, the Contractor shall provide verification through both measurement and calculations that the system is compliant with IEEE 519, 2014.

Part 2 – Products

Manufacturers

The VFD shall be an Allen-Bradley Powerflex 753 model VFD with EtherNet/IP communication interface or pre-approved equal. Approved manufacturers and models are as follows:

- Allen-Bradley – Powerflex 753
- Schneider Electric – ATV900 Series
- Eaton – SVX9000

All drives shall be supplied by one manufacturer.

Manufactured Units

The variable frequency control shall include transient voltage suppression to allow reliable operation on a typical industrial or commercial power distribution system.

Hardware

1. Utilize diode bridge or SCR bridge on the input rectifier.
2. Utilize DC bus inductor on all six-pulse VFDs only.
3. Utilize switching logic power supply operating from the DC bus.
4. Incorporate phase to phase and phase to ground MOV protection on the AC input line.
5. Microprocessor based inverter logic shall be isolated from power circuits.
6. Utilize latest generation IGBT inverter section.
7. Battery receptacle for Lithium battery power to the Real Time Clock.
8. Additional DPI port for handheld and remote HIM options.
9. Dedicated Digital Input for hardware enable.
10. Conformal coated printed circular boards.

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11. Informal coated printed circuit boards.
12. Optional onboard 24V DC Auxiliary Control Power Supply.

Control Logic

1. Ability to operate with motor disconnected when in V/Hz mode.
2. Provide a controlled shut down, when properly protected, with no component failure in the event of an output phase to phase or phase to ground short circuit. Provide annunciation of the fault condition.
3. Provide multiple programmable stop modes including Ramp, Coast, DC-Brake, Ramp-to-Hold, Fast Braking, and Current Limit Stop.
4. Provide multiple acceleration and deceleration rates.
5. Adjustable output frequency up to 650 Hz.
6. Ability to control outputs and manage status information locally within the VFD.
7. Ability to function stand-alone or complementary to supervisory control.
8. Ability to provide scaling, selector switches, or other data manipulations not already built into the VFD.

Motor Control Modes

1. Selectable Sensorless Vector, Flux Vector, V/Hz, and Adjustable Voltage Control modes selectable through programming.
2. The drive shall be supplied with a Start-up and Auto-tune mode.
3. The V/Hz mode shall be programmable for fan curve or full custom patterns.
4. Capable of Open Loop V/Hz.

Current Limit

1. Programmable current limit from 20 percent to 160 percent of rated output current.
2. Current limit shall be active for all drive states: accelerating, constant speed and decelerating.
3. The drive shall employ PI regulation with an adjustable gain for smooth transition in and out of current limit.

Acceleration / Deceleration

1. Accel/Decel settings shall provide separate adjustments to allow either setting to be adjusted from 0 to 3600 seconds.
2. A second set of remotely selectable accel/decel settings shall be accessible through digital inputs.
3. S Curve profiles shall be adjustable.

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Adjustments

1. A digital interface can be used for all set-up, operation and adjustment settings.
2. All adjustments shall be stored in nonvolatile memory (EEPROM).
3. No potentiometer adjustments shall be required.
4. EEPROM memory for factory default values shall be provided.
5. Software must be available for trending and diagnostics, as well as online and offline programming functionality.

Process PID Control

1. The drive shall incorporate an internal process PI regulator with proportional and integral gain adjustments as well as error inversion and output clamping functions.
2. The feedback shall be configurable for normal or square root functions. If the feedback indicates that the process is moving away from the set-point, the regulator shall adjust the drive output until the feedback equals the reference.
3. Process control shall be capable of being enabled or disabled with a hardwire input. Transitioning in and out of process control shall be capable of being tuned for faster response by preloading the integrator.
4. Protection shall be provided for a loss of feedback or reference signal.

Skip Frequencies

1. Three adjustable set points that lock out continuous operation at frequencies which may produce mechanical resonance shall be provided.
2. The set points shall have a bandwidth adjustable from Maximum Reverse Speed to Maximum Forward Speed.

Fault Memory

1. The last 100 fault codes shall be stored and time stamped in a fault buffer.
2. Information about the drive's condition at the time of the last fault such as operating frequency, output current, dc bus voltage and twenty-seven other status conditions shall be stored.
3. A power-up marker shall be provided at each power-up time to aid in analyzing fault data.
4. The last 100 alarm codes shall be stored and time stamped for additional troubleshooting reference.

Fault Reset / Run

1. The drive shall provide up to nine automatic fault reset and restarts following a fault condition before locking out and requiring manual restart.
2. The automatic mode shall not be applicable to a ground fault, shorted output faults and other internal microprocessor faults.
3. The time between restarts shall be adjustable from 0.5 seconds to 30 seconds.

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Run on Power Up

1. A user programmable restart function shall be provided to allow restart of the equipment after restoration of power after long duration power outages. Restart time dependent on presence of incoming signal.

Overload Protection

1. The drive shall provide internal class 10 adjustable overload protection.
2. Overload protection shall be speed sensitive and adjustable.
3. A viewable parameter shall store the overload usage.

Auto Economizer

1. An auto economizer feature shall be available to automatically reduce the output voltage when the drive is operating in an idle mode (drive output current less than programmed motor FLA). The voltage shall be reduced to minimize flux current in a lightly loaded motor thus reducing kW usage.
2. When the load increases, the drive shall automatically return to normal operation.

Terminal Blocks

1. Separate terminal blocks shall be provided for control and power wiring.
2. I/O terminal blocks shall be removable with wiring in place.
3. For frames 8 to 10 power wiring is landed on robust L-brackets behind the drive unit. This wiring remains in-place if the drive unit is removed.

Flying Start

1. The drive shall be capable of determining the speed and direction of a spinning motor and adjust its output to "pick-up" the motor at the rotating speed. This feature is disabled by default.

Inputs and Outputs

1. The Input / Output option modules shall consist of both analog and digital I/O.
2. No jumpers or switches shall be required to configure digital inputs and outputs.
3. All digital input and output functions shall be fully programmable.
4. The control terminal blocks shall be rated for 115V AC.
5. Inputs shall be optically isolated from the drive control logic.
6. The control interface card shall provide input terminals for access to fixed drive functions that include start, stop, external fault, speed, and enable.

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7. The VFD shall be capable of supporting up to 7 analog inputs, 7 analog outputs, 21 digital inputs, 7 relay outputs, 7 transistor outputs, and 3 positive temperature coefficient (PTC) inputs.
8. The Input / Output option modules shall have the following features:
    a) Analog Inputs:
        i. Quantity two (2) differentially isolated, ±10V (bi-polar), 88k ohm input impedance, 4-20 mA, 11 bit plus sign.
        ii. Analog inputs shall be user programmable for a variety of uses including frequency command and process loop input. Analog inputs shall be user programmable for function scaling (including invert), offset, signal loss detect, and square root.
    b) Analog Outputs:
        i. Quantity two (2) ±10V (bi-polar) / 11 bit and sign, 2 k ohm minimum load, 4-20 mA, 11 bit plus sign, 400 ohm maximum load.
        ii. The analog output shall be user programmable to be proportional to one of fourteen process parameters including output frequency, output current, encoder feedback, output power.
        iii. Programming shall be available to select either absolute or signed values of these parameters.
    c) Digital Inputs:
        i. Quantity of six (6) digital inputs rated 24V DC/115V AC.
        ii. All inputs shall be individually programmable for multiple functions including: Start, Run, Stop, Auxiliary Fault, Speed Select, Jog and Process PI functions.
    d) Digital Outputs:
        i. At least one (1) relay output (N.O. or N.C.).
        ii. For 240V AC or 24V DC, N.O. contact output ratings shall be 2-amp maximum, general purpose (inductive)/resistive. N.C. contact output ratings shall be 2-amp maximum, resistive only.
        iii. Relays shall be programmable to multiple conditions including: Fault, Alarm, At Speed, Drive Ready, and PI Excess Error.
        iv. Timers shall be available for each output to control the amount of time, after the occurring event, that the output relay actually changes state.
        v. At least one (1) transistor output.
        vi. For 24V DC, transistor output rating shall be 1-amp maximum, Resistive.

<u>Reference Signals</u>

1. The drive shall be capable of using the following input reference signals:
    a) Analog Inputs
    b) Preset Speeds

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c) Remote Potentiometer

d) Digital MOP

e) Human Interface Module

f) Communication Modules

Loss of Reference

1. The drive shall be capable of sensing reference loss conditions.
2. In the event of loss of the reference signal, the drive shall be user programmable to the following:
   a) Fault the drive and coast to stop.
   b) Issue a minor fault - allows the drive to continue running while some types of faults are present.
   c) Alarm and maintain last reference.
3. When using a communications network to control the drive, the communications adapter shall have these configurable responses to network disruptions and controller idle (fault or program) conditions:
   a) Fault
   b) Stop
   c) Zero Data
   d) Hold Last State
   e) Send Fault Configuration

Metering

1. At a minimum, the following parameters shall be accessible through the Human Interface Module, if installed:
   a) Output Current in Amps
   b) Output Voltage in Volts
   c) Output Power in kW
   d) Elapsed MWh
   e) DC Bus Voltage
   f) Frequency
   g) Heatsink Temperature
   h) Last eight (32) faults
   i) Elapsed Run Time
   j) IGBT Temperature
   k) Blown fuses, including specific fuse locations communicated to the host system

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Faults

1. At a minimum, the following faults shall be accessible through the Human Interface Module:
   a) Power Loss
   b) Undervoltage
   c) Overvoltage
   d) Motor Overload
   e) Heat Sink Over-temperature
   f) Maximum Retries
   g) Phase to Phase and Phase to Ground Faults

Predictive Maintenance Features

1. At a minimum, the following predictive diagnostic features shall be provided, and a parameter showing the remaining lifetime expressed as hours of the following components will be available:
   a) Relay Output Life Cycles based on load type and amps.
   b) Hours of Fan Life based on load and ambient temperature.
   c) Motor Bearing life based on expected hours of use.
   d) Motor Lubrication schedule based on hours of use.
   e) Machine Bearing life based on expected hours of use.
   f) DC Bus Capacitors based on actual use (temperature, current, and ripple).
   g) IGBTs based on actual load and temperature.
   h) LCL filter Capacitors based on actual use.

Real-Time Clock

1. Shall be capable of providing time stamped events.
2. Shall have the ability to be set locally or via a remote controller.
3. Shall provide the ability to be programmable for month, day, year and local time zones in HH:MM:SS.

VFD Packaged System

Basic Features

1. Ratings
   a) Voltage
      i. Capable of accepting nominal power of 480V AC at 60 Hz.
      ii. The supply input voltage tolerance shall be ± 10 percent of nominal line voltage.

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b) Displacement Power Factor

i. Six-pulse VFD shall be capable of maintaining a minimum true power factor (Displacement P.F. X Distortion P.F.) of 0.95 or better at rated load and nominal line voltage, over the entire speed range.

c) Efficiency

i. A minimum of 96.5 percent (+/- 1 percent) at 100 percent speed and 100 percent motor load at nominal line voltage.

ii. Control power supplies, control circuits, and cooling fans shall be included in all loss calculations.

d) Operating ambient temperature range without derating: 0 degrees Celsius to 40 degrees Celsius (32 degrees Fahrenheit to 104 degrees Fahrenheit).

e) Operating relative humidity range shall be 5 percent to 95 percent non-condensing.

f) Operating elevation shall be up to 1,000 Meters (3,300 ft) without derating.

2. Sizing

a) Systems rated at Normal Duty loads shall provide 110 percent overload capability for up to one minute and 150 percent for up to 3 seconds.

3. Auto Reset/Run

a) For faults other than those caused by a loss of power or any other non-critical fault, the drive system shall provide a means to automatically clear the fault and resume operation.

4. Ride-Through

a) The VFD system shall attempt to ride through power dips up to 20 percent of nominal. The duration of ride-through shall be inversely proportional to load. For outages greater than 20 percent, the drive shall stop the motor and issue a power loss alarm signal to a process controller, which may be forwarded to an external alarm signaling device.

5. Run on Power Up

a) The VFD system shall provide circuitry to allow for remote restart of equipment after a power outage. Unless indicated in the contact drawings, faults due to power outages shall be remotely resettable. The VFD system shall indicate a loss of power to a process controller, which may be forwarded to an external alarm signaling device. Upon indication of power restoration the process controller will attempt to clear any faults and issue a run command, if desired.

6. Communications

a) VFD shall be capable of communicating on multiple networks.

b) The VFD shall provide a Dual Port EtherNet/IP interface.

c) VFD shall be capable of supporting the following network options:

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i. EtherNet/IP

7. Enclosure Door Mounted Human Interface Module (HIM)
   a) VFD shall provide a HIM with integral LCD display, operating keys and programming keys.
   b) An enclosure door-mounted HIM, rated NEMA/UL Type 4/12, shall be provided.
   c) The HIM shall have the following features:
      i. A seven (7) line by twenty-one (21) character backlit LCD display with graphics capability.
      ii. Shall indicate drive operating conditions, adjustments, and fault indications.
      iii. Shall be configured to display in the following three distinct zones:
         a. The top zone shall display the status of direction, drive condition, fault / alarm conditions, and Auto / Manual mode.
         b. The middle zone shall display drive output frequency.
         c. The bottom zone shall be configurable as a display for either programming menus / information or as a two-line user display for two additional values utilizing scaled units.
      iv. Shall provide digital speed control.
      v. The keypad shall include programming keys, drive operating keys (Start, Stop, Direction, Jog, and Speed Control), and numeric keys for direct entry.

Enclosure

8. Shall be rated NEMA/UL (12)
9. Shall be painted per the manufacturer's standard.
10. Shall provide entry and exit locations for power cables.
11. Shall contain a label for UL508.
12. The drive system nameplate shall be marked with system Short Circuit Current Rating (SCCR).

Drive Enclosure Input Disconnect

13. Provide an enclosure door interlocked disconnect with a thermal magnet circuit breaker, or motor circuit protector.
14. Operator Handles
    a) Provide externally operated main disconnect handle.
    b) Handles shall be lockable with up to three lockout / tagout padlock positions.

Control Power Transformer

15. Provide a control power transformer mounted and wired inside of the drive system enclosure.

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16. The transformer shall be rated for the VFD power requirements.

Harmonic Mitigation Techniques

17. The drive system shall be compliant with IEEE 519-2014 standards at the input VFD terminals based upon the input power phase imbalance within 0.5 percent of nominal line voltage and under full VFD output current ratings

18. Passive Harmonic Filter

    a) VFDs shown with passive harmonic line filters shall be supplied with an input AC line harmonic filter compensated reactor with minimum 5 percent impedance unless noted otherwise on the one-line diagram. Line reactor shall be designed to address performance issues of NEMA MG1-20.55 and to provide proper transient protection of the VFD input power devices. Harmonic line filters shall be MTE Matrix Series AP Harmonic Filters or equal, with Capacitor Contactor for disconnecting the filter capacitor bank when the drive is not running.

Auxiliary Relays

19. Provide relays for Drive Alarm, Drive Ready, Drive Fault, Drive Run, and System Status Faults (as required).

20. See section 16.32.1 Relays.

Control Interface

21. The control terminals shall be rated for 115V AC.

22. The control interface shall provide input terminals for access to VFD functions that include start, stop, external fault, speed select, and enable, as required.

Hand/Off/Auto Selector Switch

23. Provide a "HAND/OFF/AUTO" selector switch, mounted on the enclosure door.

24. The "HAND/OFF/AUTO" selector switch shall start the drive in the “HAND” mode and stop the drive in the “OFF” mode.

25. In the “AUTO” mode the drive shall be started and stopped from a remote “RUN” contact.

26. In all modes, Auxiliary and Enable inputs to the drive control interface board must be present before the drive will start.

27. When a HIM is present, the stop function shall always be available to stop the drive regardless of the selected mode (“HAND” or “AUTO”). The HIM will be non-functional (except for the display and programming) when the switch is in “OFF” mode. The HIM shall stop the drive if the switch is in the “AUTO” mode with the remote start contact initiated.

28. The drive speed reference shall be controlled from the HIM, unless a separate door-mounted potentiometer is provided, when in “HAND” mode (factory default setting).

29. The drive speed reference shall be controlled by a remote 4…20 mA input when in “AUTO” mode.

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30. See section 16.31.5 Selector Switch.

Drive Disable Mushroom Push Button

31. Provide a maintained mushroom style push button, mounted on the enclosure door that when pushed, will open the drive enable input.
32. See section 16.31.4 Pushbuttons.

Pilot Lights

33. Provide LED pilot lights, mounted on the enclosure door, for indication of the following status:
    a) Run
    b) Drive Fault
    c) Emergency Stop
    d) High Pressure Alarm
34. See section 16.31.6 Indicating Lights.

Motor Run Time Meter

35. Provide a digital, non-resettable, door-mounted elapsed time meter.
36. The meter shall be electrically interlocked with the Drive Run relay and Bypass contactor to indicate actual motor operating hours.
37. See section 16.31.2 Run Time Meters.

Output Filtering

38. Drive Output Load Reactor
    a) Provide a drive output load reactor mounted within the drive system enclosure.
    b) The load reactor shall meet the following specifications:
        i. The construction shall consist of silicon steel laminations with an impedance of 5 percent.
        ii. Reactor construction shall utilize copper wire or copper foil for the windings.
        iii. The insulation shall be Class N, maximum temperature 200 degrees C.
        iv. The unit shall be rated for system voltage, ampacity, and frequency.
        v. The reactor shall operate at rated current with a maxim average winding temperature rise of 135 degrees C.

Part 3 – Execution

Setup

VFD Manufacturer shall program:

1. All fault settings to reset after fault condition returns to normal
2. Minimum and maximum motor speeds provided by motor manufacturer.

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3. Hertz change per second.
4. Hand speed control shall be set to 95 percent of full range for panel mounted HOA switch.
5. EtherNet/IP and HIM module communication faults/alarms to "No Action". Communication errors should not shut down the VFD.
6. Parameter 150 (Digital In Cfg) to "Run Level", not "Run Edge".
7. Parameter 292 and I/O card parameters 106 and 116 (Life Event Parameter Settings) to "No Action" so that these life event alarms do not fault the VFD.

VFD Supplier shall provide documentation on how to control the drive over EtherNet/IP. This information should include a unique list of parameter, relay, setpoint, input/output, and control addressing as shown on the Plans and detailed in these specifications. A generic list does not meet this requirement. An Add-on-instruction or profile compatible with Rockwell Automation Studio 5000 programming would meet this requirement.

Storage

Verify that the storage environment can be maintained within the service conditions required by the manufacturer of the VFD.

Testing

This equipment shall be tested by a qualified factory representative trained in start-up and troubleshooting procedures for equipment being installed.

All components shall be factory tested both by the manufacturer at the manufacturer's facility and in the presence of the Engineer by the manufacturer or manufacturer's representative at the manufacturer's facility or at a Contractor's shop located within 100 miles of the job site. Factory testing shall be witnessed by the Engineer. If factory witness testing is to occur at the manufacturer's facility, the manufacturer's facility where testing takes place shall be located within the United States of America. Shipment of VFD to the owner shall not be allowed until the Engineer has witnessed factory testing and approved the VFD for shipment to the job site.

16.50 PANELBOARDS

16.51 Low Voltage Service Switchboard

Part 1 - General

Description of Work

This section covers furnishing and installing a complete low voltage service switchboard as shown on the Plans and detailed within these specifications.

Design Requirements

The low voltage service switchboard shall be general purpose indoor construction, with pull section and breaker section configuration as shown on the Plans. Incoming feeder shall enter the pull section from the bottom. Outgoing feeders shall exit breaker section from the bottom.

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Equipment sizes shall not exceed the measurements shown on the plans without prior approval from the Engineer. Maximum spacing from the wall shall be ½-inch.

Standards and Codes

The switchboard shall meet all applicable UL, NEMA, NEC, and local code requirements for service entrance equipment, and shall contain all barriers required to isolate fused and non-fused conductors. The switchboard shall be furnished with a UL service entrance label.

Part 2 - Products

Manufacturer

Acceptable manufacturers shall be as follows:

- Siemens
- Schneider Electric (Square D)
- Eaton (Cutler-Hammer)
- General Electric

Manufactured Units

The switchboard shall be deadfront with front only accessibility. The framework shall be code gauge steel, rigidly welded. Floor sills and lifting means shall be provided. The color shall be manufacturer's standard gray.

The bus shall be tin plated copper of sufficient size to limit the temperature rise to 65 degrees Celsius, based on UL tests. Bus bracing shall be rated at least 65kA rms unless noted otherwise on the Plans.

The switchboard manufacturer shall be responsible for coordination, proper phasing, and internal busing to the outgoing busway.

The switchboard manufacturer shall be responsible for coordination and installation of the automatic transfer switch.

Provide utility current transformer compartment as shown on Plans that meets the requirements of the utility providing service.

A full-size neutral bus and code sized ground bus shall be provided. All buses shall be extended into the pull section and shall be mounted in the lower half of the equipment.

Molded-case circuit breakers with fixed frames shall be provided to serve feeders. Breakers shall have the frame and trip size as indicated on the Plans and shall be rated 100 percent. The breakers shall be rated a minimum 65k A.I.C. and be microprocessor controlled to monitor short time, long time, and instantaneous trip functions where indicated on the Plans.

The breakers shall have Ground Fault Protection and Indication equipment as required by the NEC in Article 230-95. All ground fault equipment shall be factory installed and tested by the Manufacturer.

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Power Monitoring

Customer owned metering equipment (Section 16.31.1) and associated sensors shall be provided by the Contractor in the pull section of the equipment as indicated on the Plans. See also Division 16.31.1 for digital power meter requirements.

Surge Protection Device (SPD)

See Division 16.36.1

Automatic Transfer Switch (ATS)

See Division 16.92

Part 3 – Execution

Testing

This equipment shall be tested and placed into operation by a qualified factory representative trained in start-up and troubleshooting procedures for equipment being installed.

Breakers installed in the low voltage service switchboard shall be fully tested and adjusted for coordinated trip settings by the Manufacturer of the switchboard following field installation of the equipment but prior to final inspection by the Engineer. The Manufacturer shall perform a protective device coordination study in accordance with Article 6.6 of the NETA, Acceptance Testing specifications. The Manufacturer shall furnish completed certified test reports to the Owner, indicating tests performed and all trip settings.

16.52 Common Work for Panelboards

Part 1 - General

Description of Work

This section covers the furnishing and installation of all panelboard equipment complete.

Quality Assurance

Provide products specified in this Section that are listed and labeled as defined in NEC Article 100.

Standards and Codes

All materials and equipment specified herein shall, within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

All material and equipment specified herein shall conform with all applicable NEMA, ANSI, and IEEE standards.

All materials and equipment specified herein, and their installation methods shall conform to the latest published version of the NEC.

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Part 2 – Products

Manufacturers

Materials, equipment, and accessories specified in this section shall be products of:

- Eaton/Cutler-Hammer
- Schneider Electric/Square D Company
- Siemens

Panelboards shall be of the same manufacturer as equipment furnished under Section 16.50, Low Voltage Motor Control.

Components

Panelboard Type

1. Panelboards shall be rated at proper voltage and current for intended use with bus bars of copper. Panels shall be 3-phase, 4-wire, 100 percent neutral, with equipment ground bar unless noted otherwise. Panelboards shall be dead front.

Wire Terminations

1. Panelboard assemblies, including protective devices, shall be suitable for use with 75 degrees Celsius or greater wire insulation systems at NEC 7 degrees Celsius conductor ampacity in accordance with UL 486E.

Load Current Ratings

1. Unless otherwise indicated, load current ratings for panelboard assemblies, including bus and circuit breakers, are non-continuous as defined by NEC. Continuous rating shall be 80 percent of non-continuous rating.
2. Where indicated "continuous", "100 percent", etc., selected components and protective devices shall be rated for continuous load value shown.
3. The following interrupting capacity shall be considered minimum. Other ratings shall be as specified on the Plans.

240V and 208Y/120V Panelboards	22,000 AIC symmetrical
480V/277V Panelboards	40,000 AIC symmetrical

Overcurrent Protective Devices

1. In accordance with NEMA AB 1, NEMA KS 1, UL 98 and UL 489, protective devices shall be adapted to panelboard installation.
2. Panelboards shall be capable of device replacement without disturbing adjacent devices and without removing main bus.
3. Spare Spaces: Cover openings with easily removable cover.
4. When not identified on Plans, provide minimum of 18 single-pole breaker spaces.

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Circuit Breakers

1. Provide thermal-magnetic unless otherwise indicated, quick-make, quick-break, molded case, of indicating type showing ON/OFF and TRIPPED positions of operating handle. Mount breakers in all panelboards so that the breaker handles operate in a horizontal plan.
2. The bus connection shall be bolt-on circuit breakers in all panelboards. In power distribution panelboards, 225-ampere frame sizes and greater may be plug-in type where individual positive locking device requires mechanical release for removal.
3. Trip Mechanism:
    a) Individual permanent thermal and magnetic trip elements in each pole.
    b) Test button on cover.
    c) Variable magnetic trip elements with a single continuous adjustment 3X to 10X for frames greater than 100 amps.
    d) Two and three pole breakers shall have common trip.
    e) Automatic opens all poles when overcurrent occurs on one pole.
    f) Calibrated for 40 degrees C ambient, unless shown otherwise.

Ground Fault Circuit Interrupter (GFCI)

1. Where indicated, equip breaker as specified above with ground fault sensor rated to trip on 5-mA ground fault with 0.025 second (UL 943, class A sensitivity, for protection for personnel).
2. Ground fault sensor shall be rated same as circuit breaker.
3. GFCI shall have a push-to-test button and a reset button.

Equipment Ground Fault Interrupter (EGFI)

1. Where indicated, equip breaker as specified above with ground fault sensor rated to trip on 30-mA ground fault (UL listed for equipment ground fault protection).

Cabinets for Each Panelboard

1. Cabinets shall be flush, or surface mounted as indicated on the Plans with tight closing doors without play when latched. Where two cabinets are located adjacent to each other in finished areas, provide matching trim of the same height.
2. Provide cabinets of sufficient dimensions to allow for future expansion and addition of circuit breakers within the panelboards as indicated on the Plans.
3. Provide locks for each cabinet door. All electrical distribution equipment locks are to be keyed identically.
4. Fasten panelboard with machine screws with oval countersunk heads, finish hardware quality, with escutcheons or approved trim clamps. Clamps assessable only when dead front door is open are acceptable. Surface mounted panelboards with fronts greater than 48 inches vertical dimension shall have trim hinged at the right side in addition to the hinged door over dead front.

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5. Material for Type 1, Type 3R, and Type 3S cabinets shall be code-gauge, hot-dip galvanized sheet steel with reinforced steel frame.
6. Finish all enclosures with rust inhibitor primer followed by manufacturer's standard gray baked enamel or lacquer.

Bus

1. Material for internal bus shall be full size copper throughout length. Provide for mounting of future protective devices along full length of bus regardless of number of units and spaces shown. Machine, drill and tap as required for current and future positions.

Feeder Lugs

1. Main and neutral feeder lugs shall be replaceable, bolted mechanical or crimp compression type.

Equipment Ground Terminal Bus

1. Provide copper equipment ground terminal bus with suitably sized provisions for termination of ground conductors. The terminal bus shall be bonded to the enclosure.
2. Provide individual mechanical termination points no less than the quantity of breaker pole positions.
3. Provide individual termination points for all other grounding conductors such as feeder, grounding electrodes, etc.

Neutral Terminal Bus

1. Provide copper neutral terminal bus with suitably sized provisions for termination of neutral conductors. The neutral bus shall be isolated from the enclosure.
2. Provide individual mechanical termination points no less than the quantity of breaker pole positions.
3. Provide individual termination points for all other neutral conductors.
4. Termination points shall be bolted crimp compression lugs for conductors 6 AWG or larger.

Part 3 – Execution

General

Install in accordance with NECA 407, NEMP PB 1.2 and manufacturers' written installation instructions.

Installation

Install securely, plumb, in-line and square with walls.

Install top of panelboard trim 72 inches above floor, unless otherwise shown. Install panelboard so tops of protective device operating handles are no more than 72 inches above the floor.

Install filler plates in unused spaces.

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System of Numbering and Bus Arrangement

System numbering and bus arrangement shall be as shown on the panel schedule on the Plans.

Panelboard Nameplate

Provide engraved plastic nameplate with ½-inch high characters for panel identifications (for panel name) attached with screws to each panelboard front. Include voltage, phase and wire (i.e., 208Y/120, 3-phase, 4-wire) in ⅜-inch characters.

Circuit Index

Provide as-built information for each branch circuit panelboard by circuit with its proper load designation.

Ground Fault Protection

Install panelboard ground fault circuit interrupter devices in accordance with installation guidelines of NEMA 289.

16.55 Switches and Protective Devices

16.55.1 Common Work for Switches and Protective Devices

Part 1 - General

Design Requirements

Overcurrent devices shall be NEMA rated.

Extra Materials

Provide one fuse for each ungrounded conductor and a minimum of one spare fuse per phase of each ampacity and voltage used on the project. Deliver fuses to Owner at the completion of the project.

Part 3 – Execution

Installation

Overcurrent protection devices and safety switches shall be centered 60 inches above the finished floor unless noted otherwise on the Plans.

16.55.13 Fuses

Part 1 - General

Design Requirements

Fuses shall be of the type and amperage indicated on the Plans. The voltage rating shall be appropriate for the application indicated. The fuse types indicated on the Plans imply a certain set of fuse characteristics. No substitutions of fuse types will be allowed without Engineer approval.

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Part 2 - Products

Manufacturers

Fuses shall be:

- Bussman
- Gould Shawmut
- Littlefuse
- Reliance
- Or Equal

Materials

Fuses in motor circuits which are indicated but not sized, shall be provided with Manufacturer's recommended size based on the actual motor installed. In-line or integrally-mounted fuse clips shall be provided on all control power or low-voltage transformers.

16.55.16 Molded Case Circuit Breakers

Part 1 - General

Design Requirements

Breakers shall have the interrupting rating and trip rating indicated on the Plans. All breakers shall be calibrated for operation in an ambient temperature of 40 degrees Celsius.

Part 2 - Products

Manufactured Units

Molded case circuit breakers shall be quick-make and quick-break type with wiping type contacts. Each breaker shall be provided with arc chutes and individual trip mechanisms on each pole consisting of both thermal and magnetic trip elements. Two and three pole breakers shall be common trip. Molded case circuit breakers shall be trip-free. Each breaker shall have trip indication independent of the "ON" or "OFF" positions.

16.55.18 Disconnect Switches

Part 1 - General

Design Requirements

Furnish and install disconnect switches conforming to NEMA KS 1, type HD, sized for the ampere and voltage as shown on the Plans and as required by the NEC and nameplate requirements of the equipment served.

Part 2 - Products

Manufactured Units

The switches shall be 600-volt type and horsepower rated. Auxiliary contacts shall be provided as indicated on the Plans.

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Part 3 – Execution

Installation

Provide additional disconnects if required by Code.

16.60 CONDUCTORS

16.61 Low Voltage Wire and Cable

Part 1 - General

Design Requirements

This section is for power and control conductors for 600 volts or less.

All conductors shall be copper. Wire or cable not shown on the Plans or specified, but required, shall be of the type and size required for the application and in conformance with the applicable code.

Part 2 - Products

Materials

Conductors

1. Solid and stranded copper wire shall be 600-volt Type THW, THWN, or THHW, Class B stranding, sizes #14 AWG, #12 AWG, and #10 AWG only. Use of THHN insulation shall not be allowed. Aluminum conductors shall not be allowed.
2. Stranded copper wire shall be 600-volt Type XHHW, Class B stranding, sizes #8 AWG and larger. Aluminum conductors shall not be allowed.

Splices

1. For Lighting Systems and Power Outlets: Wire nuts shall be twist-on type insulated connectors utilizing an outer insulating cover and a means for connecting and holding the conductors firmly.
2. All Equipment: Crimp type connectors shall be insulated type, suitable for the size and material of the wires and the number of wires to be spliced and for use with either solid or stranded conductors.
3. Division 16 Equipment and Power Conductors: Bolted pressure connectors shall be suitable for the size and material of the conductors to be spliced.
4. All Equipment: Epoxy splice kits shall include epoxy resin, hardener, mold, and shall be suitable for use in wet and hazardous locations.

Terminations

1. Crimp type terminals shall be self-insulating sleeve type, with ring or rectangular type tongue, suitable for the size and material of the wire to be terminated, and for use with either solid or stranded conductors.

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2. Terminal lugs shall be split bolt or bolted split sleeve type in which the bolt or set screw does not bear directly on the conductor.
3. Wire Markers shall be plastic sleeve type. Wire numbers shall be permanently imprinted on the markers.

Finishes

Color Coding: Provide color coding for all circuit conductors. Insulation color shall be white for neutrals and green for grounding conductors. An isolated ground conductor shall be identified with an orange tracer in the green body. Ungrounded conductor colors shall be as follows:

1. 120/208 Volt, 3 Phase: Red, black and blue.
2. 277/480 Volt, 3 Phase: Yellow, brown and orange.
3. 120/240 Volt, 1 Phase: Red and black.

Part 3 – Execution

Location (Installment) Schedule

Provide the following conductors for the following applications:

1. Use stranded copper conductors for all power and control circuits unless noted otherwise on plans or below. Size as noted on the Plans.
2. Contractor may use solid copper conductors for lighting and receptacle circuits using screw-type terminals. Size as noted on the Plans.
3. Size #14 AWG wire or smaller shall not be allowed on power circuits.

Installation

Conductor Splices

1. Splices: Install all conductors without splices unless necessary for installation, as determined by the Engineer. Splices when permitted shall be completed using an approved splice kit intended for the type of conductor and the application. The splice shall be in accordance with the splice kit manufacturer's instructions.
2. Underground Splices: All underground outdoor splices when approved by Engineer shall be completed in an accessible pullbox or handhole using an approved watertight epoxy resin splice kit rated for the application up to 600 volts. Splices will not be allowed to be direct buried.

Conductor Identification

1. Except for interior lighting and receptacle circuits, identify each wire or cable at each termination and in each pullbox, junction box, handhole, and manhole using numbered and lettered wire markers. All electrically common conductors shall have the same number. Each electrically different conductor shall be uniquely numbered. Identify panelboard circuits using the panelboard identification and circuit number. Identify motor control circuits using the equipment identification number assigned to the control unit by the

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motor control center manufacturer and the motor control unit terminal number. Identify other circuits as shown in the circuit schedule as favorably by the Engineer.

2. Conductors between terminals of different numbers shall have both terminal numbers shown at each conductor end. The terminal number closest to the end of the wire shall be the same as the terminal number.

Testing

Insulation Resistance Tests: For all circuits 150 volts to ground or more and for all motor circuits over ½ horsepower, test cables per NETA Paragraph 7.3.1. The insulation resistance shall be 20 megohms or more. Submit results to Engineer for review.

16.63 Signal Cable

Part 2 - Products

Materials

Twisted Shielded Pairs (TSP)

1. Cable shall conform to IEEE 383, UL 13, and UL 83 and shall be type PLTC cable suitable for direct burial. Each TSP shall consist of two #16 AWG, 7-strand copper conductors per ASTM B8 with 15 Mils PVC insulation and individual conductor jacket of nylon. Conductors shall be twisted with 2-inch or shorter lay, with 100 percent foil shielding and tinned copper drain wires. The cable shall have an overall PVC jacket with a thickness of 35 Mils. The insulation system shall be rated at 90 degrees Celsius and for operation at 600 volts.

Cat 5E Ethernet Cable

1. The Ethernet cable shall be shielded 600V UL rated. The use of a 300V rated cable is not acceptable. All Ethernet cable terminating outside of a telemetry panel shall be grounded at the telemetry panel only.
2. Ethernet cables shall be industrial type Ethernet cable and UL listed for installation in the Motor Control Center. Ethernet cables shall be Allen-Bradley Ethernet Cable with metal In-cabinet RJ45 Connectors, no substitutions.

Fiber Optic Cable

1. Fiber optic cable shall be OS2 single-mode fiber cable with a minimum of 12 fibers. Cable jacketing shall be black and OFNR riser rated for vertical-run and general use. Provide cable with high grade PVC molded strain relief. Each fiber optic cable terminating at a fiber optic patch panel shall have an SC connector. Each fiber optic cable terminating at a switch shall have an LC connector. Cables shall be listed and marked in accordance with the requirements of the NEC. Cables shall be Corning FREEDM Loose Tube, Indoor/Outdoor, Gel-Free cables or equal. Provide SFP connectors as described in Division 17.
2. Fiber optic patch cable shall be a duplex single-mode fiber optic patch cable. Cable jacketing shall be yellow. Provide cable with high grade PVC molded strain relief. Each fiber optic patch cable shall have an SC connector for terminating at the patch

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panel and an LC connector for terminating at the switch. Connectors shall match existing connectors used by the PUD and shall be verified by the Contractor prior to submitting and ordering cables.

Part 3 - Execution

Installation

Cable Installation

1. Cables shall be continuous from initiation to termination without splices.
2. Cable shielding shall be grounded at one end of the cable only. Bonding shall be to a single ground point only. Bonding from cable to cable in multiple run installations shall not be permitted.
3. Install instrumentation cables in separate raceway systems with voltages not to exceed 30 volts DC.

Conductor Identification

1. Except for interior lighting and receptacle circuits, identify each wire or cable at each termination and in each pullbox, junction box, handhole, and manhole using numbered and lettered wire markers. All electrically common conductors shall have the same number. Each electrically different conductor shall be uniquely numbered. Identify panelboard circuits using the panelboard identification and circuit number. Identify motor control circuits using the equipment identification number assigned to the control unit by the motor control center manufacturer and the motor control unit terminal number. Identify other circuits as shown in the circuit schedule as determined by the Engineer.
2. Conductors between terminals of different numbers shall have both terminal numbers shown at each conductor end. The terminal number closest to the end of the wire shall be the same as the terminal number.

Testing

Insulation Resistance Tests: Perform insulation resistance on all circuits. Make these tests before any equipment has been connected. Test the insulation with a 500 Vdc insulation resistance tester with a scale reading 100 mega ohms. The insulation resistance shall be 20 mega ohms or more. Submit results to Engineer for review.

16.70 RACEWAYS, BOXES, AND FITTINGS

16.71 Raceways

Part 1 – General

Design Requirements

Conduit sizes not noted on Plans shall be in accordance with NEC requirements for the quantities and sizes of wire installed therein.

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Part 2 – Products

Components

Conduit and Fittings

1. Galvanized Rigid Steel (GRS): Rigid conduit shall be steel, hot dipped galvanized inside and out. The GRS must meet USA Standards Institute C80-1 Underwriters Laboratories Standard UL6 and carry a UL label. Use cast threaded hub fittings and junction boxes for all rigid conduit except in locations not permitted by the NEC.
2. PVC Coated Rigid Steel Conduit (PVC-GRS): PVC coated conduit shall meet the GRS standard above plus have a 40 Mil PVC factory applied PVC coating.
3. Nonmetallic Conduit: Nonmetallic Conduit shall be rigid PVC, Schedule 40 (PVC-40) or 80 (PVC-80). PVC conduit installed above grade shall be Schedule 80 extra heavy wall 90 degree Celsius. UL listed for aboveground use and UV resistant. Conduit shall be gray in color. Fittings shall be of the same material as the raceway and installed with solvent per the Manufacturer's instructions. Conduit, fittings, and solvent shall all be manufactured by the same Manufacturer.
4. Flexible Metal Conduit (Flex-LT): Flexible conduit shall be interlocking single strip, hot dipped galvanized and shall have a polyvinyl chloride jacket extruded over the outside to form a flexible watertight raceway. Flexible conduit shall be American Brass Company Sealtite Type VA, General Electric Type UA or equal.
5. Electrical Metallic Tubing (EMT): EMT shall be UL 797 and ANSI C80.3; steel tubing, hot dipped galvanized. EMT fittings shall be ANSI/NEMA FB 1; steel, rain tight, insulated throat, compression type.

Conduit and Cable Supports

1. Conduit Supports: Hot dipped galvanized framing channel shall be used to support groups of conduit. Individual conduit supports shall be one-hole galvanized malleable iron pipe straps used with galvanized clamp backs and nesting backs where required. Conduit support for PVC or PVC coated rigid steel shall be one-hole PVC or epoxy coated clamps or PVC conduit wall hangers.
2. Ceiling Hangers: Ceiling hangers shall be adjustable galvanized carbon steel rod hangers. Unless otherwise specified, hanger rods shall be ½-inch all-thread rod and shall meet ASTM A193. Hanger rods in corrosive areas and those exposed to weather or moisture shall be stainless steel.

Conduit Sealants

1. Moisture Barrier Types: Sealant shall be a non-toxic, non-shrink, non-hardening, putty type hand applied material providing an effective barrier under submerged conditions.
2. Fire Retardant Types: Fire stop material shall be a reusable, non-toxic, asbestos-free, expanding, putty type material with a 3-hour rating in accordance with UL 1479. Provide products indicated by the manufacturer to be suitable for the type and size of penetration.

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Part 3 - Installation

Raceway Applications

Galvanized Rigid Steel (GRS) conduit shall be used in all locations unless noted otherwise below or on the Plans.

ABOVE GRADE CONDUITS (non-corrosive areas) shall be:

1. GRS for power and control wiring.
2. GRS for instrumentation and telecommunications wiring.
3. GRS for motor leads from VFDs.
4. EMT for above-grade lighting circuits.

ABOVE GRADE CONDUITS (wet or corrosive areas, NFPA 70 hazardous areas) shall be:

1. PVC-GRS for power and control wiring.
2. PVC-GRS for instrumentation and telecommunications wiring.
3. PVC-GRS for motor leads from VFDs.

CONCEALED ABOVE GRADE CONDUITS shall be:

1. GRS for all wire and cable types in wood stud frame walls.
2. PVC-40 for power and control wiring in concrete block or brick walls.
3. PVC-40 for instrumentation and telecommunications wiring in CMU or brick walls.
4. GRS for motor leads from VFDs in CMU or brick walls.

BELOW GRADE CONDUITS IN DIRECT EARTH (not under slabs-on-grade) shall be:

1. PVC-40 for power and control wiring.
    a) Sweeps and risers for transition of PVC from below grade to above grade shall be PVC-GRS.
2. PVC-GRS for instrumentation and telecommunications wiring.
3. PVC-GRS for motor leads from VFDs.

UNDER SLABS-ON-GRADE CONDUIT shall be:

1. PVC-40 for power and control wiring
    a) Sweeps and risers for transition of PVC from below grade to above grade shall be PVC-GRS.
2. PVC-GRS for instrumentation and telecommunications wiring.
3. PVC-GRS for motor leads from VFDs.

CONCRETE-ENCASED CONDUITS shall be:

1. PVC-40 for power and control wiring

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a) Sweeps and risers for transition of PVC from below grade to above grade shall be PVC-GRS.

2. PVC-40 for instrumentation and telecommunications wiring.
   a) Sweeps and risers for transition of PVC from concrete-encasement to above grade shall be PVC-GRS.
3. PVC-GRS for motor leads from VFDs.

ALL CONNECTIONS TO VIBRATING EQUIPMENT OR MOTORS shall be:

1. Liquidtight flexible metallic conduit for indoor, non-corrosive areas and all motor leads from VFDs.
2. Connection to equipment outdoors or in corrosive areas shall be with non-metallic liquidtight flexible conduit (except for motor leads from VFDs shall be flexible metallic.)

Installation

All conduits shall be concealed in the floor, walls, ceiling slab, or beneath the floor slab. Surface mounted conduit will not be accepted unless noted otherwise on the construction Plans.

Size of Raceways:

1. Raceway sizes as shown on the Plans, if not shown on the Plans, then size in accordance with NFPA 70.
2. Unless specifically indicated otherwise, the minimum raceway size shall be:
   a) Conduit: ¾-inch

All raceways shall contain a separate grounding conductor.

Spare conduits shall contain one $^{3}/_{16}$-inch diameter nylon pull rope.

Conduit routing is shown diagrammatic on the Plans. Contractor is responsible for routing the conduits in a neat manner, parallel and perpendicular to walls and ceilings.

Location of conduit ends are shown approximately. Contractor is responsible for ending conduits in location that will not conflict with electrical equipment. Route conduit ends to facilitate ease of equipment maintenance. Conduits extending from the floor to a device shall be located as close as possible to avoid creating a hazard.

Conduit shall not be routed on exterior of structures except as specifically indicated on the Plans.

Where water cannot drain to openings, provide drain fittings in the low spots of the conduit run.

Securely fasten raceways at intervals and locations required by NEC, or the type of raceway employed.

Provide all required openings in walls, floors and ceilings for conduit penetration.

1. Do not install one (1) inch and larger raceways in or through structural members (beams, slabs, etc.) unless approved by Engineer.

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2. New Construction: Avoid cutting openings, where possible, by setting sleeves or frames in masonry and concrete, and by requesting openings in advance.
3. Existing Construction: Core drill openings in masonry and concrete. Avoid structural members and rebar.

Conduit encasement or embedment in the earth shall be separated from the earth by at least 3-inches of concrete unless otherwise shown on the Plans. Plastic conduit spacers shall be located five feet on centers. The spacers shall be secured to the conduits by wire ties. The conduits shall be watertight.

Analog signal conduits shall be separated from power or control conduits. The separation shall be a minimum of 12-inches for metallic conduits and 24-inches for nonmetallic conduits.

Install explosion-proof seal-offs in hazardous areas shown on the Plans and as required by the NEC.

Plastic raceway joints shall be solvent cemented in accordance with recommendations of raceway manufacturer.

All conduit openings not encased in a panel shall be sealed with duct seal.

16.72 Boxes and Enclosures

16.72.2 Outlet and Junction Boxes

Part 1 – General

Design Requirements

In corrosive areas, all junction boxes shall be NEMA 4X.

Outlet boxes and switch boxes shall be designed for mounting flush wiring devices.

Outlet boxes shall not be less than 4-inch square and 1½-inch deep. Ceiling boxes shall withstand a vertical force of 200 pounds for five minutes. Wall boxes shall withstand a vertical downward force of 50 pounds for five minutes.

Part 2 – Products

Materials

Use cast boxes with threaded hubs for all rigid and intermediate conduits. Steel boxes may be used with rigid and intermediate conduits where cast boxes are not allowed by the NEC. All boxes shall be of proper size to accommodate devices, connectors, and number of wires present in the box. Boxes shall be readily accessible.

Cast box bodies and cover shall be cast or malleable iron with a minimum wall thickness of ⅛-inch at every point, and not less than ¼-inch at tapped holes for rigid conduit. Bosses are not acceptable. Mounting lugs shall be provided at the back or bottom corners of the body. Covers shall be secured to the box body with No. 6 or larger brass or bronze flathead screws. Boxes shall be provided with neoprene cover gaskets. Outlet boxes shall be of the FS types. Boxes shall conform to FS W-C-586C and UL 514.

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Sheet metal boxes shall conform to UL 50, with a hot-dipped galvanized finish conforming to ASTM A123. Boxes and box extension rings shall be provided with knockouts. Boxes shall be formed in one piece from carbon-steel sheets.

Non-metallic boxes shall be hot-compressed fiberglass, one-piece, molded with reinforcing of polyester material, with a minimum wall thickness of ⅛-inch.

Finishes

Where only cast aluminum is available for certain types of fixture boxes, an epoxy finish shall be provided.

16.75 Wiring Devices

16.75.1 Common Work for Wiring Devices

Part 3 - Execution

Installation

Wiring Devices

1. Position of Outlets: All outlets shall be centered with regard to building lines, furring and trim, symmetrically arranged in the room or outside the structure. Device outlets shall be set plumb and shall extend flush to the finished surface of the wall, ceiling or floor without projecting beyond the same.
2. Unless otherwise noted, wall mounted outlet devices shall generally be 24-inches above the floor, 18 inches in architecturally treated areas, above process piping near process valve boards. Switches shall be 48 inches above the finished floor unless otherwise noted.

Installation of Wall Plates

1. Interior Dry Locations: Install plates so that all four edges are in continuous contact with the finished wall surfaces. Plaster filled will not be permitted. Do not use oversize plates or sectional plates.
2. Exterior and/or Wet Locations: Install plates with gaskets on wiring devices in such a manner as to provide a rain tight weatherproof installation. For receptacle devices, these plates shall maintain the weatherproof rating with an attachment plug inserted and be rated extra-duty. Cover type shall match box type.

Testing

After installation of receptacles, circuits shall be energized, and each receptacle tested for proper ground continuity, reversed polarity, and/or open neutral condition.

GFI receptacles shall be tested with the circuits energized. Devices shall be tested with a portable GFI receptacle tester capable of circulating 7.5 milliamperes of current, when plugged in, between the "hot" line and "ground" to produce tripping of the receptacle. Resetting and tripping shall be checked at least twice at each GFI receptacle.

Submit results of all field testing to the Engineer for review.

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16.75.2 Receptacles

Part 1 – General

Design Requirements

Receptacles shall be heavy duty, high abuse, grounding type conforming to NEMA configurations, NEMA WD1 and UL 514 Standards.

Part 2 – Products

Materials

Single and Duplex Receptacles

1. Indoor Clean Areas: Receptacles shall be duplex, 20 amp, NEMA 5-20R, and shall accept NEMA 5-15P and 5-15P plug caps. Receptacles shall be Hubbel 5362, General Electric 4108-2, or equal. Color shall be brown in industrial areas and ivory or white in office and laboratory areas.
2. Outdoor, Process, or Corrosive Areas: Receptacles shall be duplex, 20 amp, NEMA 5-20R, and shall accept NEMA 5-15P and 5-20P plug caps. Receptacle and plug caps shall be corrosion resistant, marine duty with yellow polycarbonate weatherproof lift covers. Receptacles shall be Hubbell 53CM62/53CM21 or equal.

GFI Receptacles

1. Device shall be rated 20 amp, 2-pole, 3-wire, 120-volt, conforming to NEMA WD1.10 configuration. Device shall have a test and reset push buttons. GFI device shall be Hubbell 5362 or equal.

Surface Multiple Outlet Assemblies

1. Units shall have outlets on center-to-center spacing as shown on the Plans. Assembly shall conform to Article 353 of the NEC.

16.75.3 Line Voltage Switches

Part 2 – Products

Manufacturers

- Sierra Electric
- Monumental Grade, Catalog No. 5721
- Daniel Woodhead 1900 series
- Or Equal

Materials

Line Voltage Types: Switches shall be rated 20 amps at 120 or 277 volts AC only. Units shall be flush mounted, self-grounding, quiet operating toggle devices. Handle color shall be brown in industrial areas and white or ivory in office or laboratory areas. Units shall conform to Federal Specifications W-S-896 D and E, UL 20, and NEMA WD1 standards.

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16.75.4 HOA (Hand-Off-Auto) Lighting Switches

Part 2 – Products

Manufacturers

- Bryant No. 4925 or Equal

Materials

HOA Switch (Lighting): Switches shall be rated 20 amps at 120 volts AC, 3-position toggle, positive action with "center-off" maintained contact, double pole.

16.75.5 Plates

Part 1 – General

Design Requirements

Plates shall be of the style and color to match the wiring devices, and of the required number of gangs. Plates shall conform to NEMA WD1, UL 514, and ANSI C73. In noncorrosive indoor areas, device plates shall be made of sheet steel, zinc electroplated with chrome finish.

Device plates in corrosive or outdoor areas shall be corrosion-resistant/marine-duty type with weather protective double doors. Device plates for explosion-proof equipment shall be factory provided with the equipment.

Part 2 – Products

Manufacturers

As manufactured by

- Crouse-Hinds
- Appleton
- Or Equal

Components

Device plates shall be provided with engraved laminated phenolic nameplates with ⅛-inch white characters on black background. Nameplates for switches shall identify panel and circuit number and area served. Nameplates for receptacles shall identify circuit and voltage if other than 120 volts, single-phase.

16.85 Lighting

16.85.1 Common Work for Lighting Fixtures

Part 1 - General

Design Requirements

Fixtures shall be a standard, cataloged item general description as called for on the Plans. All fixtures shall be UL approved and so labeled. Provide suitable supports and mountings.

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Part 2 – Products

Manufacturers

As shown on Plans. Equals will be accepted.

16.85.2 Lamps

Part 1 - General

Design Requirements

Provide all lamps as specified. Refer to the Lighting Fixture Schedule on the Plans for the ordering information on lamps. Lamps shall be new at the time of acceptance.

Warranty

Lamps that fail within 90 days after acceptance by the Owner shall be replaced at no cost to the Owner.

Part 2 – Products

Manufacturers

Approved manufacturers:

- Westinghouse
- Sylvania
- G.E.

16.85.3 Fixtures

Part 1 - General

Design Requirements

Fixtures shall be of the types, wattages, and voltages shown on the Plans, comply with UL 57, and shall be UL classified and labeled for intended use.

16.90 POWER GENERATION

16.92 Transfer Switches

16.92.2 Automatic Transfer Switch

Part 1 - General

Design Criteria

The transfer switch shall be equipped with four poles for normal and emergency service of 480 volts, 60 hertz, 3-phase.

The transfer switch shall be mechanically and electrically held and rated to 480 volts for all classes of load and continuous inductive duty.

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The transfer switch shall conform to UL 1008 provisions for Withstand Current Ratings and Closing Ratings. The transfer switch shall be rated at a minimum Withstand Rating of 42,000 Amps.

The switch shall be capable of enduring 6,000 cycles of complete opening and closing at rated current and voltage at a rate of 6 cycles per minute without failure.

The switch shall be double throw inherently interlocked mechanically and electrically to prevent supplying the load from both sources simultaneously. The operating current shall be obtained from the source to which the load is to be transferred. The transfer mechanism shall be of the double break design with solid silver cadmium surface contacts and individual heat resistant arc chambers.

Arc barriers and magnetic blowout coils will also be acceptable if single break contacts are used. The contacts shall be capable of carrying 20 times the continuous rating for interrupting current.

All contacts, coils, etc. shall be readily accessible for replacement from front of panel without major disassembly of associated parts.

Provide relays, wiring and terminal blocks to monitor the integrity of the generator start signal. Modify existing generator as necessary to comply with NEC requirements.

Part 2 – Products

Manufactured Units

The automatic transfer switch shall be an open frame Cummins OTPC, or equal. ATS to be installed inside of switchboard as shown on the Plans.

Components

The transfer switch shall include the following accessories:

Undervoltage Sensor

1. Adjustable solid-state low voltage sensing relays (pick up 85 to 98 percent of normal voltage set at 98 percent; drop out 75 to 100 percent set of 90 percent of pickup setting). Provide for each phase on both utility and backup power sources.

Time Delay Start and Stop on Drop Out

1. Solid state adjustable time delay on start (0 to 15 seconds). Set start delay for 15 seconds. Timer will send start signal to gen set CP, where louver timer will allow 15 second delay for louvers to open prior to starting gen set.

Time Delay Stop

1. Solid state adjustable time delay (0 to 10 minutes) to allow generator cooldown after normal power is restored and retransfer occurs. Set at 5 minutes.

Time Delay Transfer and Retransfer

1. Solid state time delay relay adjustable 2 to 120 seconds for transfer to emergency and 0 to 30 minutes for retransfer to normal. Set at 5 minutes for retransfer to normal. Set at 3 seconds for transfer to emergency.

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With or Without Load Selector Switch

1. Switch to select exercise with or without station load.

Normal-Test Switch

1. Switch such that in the "Normal" mode the transfer switch will operate automatically and in the "Test" mode the generator will start for test purposes. This switch shall work in conjunction with the "With" or "Without" load switch.

Exerciser Clock

1. Provide solid state exerciser clock to set the day, time, and duration of generator set exercise/test period. Provide "With" or "Without" load selector switch for the exercise period.

Programmed Transition

1. The load transfer control shall be capable of remaining in the neutral position for an adjustable time of 0.5 to 60 seconds when transferring from on-line power source to the other to allow residual voltages to decay before application of the source. Set at 60 seconds.
    a) Position lights for normal and emergency positions indication and for normal and emergency power available.
    b) Switch position indication limit switches for normal and generator positions.
    c) Provide dry contacts wired to terminal strip for 1) ATS in emergency position, 2) ATS in normal position, 3) ATS pre-transfer status.
    d) Provide contacts and necessary power transformer(s) for supplying power to the EG room intake and exhaust louvers. Contacts shall close once the EG is called to start.

Power Meters

1. Provide a digital AC Voltmeter, an Ammeter, and a Frequency meter.

Operator Interface Display

1. Provide operator interface display that allows operators to adjust all settings and see all values.

Control Board

1. Provide current generation hardware and firmware for the control board.

Provide manual override switch to bypass the control system and transfer load from source to source when control is disabled.

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16.95 Testing

16.95.1 Common Work for Testing

Part 1 - General

Submittals

Test reports shall be submitted to the Engineer prior to final acceptance in accordance with Division 1.33 of these specifications.

Scheduling and Coordination

The Contractor shall inform the Engineer in advance of testing in accordance with the requirements listed in Division 1 of these specifications.

Prior to scheduling the testing, the Contractor shall have satisfied themselves that the project area is properly cleaned up; all patching and painting deemed necessary properly completed; and all systems, equipment and controls are functioning as intended.

Part 2 - Products

Source Quality Control

Submit reports of factory tests and adjustments performed by equipment manufacturers to the Engineer prior to field testing and adjustment of equipment. These reports shall identify the equipment and show dates, results of test, measured values and final adjustment settings. Provide factory tests and adjustments for equipment where factory tests are specified in the equipment specifications. The Engineer may inspect the fabricated equipment at the factory before shipment to job site. Provide the Engineer with sufficient prior notice so that an inspection can be arranged at the factory.

Part 3 – Execution

Site Testing

Test all circuits for continuity, freedom from ground, and proper operation during progress of the work.

Insulation Resistance, Continuity, and Rotation: Perform routine insulation resistance, continuity and rotation tests for all distribution and utilization equipment prior and in addition to tests performed by the testing laboratory specified herein.

Electric Motors: Perform voltage, current and resistance tests on all motors ½ horsepower and larger installed this project. Insulation resistance readings shall be taken with a 500-volt megger for 30 seconds with the circuit conductors connected to the motor. Verify that an overload condition does not exist.

Conduct special test as required for service and/or system ground.

Arc Flash Study, Protection Device Coordination, and Short Circuit Analysis

Contractor shall provide an Arc Flash Hazard Study for the electrical distribution system shown on the Plans. The intent of the Arc Flash Hazard Study is to determine hazards that exist at each major piece of electrical equipment shown on the one-line diagrams. This includes

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switchgear, switchboards, panelboards, motor control centers, generators, transfer switches, and transformers. The study will include creation of Arc Flash Hazard Warning Labels listing all items as required in NFPA 70E-2018. These labels serve as a guide to assist technicians and others in the selection of proper Personal Protective Equipment when working around exposed and energized conductors. The contractor shall install the labels. The arc flash hazard study shall consider all operating scenarios during normal conditions alternate operations, emergency power conditions, and any other operations, which could result in maximum arc flash hazard. The label shall list the maximum incidental energy calculated and the scenario number and description on the label.

Submit arc flash hazard study results and draft warning labels for review and approval by the Engineer prior to label installation.

Field Quality Control

General

1. Conduct final test in the presence of Owner and/or their authorized representative. Contractor shall provide all testing instrumentation and labor required to demonstrate satisfactory operation of systems, equipment and controls.

Operational Tests

1. Operational test all circuits to demonstrate that the circuits and equipment have been properly installed, adjusted and are ready for full-time service. Demonstrate the proper functioning of circuits in all modes of operation, and including alarm conditions, and demonstrate satisfactory interfacing with the data acquisition and alarm systems.

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16.95.3 Conductor Test Report

Conductor Test Report Page 1 of 1														
PROJECT:								OWNER:						
Contractor Co. Name: Tested by:								Phone Number: Test Date:						
Race-way Label (1)	V (2)	C (3)	Operating Load Voltage						Insulation Resistance - OHMS					
			VAB	VCB	VCA	VAN	VBN	VCN	A-B	B-C	C-A	A-G	B-G	C-G
A														
B														
C														
D														
E														
F														
G														

1. Refer to raceway and wire schedule and one-line diagram for description of feeder identified by label shown on this report
2. Visual Inspection – Check when completed
3. Continuity Test – Check when completed

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16.95.4 Ground Electrode Resistance Test Report

Ground Electrode Resistance Test Report	
PROJECT:	OWNER:
Contractor Co. Name: **Tested by**:	Phone Number: Test Date:
Test Meter Type: **Test Distance-D**: **Soil Conditions**: **Measured Resistance**:	
DESCRIPTION OF TEST PROCEDURE, CONDITIONS, RESULTS:	

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Division 17
Automatic Control

17.00 GENERAL

This division covers all work necessary for furnishing, installing, adjusting, testing, documenting, and starting-up the Instrumentation and Control (I&C) and Telemetry System. Programmable logic controller (PLC) shall provide local, automatic control of on-site pumps. Computer-based telemetry system will provide remote control, alarm presentation, and data logging activities at the Owner's headquarters location.

Sections in these specifications titled "*Common Work for . . .*" shall apply to all following related subsections whether directly referenced or not.

These specifications are an integral part of the contract documents for the I&C and Telemetry portion of this contract. The written descriptions of system performance contained herein are given to assist the Contractor in interpreting the contract plans but are not intended to be all-inclusive. The Contractor shall be aware that all automatic control systems do not require the same components and accessories for complete system operation. Therefore, these specifications do not include all accessories and appurtenances required for a complete system. The Contractor shall, however, provide all accessories and appurtenances to result in a completely operational system as required to meet the functional requirements of these documents. Where specific equipment specifications are given, they are used to represent the level of quality required by these documents.

17.05 Common Work for Automatic Control

Part 1 - General

Summary

The work under this division covers construction specifically described in these specifications. Project Plans will be provided for this project. All work incidental and necessary to the completion of the project described herein shall be completed under the bid item listed in the bid proposal, and no other compensation will be allowed. The work generally consists of the following:

- Detailed system layout and design for the particular equipment bid in accordance with these functional specifications.
- Furnishing of I&C equipment including delivery, storage, software, programming, installation, testing, startup, and documentation.
- Providing operator maintenance manuals for all equipment and devices provided by this Contract.
- Providing system training to the operators of the proposed equipment.

Related Sections

- Division 16 Electrical

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References

The project Plans are based on Instrument Society of America (ISA) standards numbers S5.1, S5.2, S5.3, and S5.4. The Contractor is encouraged to be familiar with these standards since the project plans do not contain wiring or ladder diagrams, but are based on the functional requirements of the ISA format.

All equipment and materials shall conform to the latest revised editions of applicable standards published by the following organizations:

- American National Standards Institute (ANSI).
- Institute of Electrical and Electronic Engineers (IEEE).
- National Electrical Manufacturers Association (NEMA).
- Underwriters' Laboratories (U/L).
- Instrument Society of America (ISA)

All equipment and materials, and the design, construction, installation, and application thereof shall comply with all applicable provisions of the National Electrical Code (NEC), the Occupational Safety and Health Act (OSHA), and any applicable Federal, State, and local ordinances, rules, and regulations. All materials and equipment specified herein shall be within the scope of Underwriter's Laboratory (UL) examination services, be approved by the UL for the purpose for which they are used and shall bear the UL label.

All control panels shall bear a label by UL or by an approved testing authority for the completed assembled panel.

Definitions

Contractor: The Contractor, as distinct from the Control System Integrator, shall install panels and other materials furnished by the Control System Integrator and provide all materials and work necessary and thereby, satisfy all requirements that are within the scope of this section.

Control System Integrator: Control System Integrator: A single firm, pre-selected by the Contractor, who shall design and furnish the system, provide the instrument panels, provide the PLC, RTU, VFD's, programming and other instrument components including start-up and training services. The Control System Integrator shall be Quality Controls Corporation (QCC).

Quality Controls Corporation
Mr. James Cross
5015 208th Street SW, Suite 1B
Lynnwood, WA 98036
O 425.778.8280 | jamesc@qcchome.com

Submittals

All submittals shall be complete, neat, orderly, and indexed. Partial submittals will not be accepted. Submittal information shall be provided to the Owner for the following items:

- Telemetry Panel

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- Variable Frequency Drives
- Ventilation Control Panel
- Liquid Level Switch
- Pressure Switches
- Pressure Transmitter
- Heating Thermostat
- Cooling Thermostat
- Photoelectric Smoke Detector
- Operation and Maintenance Manuals per Division 1.79.2 and Division 17.94
- Full size nameplate wording schedules, in lettering style proposed for use.

In addition to the requirements of Division 1.33, the Contractor shall develop and submit the following information provided by the Control System Integrator.

Hardware Submittals

Before any components are fabricated, and/or integrated into assemblies, or shipped to the site, the Contractor shall prepare a complete hardware submittal. The Engineer shall require five (5) sets, including fully detailed shop drawing, catalog cuts, wiring connections, and such other descriptive matter and documentation as may be required to fully describe the equipment and to demonstrate its conformity to these Specifications. The decision of the Engineer, upon the acceptability of any submittal, shall be final. Catalog information shall be submitted for all components and equipment, regardless of whether or not it is of the same manufacture as that listed in the Specifications.

System Plan Submittals

Following approval of the hardware submittal, the Control System Integrator shall prepare complete system interconnect wiring diagrams and panel layout plans for approval.

Plans

The Control System Integrator shall develop all shop drawings required for design, fabrication, assembly, and installation of the control system. Shop drawings shall include all plans required in manufacture of specialized components and for assembly and installation of them.

Plans shall be prepared with a CAD program capable of exporting to AutoCAD format, and printed on 11-inch by 17-inch media. Plans shall have borders and title blocks identifying the project system, revisions to the plans, and type of plan. Each revision of a plan shall carry a date and brief description of the revisions. Diagrams shall carry a date and brief description of the revisions. Diagrams shall carry a uniform and coordinated set of wire numbers and terminal block numbers in compliance with panel work wiring. Additionally, one set of electronic .DWG files shall be provided to the Owner.

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Elementary Diagrams

The Contractor shall provide elementary diagrams for all discrete loops. Loop diagrams shall be prepared in compliance with ISA S5.4 and shall be provided for all analog loops. Elementary diagrams and loop diagrams shall show circuits and devices of a system. These diagrams shall be arranged to emphasize device elements and their functions as an aid to understanding the operation of a system and maintaining or troubleshooting that system. Elementary and loop diagrams shall also show wire numbers, wire color codes, signal polarities, and terminal block numbers.

Panel Fabrication and Arrangements Plans

The Contractor shall provide arrangement plans of all panel front- and internal-mounted instruments, switches, devices, and equipment indicated. All panel mounting details shall be shown. Outer dimensions of all panels shall be included on the plan. Deviations from approved arrangements require approval prior to installation.

Arrangement plans shall be drawn to scale using standard Architectural or Engineering scales.

Site Conditions

Specified instrumentation and control equipment shall be modified, if necessary, to make it suitable for operation in the ambient conditions specified in Division 16.

Warranty

In addition to any other warranties required by the specifications, the entire PLC system will be warranted against defects in materials, workmanship, and software functions for a period of one (1) calendar year following the successful completion of the Functional Acceptance Test (FAT). The Contractor or designated service organization will be available on 24-hour notice to correct any system problems without charge to the Owner during the warranty period. In addition, the Contractor will provide four 2-day site visits during the warranty period to perform inspection and calibration of the equipment or other work at the request of the Owner.

Extra Materials

The Contractor shall supply sufficient spare parts, components, and assemblies to replace *any* defective or malfunctioning control component provided in this system. Control components are considered any device or combination of devices without which normal automatic control as outlined in this specification cannot be accomplished, and includes:

1. Two (2) spares of each part, component, or assembly, if more than ten (10) of those components are normally in use in the system.
2. One (1) box of each fuse type provided on this project. If ten (10) or more of a fuse type is provided for the project, then two (2) spare boxes shall be provided.
3. One (1) spare circuit breaker of each rating type provided on this project.
4. One (1) spare PLC processor.
5. One (1) spare telemetry panel DC power supply.
6. One (1) spare relay of each rating type provided on this project.

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Spare part components shall be packaged for at ease of field installation by non-trained personnel, so that no soldering or special skills are required for installation. All spare parts shall be delivered in a hinged plastic box that is purposefully made for this contract. The box shall have a parts list permanently attached to the inside lid which lists all parts and refers to them by numbered code visible on the outside of the package. Fragile components shall be adequately protected with cut foam. Electronic components shall be wrapped in ultra-violet inhibiting file. The exterior of the box shall be labeled "Telemetry Spare Parts – Water Department." Provide the box with lifting handles.

Part 2 – Products

Components

These Specifications list major instruments required to provide the process instrumentation system. All instrument functions specified on this list shall be provided by the Control System Integrator. Any additional instruments required to complete the instrument loops because of certain characteristics of the particular equipment selected by the Control System Integrator shall be provided. Such additional instruments shall be provided and included in the original contract price even though not specified in the instrument index or on the Plans.

The following systems utilize automatic control:

- Pump controls
- Pump SealSafe controls
- Engine generator set controls
- Ventilator controls
- Heater controls

Accessories

Provide all accessories required to furnish a complete control system that meets the requirements of the Plans and Specifications.

Source Quality Control

Material shall be new, free from defects, and of the quality specified. All equipment and materials utilized in the system shall be the products of Manufacturers with at least five (5) years of experience in the manufacture of similar equipment. Similar items in the system shall be the products of the same Manufacturer. All equipment shall be of industrial grade and of standard construction, shall be capable of long, reliable, trouble-free service, and shall be specifically intended for control and monitoring of operation of motor-driven pumps and equipment. All equipment shall be of modular design to facilitate interchangeability of parts and to assure ease of servicing.

Part 3 - Execution

Installers

Installation shall be performed by the workers who are skilled and experienced in the installation of I&C and Telemetry systems.

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Installation

Installation and testing procedures shall be as specified in these and subsequent sections of this division.

The control system shall be installed in accordance with the installation plans and instructions prepared by the Control System Integrator.

Installation shall include all elements and components of control system and all conduit and interconnecting wiring between all elements, components, sensors, and valve operators.

Equipment shall be located so that it is readily accessible for operation and maintenance.

Field Equipment

Equipment shall be provided as specified on the Plans such that ports and adjustments are accessible for in-place testing and calibration. Where possible, equipment shall be located between 48 inches and 60 inches, unless specified otherwise on the Plans, above the floor or a permanent work platform. Instrumentation equipment shall be mounted for unobstructed access, but mounting shall not obstruct walkways. Equipment shall be mounted where shock or vibration will not impair its operation. Support systems shall not be attached to handrails, process piping or mechanical equipment except for measuring elements and valve positioners. Instruments and cabinets supported directly by concrete or concrete block walls shall be spaced out not less than ⅝-inch by framing channel between instrument and wall.

Steel used for support of equipment shall be hot-dip galvanized after fabrication. Support systems including panels shall be designed in accordance with the Seismic Restraint and Anchorage section of Division 1.81 of these specifications and to prevent deformation greater than ⅛-inch under the attached equipment load and an external load of 200 pounds in any direction.

Electrical Power Connection

Electric power wiring and equipment shall be in compliance with Division 16. Power disconnect switches shall be provided within sight of equipment and shall be labeled to indicate opened and closed positions and specific equipment served. "Within sight of" is defined as having a clear unobstructed view from the equipment served and within 50 feet of the equipment served. Disconnect switches shall be mounted between 36 inches and 72 inches above the floor or permanent work platform. Where equipment location is such that the above requirements cannot be met by a single disconnect switch, two switches, one at the equipment and one at the work platform, shall be provided.

Signal Connection

Electrical signal connections to equipment shall be made on terminal blocks or by locking plug and receptacle assemblies. Jacketed flexible conduit shall be used between equipment and rigid raceway systems except that flexible cable assemblies may be used where plug and receptacle assemblies are provided and the installation is not subject to mechanical damage in normal use. The length of flexible conduit or cord assemblies shall not exceed 2 feet. Flexible cable, receptacle and plug assemblies shall be used only where specified.

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17.06 Control System Integrator

Part 1 - General

Division of Responsibility

All instrumentation and industrial electronic systems shall be provided under the supervision of a single Control System Integrator, chosen by the Contractor, which is regularly engaged in the design and installation of such systems of similar scope and complexity. The Control Systems Integrator shall be enjoined by the Contractor as a Subcontractor. The assignment of specific responsibilities herein to the Control System Integrator shall not, in any way and under any conditions, diminish the Contractor's full and complete responsibility for all work performed and all materials installed under the contract. The contract between the Contractor and the Control System Integrator shall specifically require that the Control System Integrator conform to and meet all requirements specified in the contract documents.

The assignment of a Control System Integrator that is an equipment supplier shall not be acceptable.

Control System Integrator's Responsibility

The Control System Integrator shall be solely and completely responsible for the final design and assembly of the entire control system. Responsibilities include:

- Provision of, and the detailed design of, custom control panels and the motor control center. The plans show general layout of the control panels. The Integrator shall provide detailed scaled design of all components on and in the control panels and determine specific requirements.
- The design of all interconnecting wiring of control equipment including remote control panels, packaged equipment panels, mechanical equipment with control components, etc.
- Testing of the control panels in the Control System Integrator's shop.
- Coordinate with the Contractor for specific requirements and locations of raceway penetrations and field wiring in control panels.
- The Control System Integrator shall supply the Contractor with all necessary detailed installation plans and/or written instruction for installation of all control components and sensing devices for proper system operation.
- Develop an assembly and testing schedule to allow for testing of all new programs in the Control System Integrator's shop.
- Provide installation assistance.
- Programming of the PLC's.
- Programming of the graphical touch screen operator interfaces (OI) on the control panels.
- MTU and Human Machine Interface (HMI) programming at the Owners Headquarters.

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- Provide Startup and Training Services.

General and Electrical Contractor's Responsibilities

The General and Electrical Contractor shall be responsible for the following equipment and services:

- Review of the Control System Integrator's submittals and wiring diagrams for coordination with space requirements, raceway requirements of field wiring, etc.
- Supply the Integrator with submittals of equipment related to the control system that the Integrator must include in their submittals and integrate. Such as motors, packaged control panels that the Integrator does not build, etc.
- Installation of the control panels provided by the Control System Integrator.
- Installation of the interconnecting wiring in accordance with these documents and the Control System Integrators wiring diagrams.
- Installation of I&C and Telemetry System components in accordance with these documents and plans or instructions of the Control System Integrator.

Part 3 – Execution

Installers

The Control System shall be designed, constructed and commissioned by Quality Control Corporation (QCC) of Lynnwood, Washington.

17.08 System Description

Part 1 – General

Summary

The I&C and Telemetry system functions required are specified on the Plans and in subsequent sections of this Division.

Design and Performance Requirements

The system shall be designed to provide the control capabilities and functions indicated and implied by the Plans and these Specifications and to provide trouble-free operation with minimum maintenance. The system shall readily enable manual operation of any and all functions in the event of failure of any one component.

The control system shall be designed and assembled by the Control System Integrator to provide:

- Control of motor driven pumps, equipment, and processes.
- Monitoring of operation of motor driven pumps, equipment, and processes.
- Indication of operating status of motor driven pumps, equipment, and processes.
- Monitoring and indication of pressures, temperatures, levels, and flows, as indicated and implied by the Plans and Specifications.

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- The capabilities indicated and implied by the Plans and Specifications.

The I&C and Telemetry System shall be designed and assembled by the Control System Integrator to be an integrated system composed completely of components which are specifically designed and used for and in conjunction with control and operation of motor-driven pumps and process control equipment. The Control System Integrator shall supply all interfacing equipment, appurtenances, and accessories and all such devices that may be required for proper interfacing as part of the control system.

Project Conditions

The control system for the pump station shall be a Remote Telemetry Unit (RTU) based system that consists of existing and new RTUs linked to the existing Master Telemetry Unit (MTU) via fiber optic communications. The MTU is located at the water treatment plant with a computer based Human Machine Interface (HMI).

RTU sites included in this project are:

1. Pump Station Telemetry Panel

Part 2 – Products

Manufacturers

The telemetry components of the RTU shall be manufactured by Allen-Bradley to be consistent with the Owner's existing system.

Components

The I&C and Telemetry System shall include the instruments, control devices, Remote Telemetry Unit, Human Machine Interface, input and output devices, sensors, interfacing devices, cabinets, enclosures, and other components indicated and implied by the Plans and Specifications.

The following is a list of the RTUs, Control Panels, Pressure and Level Assemblies, and Motor Control Centers to be provided by the Control System Integrator:

- Telemetry Panel
- Variable Frequency Drives
- Pump Station Discharge Pressure Assembly
- Pump Discharge Pressure Switch Assembly
- Ventilation Control Panel

Part 3 – Execution

Preparation

The Control System Integrator shall be responsible for the coordination and integration of control system with the motor control and other related equipment. The Control System Integrator shall communicate directly with the Manufacturer(s) and Supplier(s) of all related equipment to determine all details of the equipment, which may influence or affect the control system. The Control System Integrator shall determine all requirements for and shall cause

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integration of the control system into a unified operating system. The Control System Integrator shall define all requirements for all interfacing equipment and shall supply all appurtenances, accessories and all such devices, which may be required for proper interfacing as part of the control system.

The Control System Integrator shall be responsible to obtain submittal information on equipment supplied by other disciplines and to integrate them into the control system to form a complete working package as outlined by the contract documents.

Installation

The system shall be completely assembled in the shop by the Control System Integrator. All components and equipment shall be prewired to the maximum extent possible.

All Process Control shall be done within the control panels unless specifically listed on the Plans as other.

17.10 PANELS

17.11 Panel Certifications

Part 1 – General

Design Requirements

Panels provided for this project shall meet the requirements of UL-508 for water system and UL-913 for sewer system. All panels shall bear the appropriate label. The provider of the panels shall be a UL-508A certified facility. All field modifications shall be in conformance with UL-508 or UL-913.

17.12 Equipment Panels

Part 1 – General

References

Division 10.14.8 Electrical and control signs and labels. All panels shall be labeled.

Design Requirements

Control equipment panels shall be enclosures conforming to the requirements of the National Electrical Manufacturers Association (NEMA) and shall be NEMA 12 for indoor use.

Part 2 – Products

Components

- Enclosure shall be constructed of steel.
- Minimal metal thickness shall be 14-gauge.
- All doors shall be rubber-gasketed with continuous hinge and key locking latch mechanism.
- Wherever practical, enclosures shall be a manufactured item.

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- All doors shall be provided with quick-release latches to secure cover.
- Panels shall be sized to adequately dissipate heat generated by equipment mounted in or on the panel.
- Enclosure shall include a backpan.
- Enclosure shall be finished in ANSI 61 gray polyester powder coating inside and out over phosphatized surfaces.
- The enclosure shall be oversized to accommodate future racks and auxiliary devices as required.
- All outdoor enclosures shall be provided with a control panel heater and ventilation fan and filter with built-in thermostat to provide adequate climate control.

Fabrication

Panels should be completely fabricated, and instruments installed and wired in the manufacturer's factory (where possible). All wiring shall be completed and tested prior to shipment. All external connections shall be by way of numbered terminal blocks. Panel cutouts for instruments and devices shall be cut, punched or drilled and smoothly finished with rounded edges.

17.20 PANEL COMPONENTS

Part 1 - General

Design Requirements

All components shall be suitable for installation inside the I&C and Telemetry system panel enclosure.

Part 2 – Products

Components

17.20.3 Terminal Blocks

Part 1 - General

Design Requirements

Terminal blocks shall be one-piece molded plastic blocks with screw-type terminals and barriers rated for 600 volts. Terminals shall be double-sided and supplied with removable covers to prevent accidental contact with live circuits. Terminals shall have permanent, legible identification, and be clearly visible with the protective cover removed.

Fusible terminal blocks shall be provided with a LED blown fuse indicator for each terminal.

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Part 3 - Execution

Installation

All wires between panel-mounted equipment and other equipment shall be terminated at terminal blocks. Switches shall be terminated at the terminal blocks with crimp-type, pre-insulated, ring-tongue lugs. Lugs shall be of the appropriate size for their terminal block screws and for the number and size of the wires terminated.

17.21 Power Supply and Protection

17.21.2 Normal Power Supply

Part 1 - General

Design Requirements

All equipment panels shall be provided with 120-volt, 60-Hz power. Make provisions for conduit entry and provide a terminal block for termination of the circuit wires. All electronic control panel components shall require a 120 VAC-24 VDC power supply. DC power supply shall be sized to provide at least 50 percent more current than the peak current demands of the control panel. DC power supply shall have UPS backup power capabilities as identified in Section 17.21.3. Protection equipment shall consist of circuit breakers and fuses to protect electrical circuits from short circuits and overloads.

Part 2 – Products

Manufacturers

DC power supplies shall be Puls Inc., Sola Inc., Allen-Bradley, or approved equal.

Fuses shall be Bussmann Manufacturing Model ABC or MDA rated for Branch circuit, or approved equal.

Circuit Breakers shall be Allen-Bradley rated for Branch circuit, or approved equal.

Part 3 – Execution

Construction

Branch circuits shall be individually fused with an indication of fuse opening. All fuse holders for the panel shall be grouped on a single sub-panel. They shall be so situated that when the panel door is opened there is a clear view of the indicators and clear access for replacement of the fuses.

Provide DC power supplies as required to power instruments requiring external DC power of the appropriate voltages, with sufficient voltage regulation and ripple control to assure that the instruments being supplied can operate within their required tolerances. The power supplies at all RTUs shall include batteries for a backup power supply and charging equipment.

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17.21.3 Backup Power Supply

Part 1 - General

Design Requirements

All equipment panels shall have an Uninterruptable DC Power Module that interfaces with the Normal DC Power Supply. The Uninterruptable DC Power Module shall be capable of powering the control panel equipment for a period of not less than 24 hours after normal power failure. Transfer shall be a non-mechanical, non-interruptible, smooth transfer to battery backup.

Remote equipment batteries shall be sealed lead-acid batteries of sufficient ampere hour capacity to meet the above requirements.

Performance Requirements

The master console shall display power failure, and also a low battery condition alarm for the new equipment. A power failure alarm shall occur in the format currently used by the system. A low battery condition alarm shall cause the alarm indicator to flash but will not sound the audible alarm. The indicating light shall go off when the alarm condition is clear.

Part 3 – Execution

Installation

Batteries, battery chargers, and necessary wiring shall be installed to meet the above specifications.

17.21.5 Line Protection Units – Low Current

Part 1 - General

Design Requirements

The line protection unit shall isolate and protect the I&C electronics from current and voltage surges in the transmission lines. Each protection unit shall have:

- An isolation transformer with a minimum of 1,500 volts AC isolation, primary to secondary, and a minimum saturation current of 100 milliamps (ma) S.C. or as required to protect the I&C equipment from damage.
- Separate line-side and equipment-side terminal blocks.
- Two clip-mounted, replaceable gas discharge tubes rated at 90 volts striking voltage and 5,000 ampere peak pulse current capacity and suitable ground strap.

Part 2 - Products

Manufactured Units

The line protection unit shall be a complete unit, mounted on a separate chassis, and be field replaceable without soldering. The chassis shall be a ¼-inch thick plate.

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17.21.6 Line Protection Units – High Current

Part 1 - General

Design Requirements

The line protection unit shall isolate and protect the I&C electronics from current and voltage surges in the transmission lines. Each protection unit shall have:

- A minimum continuous operating current rating of 30 amps or larger as required to protect the telemetry equipment from damage.
- A minimum peak surge current rating of 80 KA.
- Separate line-side and equipment-side terminal blocks.
- LED indicator for circuit diagnostics.
- A response time less than or equal to 1 nanosecond.

The line protection unit shall be a complete unit available as a surface mount or DIN rail.

Part 2 - Products

Manufacturers

The line protector shall be an Allen-Bradley Model 4983-DC120-20 or equal.

17.22 Wire and Cable

17.22.2 Wiring

Part 1 - General

References

All electrical wiring shall be in accordance with the NEC.

Design Requirements

Wires shall be 600-volt class, PVC insulated, stranded copper and shall be the sizes required for the current to be carried but not less than No. 14 AWG conductor size.

Wires for signal circuits shall be twisted shielded pairs not smaller than No. 18 AWG.

Part 3 – Execution

Installation

All power wiring shall be supported on a sheet metal raceway or enclosed in a plastic wiring duct. Wiring for signal circuits shall be separated at least 6-inch from any power wiring.

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17.22.3 Cables

Part 1 - General

Design Requirements

Cables and connectors shall be industry standard, shielded, and shall be provided to connect all peripherals and equipment.

17.24 Switches and Relays

17.24.2 Selector Switch

Part 2 – Products

Manufacturers

Heavy-Duty, Watertight, and Corrosion-Resistant Type: Eaton/Cutler-Hammer, Type E34; Square D Co., Type SK; Allen Bradley, Type 800H; General Electric Co., Type CR 104P.

Manufactured Units

Selector switches shall be NEMA type 4/4X/13, corrosion-resistant/watertight/oil-tight, type selector switches with contacts rated for 10 amperes continuous at proper operating voltage. Operators shall be black knob type. Units shall have the number of positions and contact arrangements and spring return function (if any) as shown on Plans. Units shall be single-hole mounting, accommodating panel thicknesses from $^{1}/_{16}$-inch minimums to ¼-inch maximum.

17.24.3 Pushbuttons

Part 2 – Products

Manufacturers

Heavy-Duty, Watertight, and Corrosion-Resistant Type: Eaton/Cutler-Hammer, Type E34; Square D Co., Type SK; Allen Bradley, Type 800H; General Electric Co., Type CR 104P.

Manufactured Units

Pushbuttons shall be NEMA type 4/4X/13, corrosion-resistant/watertight/oil-tight, type push buttons with momentary contacts rated for 10-ampere continuous at proper operating voltage. Button color shall be as specified in control panels and shall have a full guard. Pushbutton contact arrangements shall be as shown on Plans. Size of pushbuttons as indicated on the Plans.

Special Functions

Pushbutton for "Emergency Help" applications shall have maintained contacts and red mushroom head operators.

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17.24.4 Panel Relays

Part 1 – General

Design Criteria

Relays shall be provided as necessary to perform switching functions required of control panels and other control circuits as shown on the Plans and described in the technical specifications. Appropriate relay type and associated contacts shall be selected based on the application from the control wiring diagrams or the functional description. Where timing relays and control relays require additional contacts, provide auxiliary control relays properly sized for the application.

All contacts and relays shall be NEMA rated and UL recognized.

The electrical life expectancy for the relay shall be over 500,000 operations at 120V AC, 10 amps; (over 200,000 operations at 120V AC, 10 amp for SPDT, 3PDT, and 4PDT). The mechanical life expectancy for the relay shall be over 50,000,000 operations.

Part 2 – Products

Manufacturers

Control Relays

Square D Class 8501, Type K or R; Allen Bradley 700 Type HA or HB; IDEC RH Series; or equal.

Time Delay and Timing Relays

Allen Bradley 700 Type HR; IDEC GE1, RTE or GT3 Series; or equal.

Manufactured Units

Control Relays

Relays for general purpose use shall be DPDT or 3PDT, 10 amp contacts with the appropriate coil voltage for the application. Relays shall be plug-in type with matching socket. All relays shall have LED indicators to signal when the coil is energized. Relay coils shall be rated for continuous duty.

Time Delay Relays

Time delay relays shall be multi-function, multi-range with plug-in base, pin style terminations timing and timed out LED indicators, and calibrated scales. Relays shall have minimum 0.5 seconds to 60 minutes, 8 selectable timing ranges, 5 amp contacts. Select coil voltage for the application. Units shall be sealed to prevent entry of contamination in the form of dust, dirt, or moisture.

Appropriate relay shall be selected based on application from the control wiring diagrams.

Minimum accuracy (plus or minus) shall be as follows:

1. Repeat accuracy – ½ percent.
2. Timing change over full voltage range – ½ percent change over full temperature range.

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3. Scale tolerance – 5-percent.

Part 3 – Execution

Installation

Provide adjustable time relays on all alarm and shut down circuits to prevent nuisance tripping of other alarm points. Time delay relays for these functions may not be shown on the Plans; however, provide as required on all circuits.

Provide additional form C contacts over and above the number indicated on the Plans for all relays provided.

120 VAC relays shall not be interchangeable with other voltages to prevent a hazardous interchange of relay voltages.

Provide DIN mounted or panel mounted type depending on application.

17.25 Indicating Lights and Readouts

17.25.2 Pilot Lights

Part 2 – Products

Manufacturers

Heavy-Duty, Watertight, and Corrosion-Resistant Type: Eaton/Cutler-Hammer, Type E34; Square D Co., Type SK; Allen Bradley, Type 800H; General Electric Co., Type CR 104P.

Manufactured Units

Indicating lights shall be NEMA type 4/4X/13, corrosion resistant, water-tight, oil-tight, full voltage, push-to-test, high visibility 28 chips LED type. Pilot lights shall be rated for the proper operating voltage. Appropriate lens caps shall be provided as shown on Plans.

17.25.5 Run Time Meters

Part 2 – Products

Manufacturers

HECON GO series, or equal.

Manufactured Units

Hour meter (elapsed time meters) shall be 2-inch by 1-inch nominal size, rectangular case type for flush panel mounting. The meter face shall be of the style that most closely resembles the panel indicating instruments if provided and shall have black trim with white or aluminized face. The meters shall have a 6-digit non-resettable register with the last digit indicating tenths of an hour.

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17.25.6 Operational Counters

Part 2 – Products

Manufacturers

HECON GO series, Redington Model 3400-2010, or equal.

Manufactured Units

Operational counters shall be 2-inch by 1-inch nominal size, rectangular case type for flush panel mounting. The meter face shall be of the style that most closely resembles the panel indicating instruments if provided and shall have black trim with white or aluminized face. The meters shall have a 6-digit resettable register.

17.30 INTELLIGENT CONTROL UNITS

17.31 Programmable Logic Controllers (PLC)

17.31.2 Programmable Logic Controller (PLC) System

Part 1 - General

Summary

Work involved in this contract includes providing new PLC equipment and programming to provide the functions shown on the Plans and described herein.

Performance and Design Requirements

- The PLC system modifications shall accomplish the control requirements of the loop descriptions, Plans, and Specifications.
- The design application and installation of the PLCs shall conform to NEMA ICS 1.1.
- PLC programming shall be documented.
- All PLC control system components shall be capable of meeting or exceeding electromagnetic interference tests per ANSI/IEEE C37.90.2.

Part 2 – Products

Manufacturers

Refer to project Telemetry Panel plans for specific Allen-Bradley component numbers and quantities.

Components

Input/Output (I/O) Modules

a) Provide plug-in modular-type I/O racks with cables to connect to all other required PLC system components.

b) Provide I/O system with:

1. I/O solid state boards with status lights indicating I/O status and board failure.

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2. Electric isolation between logic and field device.
3. Interchangeable boards for similar I/O type to allow substitution of operating boards for failed units by the operator.
4. Capability of withstanding low energy common mode transient to 1500 V without failure.
5. Incorporate noise suppression design.
6. Capable of meeting or exceeding surge-withstand capability tests, per ANSI/IEEE C37.90.1.
7. Capable of meeting or exceeding electrical noise tests, NEMA ICS1-109.60-109.66.

c) Discrete I/O modules:

1. Interface to ON/OFF devices.
2. I/O status indicator on module front.
3. Voltage rating to match circuit voltage.
4. Output module current rating:
   a. Match maximum circuit current draw.
   b. Minimum 1.5 A/point for 120 V AC applications.
5. Isolated modules for applications where one module interfaces with devices utilizing different sources of power.
6. Individually fused outputs with blown fuse indication.

d) Analog I/O modules:

1. Input modules to accept signals indicated on Plans or Specifications.
2. 12-bit minimum resolution.
3. I/O chassis supplied power for powering connected field devices.
4. Isolated (differential) inputs and outputs.
5. User configurable for desired fault-response state.
6. Provide output signals as indicated on Plans and Specifications.
7. Individual D/A converter for each output module.
8. Individual A/D converter for each input module.

Data Highway Communications

1. All PLC controllers shall be capable of EtherNet/IP communications. Any additional industrial protocols shall be provided through protocol converters.

PLC Peripheral Devices

1. PLC Peripheral Devices

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Graphical Operator Interface

a. The data entry and display module shall consist of a 10-inch color screen display.

b. The unit shall be capable of reading PLC data table register values and pre-defined messages and writing into PLC memory to modify register values.

c. The readout module will be used as a local operator interface device for entering operational parameters and reading out process data including display of all alarms by tag number.

d. A complete index of parameters and corresponding memory locations and a complete cross reference of alarms will be permanently attached to each PLC enclosure.

e. The unit will be self-contained, 24 VDC powered and rated minimum NEMA 12 suitable for panel mounting.

f. Communications will be direct with the Ethernet Switch via shielded CAT 5E Ethernet Cable.

g. The touch screen panel shall be an Allen-Bradley PanelView Plus 7 Standard Terminal, 10.4-inch Color Display, No Substitutions.

Part 3 - Execution

Installers

Control System Integrator shall have had experience in design, installation, and start-up of at least three similar installations using the proposed hardware and software.

Installation

Provide a completely integrated distributed programmable controller system capable of analog and sequential control, data acquisition and display, alarm annunciation and communications using the PLC system. I/O cards and memory shall be added as necessary to complete work shown on the Plans and described in the specifications.

The system shall provide true distributed control wherein each PLC is an intelligent stand-alone controller programmed for the specific functions required at its respective location. Certain information in the form of control commands, interlocks and data will be passed directly between the PLCs for use in executing the local control programs.

Input/Output Connection Requirements

1. Make connections to I/O subsystem by terminating all field wiring on terminal blocks within the I/O enclosure.
2. Prewire I/O modules to terminal blocks.
3. Provide terminal blocks with continuous marking strip.
4. Size terminals to accommodate all active data base points and spares.
5. Provide terminals for individual termination of each signal shield.
6. Field wiring shall not be disturbed when removing or replacing an I/O module.

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PLC Installment

1. Component placement:
    a. Mount all components according to manufacturer's instructions.
    b. Locate incoming line devices (isolation or constant voltage transformers, local power disconnects, surge suppressors, etc.) so as to keep power wire runs within an enclosure as short as possible.
    c. If items such as magnetic starters, contactors, relays, and other electromagnetic devices are located within the same enclosure as the PLC system components, provide at least 6 inches of separation between the magnetic area and the control area.
    d. Oversize enclosure to accommodate future racks and auxiliary devices as required.
2. Provide enclosure with a single quick disconnect of incoming power. Mount disconnect switch or breaker on enclosure exterior and label.
3. Enclosures shall comply with these specifications.
4. Enclosures shall be equipped with H2S inhibitor(s) suitable for the enclosed volume.

17.33 Network Equipment and Computers

17.33.1 Industrial Network Equipment

Part 1 – General

Design Requirements

All specified "industrial network equipment" shall comply with the following minimum specifications:

1. Rated for a 5-30VDC power supply.
2. UL listed.
3. Designed for an industrial environment.
4. Operating temperature of -40 degrees Fahrenheit to 176 degrees Fahrenheit.
5. IP66 rated water and dust resistant.
6. Control network device shall be capable of remote monitoring using OPC protocol.
7. All devices on fiber backbone shall have a minimum of two sets of transmit/receive ports.
8. Twisted pair network speed shall be a minimum of 1000Base-TX.
9. Fiber optic network speed shall be a minimum of 1000Base-FX.

These requirements do not apply to non-industrial network equipment.

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Part 2 - Products

Control Network Equipment

Data highway communications shall be accomplished on a control network consisting of nodes, one at each PLC or computer workstation and a physical link layer consisting of cables and all interfacing hardware. Control Network equipment shall consist of the following devices.

Unmanaged Ethernet/Fiber Switch

One (1) Allen-Bradley Stratix 5700 1783-BMS20CGP Ethernet/Fiber Switch. Provide Allen-Bradley SFP modules (Allen-Bradley 1783-SFP100LX) with fiber optic LC connectors. No Substitutions.

Part 3 – Execution

Installation

All network equipment in Control Panels shall be installed as per Plans, specifications, and product installation instructions. All components shall be suitable for installation in the environment where installed. All devices shall be installed as specified by the manufacturer. All devices shall be installed to be field serviceable without taking the facility out of service. Device displays shall be positioned to be easily read when viewing directly into control panels.

17.50 SENSORS AND CONTROLS

17.50.1 Common Work for Sensors and Controls

Part 1 – General

Design Requirements

Provide sensors and controls scaled and rated for their intended application.

Part 3 – Execution

Installation

All devices shall be installed to be field serviceable without taking the facility out of service. Readouts shall be positioned to be easily read from a standing position, central to the room unless allowed otherwise by the Engineer.

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17.51 Emergency Sensors and Controls

17.51.2 Smoke Detectors

Part 1 - General

Design Requirements

Provide all components suitable for installation in the environment where installed. Detector shall be provided complete with sensing head and mounting base.

The photoelectric smoke detector shall be 24-volt powered with a local audible alarm and Form C contacts for remote annunciation through two-wire connection to telemetry panel. The voltage requirement is dependent of the power source available at the telemetry panel. The detector shall detect both smoke particles and heat. The detectors shall have a latching alarm feature that resets only by a momentary power interruption.

Part 2 – Products

Manufacturers

The smoke detector shall be a System Sensor 4WTAR-B, or equal.

Part 3 – Execution

Examination

The Contractor shall verify power supply before selecting the appropriate model.

Site Testing

Test each smoke detector with artificial smoke in a can per manufacturer's instructions. Test the thermal sensing units with a heat gun or blow dryer per manufacturer's instructions.

Other testing methods will only be acceptable if approved by the manufacturer. Each failed smoke detector shall be replaced.

17.52 Pressure and Level Sensors and Controls

17.52.2 Flood Liquid Level Switches

Design Requirements

The switch shall be SPST rated for 20VA. The float shall be constructed on Buna-N material and the stem shall be constructed from brass.

Part 2 – Products

Manufacturers

Switches shall be Omega, LVN-20 or equal.

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Part 3 – Execution

Installation

The contractor shall install a liquid level switch as shown on the Plans. Mount the switch to the end of ½-inch PVC Coated GRS or galvanized pipe, depending on the area classification. Provide threaded busing as necessary to provide a complete assembly. Secure pipe to wall with a minimum of two galvanized conduit hangers. Mount the liquid level assembly ½-inch above the finished floor.

17.52.5 Pressure Switches

Part 1 – General

Design Requirements

Provide pressure switches that are surface mount type with ¼-inch or ½-inch NPT bottom fittings and completely suitable for operation when connected to potable water. All wetted parts shall be brass or stainless steel; no aluminum will be allowed. Provide unit with clear Lexan cover over trip settings that are screwdriver adjustable, and calibrated in psi. Housings shall be NEMA 4 rated with waterproof conduit connections.

Select gauges to provide suitable over-pressure protection for specific pressure range involved at each location. Sensors shall be seamless brass or stainless steel. See Division 1 for system pressures. Engineer can advise on setpoints as necessary.

Part 2 – Products

Manufacturers

Pressure switches shall be United Electric 400 series, or equal.

Part 3 – Execution

Installation

Install switches on a gauge plate as shown on the Plans with a suitable, adjustable snubber/pulsation dampener.

17.52.10 Pressure Transmitter

Part 1 – General

Design Requirements

Provide transmitter with ¼-inch or ½-inch process connections, and completely suitable for measuring pressure in a potable water pipeline. Select ranges to provide a system that utilizes the largest percentage of available span for each transmitter. Calibration information can be found in Division 1. Transmitter shall transmit in pounds per square inch at both the device screen and through the 4-20mA output.

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Part 2 – Products

Manufacturers

Pressure transmitter shall be Foxboro IGP10, Endress+Hauser Cerabar S PMP71, Siemens Sitrans P DS III, or equal.

Manufactured Units

Water pressure transmitters shall be all solid state with a 4-20ma output. All wetted parts shall be stainless steel. Transmitter shall be hermetically sealed to withstand submergence or an operating environment of 100 percent humidity for an indefinite period of time. Total error band shall not exceed 0.25 percent of full scale over a temperature range of 0-100 degrees Celsius. Voltage input shall be 9 to 20 VDC without more than a 0.12 percent change in output. Volumetric displacement of bridge from 0 psi to max-rated pressure shall be less than 0.01 cubic inches. Provide electronics with built-in protection against AC line transients and lightning spikes, and an R/F filter to reject external electrical and internal noise. Zero and span adjustments shall be non-interacting.

A digital indicator with on-board pushbuttons shall be provided to display the measurement with a choice of units. The pushbuttons shall allow zero and span adjustments and local configuration without the need for a hand-held terminal.

Part 3 – Execution

Installation

Transmitter installations shall be equipped with drain and bleed and isolation valves to remove air from transmitter diaphragm. Contractor shall be completely responsible for proper operation and interface of transmitter with other electronics provided on the project.

17.53 Environmental Sensors and Controls

17.53.2 Wall-Mounted Cooling Thermostat

Part 1 – General

Related Sections

- Division 11.95.34 Fans

Design Requirements

All components shall be suitable for installation in the environment where installed. The thermostat shall be a snap action, SPDT line voltage air switch controller rated for a 16-amp inductive load at 120 VAC.

Part 2 – Products

Manufacturer

The Cooling Thermostat shall be a Honeywell Model No. T775A2009 or equal with a -30 to 100-degree Fahrenheit range.

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Part 3 – Execution

Installation

Furnish and install cooling thermostat as shown on the Plans. Mount thermostat 4 feet above finished floor in location shown on the Plans. Contractor shall set thermostat at 75 degrees Fahrenheit.

17.53.3 Wall-Mounted Heating Thermostat

Part 1 – General

Related Sections

- Division 11.95.83.33 Radiant Space Heater

Design Requirements

Provide a 24 volt, SPST wall mounted heating thermostat. All components shall be suitable for installation in the environment where installed. Thermostat shall be as recommended by the space heater manufacturer. Thermostat shall have an adjustable range from 40 to 100 degrees Fahrenheit. Set thermostat at 60 degrees Fahrenheit unless specified otherwise on the plans.

Part 2 – Products

Manufacturer

The wall-mounted heating thermostat shall be a Honeywell TH6110D1005, or equal.

Part 3 – Execution

Installation

Furnish and install wall-mounted thermostat as shown on the Plans. Mount thermostat 4 feet above finished floor in location shown on the Plans.

17.90 TESTING, STARTUP, AND TRAINING

17.90.1 Common Work for Testing, Startup, and Training

Part 1 – General

Summary

Total system hardware start-up is the responsibility of the Control System Integrator.

Maintenance

The Control System Integrator shall be solely and completely responsible for all hardware maintenance of the system from time of start-up to the date of acceptance, by formal action of the Owner, of all work under the contract. The Control System Integrator shall perform all such work required or considered to be required by the Owner to cause and maintain proper operation of the system and to properly maintain the system.

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Warranty

The Contractor shall cause the Control System Integrator to make any and all repairs, replacements, modifications, and adjustments required to eliminate any and all defects in design, materials and workmanship which are disclosed within the one year guarantee period. The Control System Integrator shall begin all repairs, replacements, modifications, and adjustments within twenty-four (24) hours of notification by telephone by the Owner and shall complete such repairs, replacements, modifications, and adjustments within forty-eight (48) hours of notification. Should the Control System Integrator fail to begin the work within 24 hours or complete the work within 48 hours, the Owner may proceed to undertake or complete the work. In such event, the Contractor and his surety shall be liable for all costs incurred by the Owner.

Part 3 – Execution

Field Quality Control

Equipment Manufacturer's Support

1. The Control System Integrator shall pay for services of equipment manufacturer's field service representative(s) to:
    a. Inspect equipment covered by these Specifications.
    b. Supervise adjustments and installation checks.
    c. Conduct start-up of equipment and perform operational checks.
    d. Provide Owner with a written statement that manufacturer's equipment has been installed properly, started up and is ready for operation by Owner's personnel.

Repairs

The Control System Integrator shall correct all deficiencies and defects and make any and all repairs, replacements, modifications, and adjustments as malfunctions or failures occur.

The Contractor and the Control System Integrator shall anticipate that the Owner may delay acceptance of all work under the contract if, in the judgment of the Owner, malfunctions or failures in operation of the control system repeatedly occur after start-up. Both the Contractor and the Control System Integrator shall not be entitled to an extension of time or to any claim for damages because of hindrances, delays or complications caused by or resulting from delay by the Owner in accepting the work because of malfunctions or failures in operation of the control system.

17.91 Tests and Inspections

Part 1 - General

Summary

Materials, equipment, and construction included under this specification shall be inspected in accordance with the specifications. Testing shall be performed by the Control System Integrator in accordance with Division 16, and this and subsequent sections of this division. Testing shall be required to determine if installed equipment and system(s) will operate in the

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manner in which they are intended to operate. The decision of the Owner upon the acceptability of the test procedures and conformance shall be final. The work will not be accepted until all testing has been satisfactorily performed.

Scheduling

The Contractor shall prepare factory and field test procedures to demonstrate conformance of the complete system to this specification. The Contractor shall submit the detailed test procedures within four weeks after the notice to proceed for the Engineer's review and approval.

The Contractor shall furnish all labor, materials, tools, equipment, instruments, and services necessary to perform all specific functional testing of all installed equipment and systems at no additional cost.

The Control System Integrator and Contractor shall notify the Owner and of the factory testing date 30 days before testing.

The Contractor and Control System Integrator shall include in the schedule 10 consecutive working days as part of the factory testing to test the control system software at the Control System Integrator's shop.

The Control System Integrator and Contractor shall submit to the Engineer a detailed field testing schedule identifying each day that the Control System Integrator will need to be on site for field testing of equipment. A preliminary schedule shall be submitted to the Engineer for review 60 days before testing. A final schedule shall be submitted to the Engineer for review 30 days before testing.

The Contractor and Control System Integrator shall include in the construction schedule 10 consecutive working days between the completion of field testing and the startup phase to perform field software testing. Startup shall not proceed until the software field testing is complete.

Part 2 – Products

Factory Testing

All factory testing of control panels and computer systems shall be performed at the Control System Integrator's shop.

The completed control system shall be tested in the shop by the Control System Integrator. All motor control centers and VFD's supplied by the Control System Integrator shall be interconnected with the control system and powered with rated incoming voltage. Testing shall be conducted in two phases. The initial hardware testing shall include, but not be limited to, operation of all input and output (I/O) points, control devices and motor controllers. The subsequent testing shall include, but not be limited to, testing of RTU programming and Operator Interface.

The initial hardware testing of the control system shall include the following:

1. The entire assembled panels shall be meggered and tested to be free from grounds and shorts.

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2. Energize each discrete input and output and simulating each analog input and output using a loop simulator and calibrator. Circuits not energized shall be tested for continuity. Discrete input signals shall be tested in both the "on" and "off" state. Analog signals shall be tested at a minimum of three values (4 mA, 12 mA, and 20 mA). The test results shall be documented by the Control System Integrator in checklist format. The final test results shall be signed by both the Engineer and Control System Integrator prior to shipment of equipment to the job site.
3. Provide signal generators, multimeters, and other test equipment as required to verify proper operation of the assembled panels.
4. The Control System Integrator shall interconnect the control panels with the motor control centers and VFD's for both hardware and software testing phases. Control panels shall initially be hardware tested in one group. Similarly, the motor control centers and VFD's shall be hardware tested in another group. After both groups of hardware are confirmed to be operating correctly, the Control System Integrator shall interconnect the equipment with Ethernet cables and analog and discrete wiring as shown on the Plans. The equipment shall remain connected for the remainder of the factory testing period.
5. Correct, replace, or repair control panel and motor control center wiring, and/or components until testing demonstrates proper operation. Control panels and motor control centers shall not be shipped to the job site until testing has demonstrated complete operation of the panels.
6. Provide updated and complete as-built drawings for the control panels and motor control centers at the time of final factory testing. The Engineer shall review the drawings against the panel construction at the time of final factory testing. Drawings which do not reflect the actual construction of the panel shall be revised and reviewed again by the Engineer. As-built drawings that require revisions shall be submitted to the Engineer for review prior to shipment of equipment to the job site. This review process shall be repeated as necessary so that as-built drawings reflect the actual construction of the panels and motor control centers at the time of shipment. Panels and motor control centers shall not be shipped to the job site until the as-built drawings are updated, complete, and reflect the actual as-shipped status of the equipment.

Upon completion of the initial hardware testing, the Control System Integrator shall conduct software testing for final inspection by the Owner. The Control System Integrator shall provide for time, equipment, and support in their shop to completely demonstrate the functions of the entire control system. All control functions and all status and alarm monitoring and indication shall be demonstrated under simulated operating conditions. Simulating equipment shall be provided and wired into the control system for this testing. Testing shall be continued for the time period required by the Owner to observe and verify any revisions and as described above in the scheduling portion of this specification.

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Part 3 – Execution

Field Quality Control

Following installation by the Contractor, the Control System Integrator will verify the correctness of the interconnecting wiring and energize all control equipment in the field. Each point at the controller(s) shall be checked for proper functional operation through communication with the central computer.

Field Tests

The Control System Integrator in conjunction with the Contractor shall conduct field tests of all panels, motor control centers, VFD's, and instrumentation in the presence of the Engineer after installation of the equipment at the site. Testing shall be conducted by physically actuating signaling devices, installing temporary jumpers, or artificially imposing signals on the field wiring. This shall be done to establish proper operation of the field devices, the integrity of the field wiring, and the proper connection of field devices to the panels. The Contractor and Control System Integrator shall coordinate with the Engineer to provide for as complete testing of the control system as is practical prior to placing the equipment on line for actual control and monitoring. The Contractor and Control System Integrator shall make corrections or repairs to the wiring and/or devices as necessary to provide proper operation of the system.

After the initial testing is complete, commissioning shall be accomplished by the Control Systems Integrator and Contractor, with the Owner and Engineer present. Commissioning shall include operation and verification of all control components and features of the entire control system. Each function shall be demonstrated to the satisfaction of the Owner.

Repairs

Should any part of the system fail during the test, the test shall be rescheduled and repeated to the satisfaction of the Owner after repairs.

17.92 Startup

Part 1 – General

Summary

All testing, startup and operation shall not be cause for claims for delay by the Contractor, and all expenses accruing therefrom shall be deemed to be incidental to this contract. The Contractor shall make arrangement for all materials, supplies and labor necessary to efficiently complete the testing, startup, and operation.

Startup shall consist of testing, by a simulated operation, all operational equipment, and controls. The purpose of these tests shall be to check that all equipment will function under operating conditions, that all interlocking controls and sequences are properly set, and that the facility will function as an operating unit.

Scheduling

Factory representatives of all major units shall be present for the startup phase. The test shall continue until it is demonstrated that all functions of controls and machinery are correct.

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Part 3 - Execution

Field Quality Control

When the installation of the Control System is substantially complete, the Contractor shall commence with calibration and field testing. Testing shall determine that all system components connect up correctly to each other so that the system works as designed. Refer to section 17.91 for field testing requirements.

All components of the control system shall be calibrated by the Control System Integrator after completion of installation. Each component shall be adjusted to be within the Manufacturer's required range and for the specific application.

Components that cannot be properly calibrated or that are found to exceed the Manufacturer's specified range or accuracy shall be removed and replaced at no additional cost to the Owner.

The control system shall be placed into operation by the Control Systems Integrator.

The Control System Integrator shall calibrate all instruments, indicators, recorders, loops, etc. and shall provide a five-point calibration test results sheet for each calibrated instrument supplied by the Control System Integrator. The five-point calibration shall include one point at: Minimum input range value, Maximum input range value, Midrange input value, no other point less than 25 percent of span to any other point. Test forms shall identify each instrument tested, input conditions vs. output signal results in tabulated form, and shall be submitted to the Engineer prior to final commissioning.

Repairs

All deficiencies observed during the start-up will be corrected by the Contractor.

17.93 Training

Part 1 – General

Submittals

Submit index of all training offered by PLC system equipment manufacturers including operation and maintenance.

The Control System Integrator shall prepare and assemble specific instruction materials for each training session and shall supply such materials to the Owner at least 2 weeks prior to the time of the training.

Part 3 – Execution

Hands-On Training

The Control System Integrator shall conduct specifically organized training sessions in operation and maintenance of the control system for personnel employed by the Owner. The training sessions shall be conducted to educate and train the personnel in maintenance and operation of all components of the control system. Training shall include, but not be limited to, the following:

1. Preventative maintenance procedures

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2. Trouble-shooting
3. Calibration
4. Testing
5. Replacement of components

At least two separate training sessions, each at least 4 hours in duration, shall be conducted at the facility after start-up of the system.

17.94 Documentation

17.94.2 Operations and Maintenance Manuals

Part 1 – General

Summary

Two types of operation and maintenance manuals (O&M) will be required for the contract:

1. General manuals for use by the Water Department staff for daily operation, maintenance, and troubleshooting.
2. Technical manuals for use by trained electronics technicians for technical and "board level" maintenance and repair.

Submittals

Prior to the receipt of payment for more than 50 percent of the work, the Contractor shall deliver to the Owner three sets of acceptable manufacturer's printed and complete PDF of operating and maintenance instructions covering each piece of mechanical and electrical equipment, or equipment assembly, furnished under this contract. Each set of instructions shall be bound into multiple volumes; each volume to be complete with and index and bound in a suitable hard-cover binder. Manuals shall be assembled and indexed so that information on each piece of equipment can be readily found.

Quality Assurance

Manuals shall be purposefully made for this installation, and general manuals which are vague or have limited applicability will not be accepted. The manuals shall be written in a non-technical format suitable for reading by water system operators with no previous automatic control equipment experience. The decision of the Owner on the acceptability of the manual shall be final.

Part 2 – Products

Materials

The Control System Integrator shall prepare and assemble detailed operation and maintenance manuals in accordance with the project general requirements. The manuals shall include, but not be limited to, the following:

1. Name, location and phone number of nearest supplier and spare part warehouse.
2. Step by step operating procedures.

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3. Narrative of overall system performance and operation.
4. Listing of all equipment setpoints.
5. Preventative maintenance procedures
6. Trouble-shooting of master and remote equipment.
7. Calibration
8. Testing
9. Replacement of components
10. System schematics / shop drawings
11. As-built elementary and one-line diagrams
12. Catalog data and complete parts list for all equipment and control devices
13. Listing of recommended spare parts.
14. Listing of recommended maintenance tools and equipment.
15. Warranties.
16. Disassembly and reassembly instructions.
17. Program documentation printout with tag numbers and descriptive comments.
18. Backup program on CD-ROM or flash drive.

All plans shall be provided on hard copy and in electronic form on disk. Electronic drawing files shall be provided in AutoCAD .DWG format with all "xrefs" bound. If "xrefs" are not bound, all "xref".DWG files shall be provided unlinked with instructions to reestablish the links. Files shall be in AutoCAD 2010 or later format.

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Division 18
Measurement and Payment

18.0 GENERAL

It is the intention of these specifications that performance of work under bid items shall result in complete construction, in proper operating condition, of improvements identified in these written specifications and accompanying plans. Work and material not specifically listed in the proposal but required according to the plans and specifications and general practice, shall be considered incidental and included in the Contractor's bid price.

Bid Item 1 – Mobilization

Lump sum price covers complete cost of furnishing, installing and testing, complete and in-place, all work and materials necessary to: move and organize equipment and personnel onto the job site; secure job site; provide and maintain necessary support facilities; obtain all necessary permits and licenses; prepare site for construction operations and maintain site and surrounding areas during construction. Payment shall be lump sum. This bid amount may not be more than 5 percent of value of total contract.

Bid Item 2 – Contractor Health and Safety Plan, Site-Specific Safety Plan, and Spill Prevention Control and Countermeasure (SPCC) Plan

Lump sum price covers complete cost of writing, submitting, editing, and finalizing the Contractor Health and Safety Plan, Site-Specific Safety Plan, and Spill Prevention Control and Countermeasure (SPCC) Plan as described in the General Conditions. Plans shall be approved and complete by the second pay estimate. Payment shall be lump sum.

Bid Item 3 – Staking and Project Control

Lump sum price shown shall cover the complete cost of providing all surveying and staking control necessary to construct the improvements and provide permanent control references. Also included is the cost to survey and replace any existing monuments or markers disturbed during construction. Payment shall be lump sum.

Bid Item 4 – Temporary Erosion and Sedimentation Control

Lump sum price shown shall cover the complete cost of providing all temporary erosion and sedimentation control relating to construction of improvements as shown on the Plans and specified herein. Work includes but is not limited to silt fence; catch basin inserts, silt socks; temporary trenching; temporary mulching; temporary plastic sheeting; control of water; restoration of damage caused by storm events; and all other work necessary for a complete installation of all temporary sedimentation and erosion control facilities. Payment shall be lump sum.

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Bid Item 5 – Furnish and Install Adequate Site and Trench Safety Systems in Accordance with Chapter RCW 49.17

Lump sum price shown shall cover the complete cost of trench safety, shoring design, and installation, including: all labor, materials, and equipment as shown on the Plans, and detailed in the contract specifications, or as required by governing safety codes. Price includes design of the shoring system as required by applicable codes and standards, whether shown on the Plans or not. Payment shall be lump sum.

Bid Item 6 – Site Work

Lump sum price shown shall cover the complete cost of providing all site work relating to construction of improvements as shown on the Plans and specified herein. Work includes, but is not limited to: structure excavation, dewatering, backfill, and compaction; site grading and gravel surfacing; trench patch, gravel surfacing, rockery retaining walls, disposal of excess material; hydroseed; chain-link fencing; removal of unsuitable materials; appurtenances; and all other work necessary for a complete installation of all site work. Payment shall be lump sum.

Bid Item 7 – Chemical Injection Vault and Chemical Feed Line

Lump sum price shown shall cover the complete cost of providing all materials, equipment, and labor necessary for construction of the chemical injection vault and chemical feed line as shown on the Plans and specified herein. Work includes but is not limited to: trenching and excavation; disposal of excess material; control of water; water main pipe, fittings, valves, chemical feed pipe and fittings, vault sump and drain pipe and fittings, select bedding; trench backfill and compaction; materials and appurtenances and connections to existing water main and chemical feed line and all other work necessary for a complete installation. Payment shall be lump sum.

Bid Item 8 – Buried Water Main and Building Drains Outside of Building Footprint and Vault

Lump sum price shown shall cover the complete cost of providing all materials, equipment, and labor necessary for construction of the buried water main and building drains as shown on the Plans and specified herein. Work includes but is not limited to: water main trenching and excavation; disposal of excess material; control of water; water main pipe, fittings, valves, building drain pipe and fittings, select bedding; trench backfill and compaction; materials and appurtenances and connections to existing water main, storm drains and all other work necessary for a complete installation. Payment shall be lump sum.

Bid Item 9 – Structural

Lump sum price shown shall cover the complete cost of providing all materials, equipment, and labor necessary for constructing the booster pump station structure complete as shown on the plans and detailed in the contract specifications including: cast-in-place concrete; CMU walls; miscellaneous metal work; doors; openings; ceilings; insulation; carpentry; trusses; hatches; roof; waterproofing; patching; and all other work necessary for the complete structure as shown on the plans and described in the specifications. Payment shall be lump sum.

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Bid Item 10 – Finishes

Lump sum price shown shall cover the complete cost of providing all labor, materials, and equipment necessary for painting and coating all surfaces of the improvements as shown on the plans and detailed in the technical specifications. Payment shall be lump sum.

Bid Item 11 – Pumps, Suction Barrels, Motors, Seals and Seal Safe System

Lump sum price shown shall cover the complete cost of providing all labor, materials, and equipment necessary for the Pumps, Suction Barrels, Motors, Seals and Seal Safe System as shown on the Plans and detailed in the contract specifications. Payment shall lump sum.

Bid Item 12 – Heating and Ventilation

Lump sum price shown shall cover the complete cost of providing all labor, materials, and equipment necessary for the heating and ventilation shown on the Plans, and detailed in the contract specifications, including all equipment not listed in other bid items. Price shall include cost of materials and installation of heaters, fans, louvers, dampers, heat pump splits, frames, and supports. Payment shall be lump sum.

Bid Item 13 – Mechanical

Lump sum price shown shall cover the complete cost of providing all labor, materials, and equipment necessary for the mechanical work shown on the Plans, and detailed in the contract specifications, including all piping, pipe headers, valves, fittings, attachments, supports, floor drains and drain piping below and within the building and vault. Payment shall be lump sum.

Bid Item 14 – Electrical

The lump sum price shown shall cover the complete cost of providing all labor, materials, and equipment necessary for the electrical work shown on the Plans and detailed in the contract specifications. Cost shall include coordination with the power supplier and acquisition of the L&I electrical permit. Payment shall be lump sum.

Bid Item 15 – Automatic Control

Lump sum price shown shall cover the complete cost of providing all labor, materials, and equipment necessary for the automatic control system as shown on the plans and detailed in the contract specifications. Payment shall be lump sum.

Bid Item 16 – Testing, Startup and Training

Lump sum price shown shall cover the complete cost of providing all labor and materials necessary for testing and startup of the project as shown on the Plans and detailed in the contract specifications. Payment shall be lump sum. Partial payment of up to 50 percent of the total bid item cost is allowed no earlier than first Contractor-initiated testing date. Final 50 percent of payment shall not be paid until testing of the station is complete, and the pump station is completely operational, and staff trained as determined by the Owner and Engineer. Minimum cost for this bid item shall be $5,000.

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Bid Item 17 – Demobilization and Cleanup

Lump sum price covers complete cost of furnishing, installing, and testing, complete and in-place, all work and materials necessary to: move all personnel and equipment off site after contract completion; cleanup site prior to final acceptance; and accomplish all other items of work not specifically listed in other divisions. Payment shall be lump sum. This bid item will only be paid with final payment request. This bid amount may not be more than 5 percent of value of total contract.

Bid Item 18 – As-Builts

Lump sum price shown shall cover the complete cost of providing all mark-up plans necessary for the Owner to create accurate as-built records as detailed in the specifications. The work includes surveying all structures and utilities to determine their as-constructed locations and elevations, and records of all mechanical and electrical equipment for maintenance purposes. The price for this work will be $5,000. Failure to comply with the as-built requirements and furnish acceptable as-built records will result in the deletion of this bid item by change order. Payment for this work will not be made prior to the final payment. Payment shall be lump sum.

Bid Item 19 – Operation and Maintenance Manuals

Lump sum price shown shall cover the complete cost of providing all labor and materials necessary to provide two (2) hard copies and one (1) electronic copy of the Operations and Maintenance Manuals as described in the specifications and train the Owner's personnel on site with manufacturer-certified representatives for the following items: Pumps and Motors; Power and Telemetry equipment as shown on the Plans and detailed in the contract specifications. Payment shall be lump sum. The price for this work will be $5,000. Partial payment of up to 20 percent ($1,000) of the total bid item cost is allowed prior to initial owner training. Final 80 percent ($4,000) of payment shall not be paid until Operations and Maintenance Manuals are determined complete by the Owner and Engineer. Payment shall be lump sum.

Bid Item 20 – Force Account

Owner and Engineer negotiated price set at $10,000 shall cover the complete cost of providing all labor and materials necessary to complete Owner directed miscellaneous work. Contractor shall not bill for work under this bid item unless directed to by the Owner in writing (mailed or e-mailed). Payment shall be agreed to in writing prior to work onset or by Owner directed force account per Standard Specifications without the 25-percent quantity price per unit modification. Payment may not be made for this bid item or may be more or less than $10,000 upon project closeout as agreed to by the Owner.

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APPENDIX A – BUILDING PERMIT

INCLUDES THE STORMWATER SITE PLAN (DRAINAGE REPORT) AND THE GEOTECHNICAL REPORT AS APPENDIX E OF THE DRAINAGE REPORT

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About Your Building Permit

Planning & Development Services · 1800 Continental Place · Mount Vernon WA 98273
voice 360-416-1320 · inspections 360-416-1330 · www.skagitcounty.net/planning

Thank you!

Obtaining a building permit is the first step in constructing a safe, legal structure.

Your permit packet should include:

- This handout
- Permit printout
- Approved site plan, construction plans, associated docs
- Approved Stormwater Pollution Prevention Plan
- Yellow inspection card

Now what?

Go forth and construct your project! Be sure to:

- Review any conditions placed on your permit.
- Comply with any clearing limits shown on your site plan.
- Follow your Stormwater Pollution Prevention Plan.
- Follow the plans and design approved for your project.

Keep your permit packet onsite

Your approved permit, inspection card, site plan, and Stormwater Pollution Prevention Plan should be kept on your construction site at all times until final inspection approval.

Get your inspections

Inspections during construction ensure that your project is built to code. Inspections may include:

- Setbacks, foundation footings, walls
- Shear walls
- Framing, plumbing, mechanical
- Blocking and tie-downs (manufactured home)
- Insulation, energy code, drywall
- Skirting and venting (manufactured home)
- Final occupancy

Many inspections are listed on your card, but not all apply to your project. Be sure to call for inspection at each step so that stage of construction can be properly inspected. For example, if you cover your framing with insulation or drywall, you will impede inspections of the framing and may be required to remove the obstructions.

To Schedule an Inspection

Call our 24-hour inspection request line at (360) 416-1330 and leave a voice message with your permit number, site address, and type of inspection. Requests called in before 7:30 a.m. get a same-day inspection. Guemes Island inspections are **only** scheduled on Wednesday and Friday mornings. To talk with the inspectors before they come to inspect, call 416-1320 between 8:00 a.m. and 8:30 a.m. Monday through Friday.

After Each Inspection

Check our website (www.skagitcounty.net/search/permits) the following day to verify your project has been inspected and the inspection recorded in your permit file.

Final Inspection & Occupancy

It is illegal to occupy your new construction until you have been approved for occupancy. For residential construction, your signed inspection card at final inspection serves as your Certificate of Occupancy. Before you get your final, you must satisfy all permit conditions, including:

- pay any outstanding impact fees
- submit your flood elevation certificate
- submit any required as-built

Revisions

If you need to revise your permit, call our office and ask to speak with a permit technician. You can submit your revised plans, including site plan revisions if applicable, in person or by mail.

Expiration

Your permit expires on the date shown on the face of the permit, usually three years from the issue date. If you have not completed your project by the time the permit expires, you have three options.

- Apply in writing to **extend** the permit for six-months. No permit may be extended more than once.
- **Renew** the permit for an additional 3-year period, by paying the renewal fee, which is currently 30% of the cost of the current building permit fee plus $120/hour for review of any modified plans (one-hour minimum).[1]
- **For non-commercial permits that** need only a final inspection, you can final the permit with a fee of $75 for processing and inspection.

[1] SCC 15.04.030(1)(c).

Driveway Standards for Skagit County

Planning & Development Services · 1800 Continental Place · Mount Vernon WA 98273
voice 360-416-1320 · inspections 360-416-1330 · www.skagitcounty.net/planning

A driveway to serve residential *or* commercial uses must meet the following standards from the International Fire Code.[1] These standards are the minimum and apply to all building permits. Roads within a new subdivision must comply with the Skagit County Road Standards.

When Fire Access is Required

You must provide a fire apparatus access road for every facility, building, or portion of a building constructed or moved into or within the jurisdiction when the facility is over 150 feet from a fire apparatus access. Exceptions may be made for minor additions or accessory buildings to existing dwellings when in the opinion of the Fire Marshal the addition or accessory building may not create significantly dangerous situations.

General Design Standards

The standards on the left apply to driveways serving 1-2 residential lots. The standards on the right apply to private roads that serve more than two lots must comply with the Skagit County Road Standards.

	1-2 residential lots	3 or more residential lots or commercial use
Width	12'	20'
Vertical Clearance	13'6"	13'6"
Turning Radius–Inside	20'	20'
Turning Radius–Outside	50'	50'
Turnouts	20' wide and 30' long every 300'	N/A
Road Terminus (for roadways exceeding 150 ft)	Acceptable means of turning around fire apparatus approved by the Fire Marshal	96' cul-de-sac standards or as approved by the Fire Marshal
Bridges	Pursuant to Skagit County Road Standards	Pursuant to Skagit County Road Standards

Standards Based on Grade

All residential and commercial driveways must meet these standards

Grade	Surface	Fire Suppression System	Water Storage
≤ 12%	gravel or equivalent; or concrete, asphalt, or equivalent	Not required	Not required
> 12% and ≤ 14%	concrete, asphalt, or equivalent	Not required	Not required
> 14% and ≤ 16%	gravel or equivalent; or concrete, asphalt, or equivalent	NFPA 13D system required	Not required
> 16%	gravel or equivalent; or concrete, asphalt, or equivalent	NFPA 13D system required	10,000-gallon water storage tank with dry hydrant required for each residence

Notes

- The Fire Marshal may make modifications to these standards if the road is not buildable because of topography, waterways, non-negotiable grades, or similar conditions. These modifications are based on the building being protected by NFPA 13D automatic sprinkler systems, and additional fire protection as required by the Fire Marshal.
- For roads accepted or platted by Skagit County prior to June 11, 1990, the Fire Marshal may modify these standards if firefighting or rescue operations would still be possible.
- For lots not in a fire district and accessible only by water, the access road requirement may be waived if the project meets all of the other requirements of Skagit County Unified Development Code to qualify for a building permit.
- Emergency vehicle access roads or driveways may not be obstructed in any manner, including vehicle parking. Width and clearance requirements consistent with these standards must be maintained at all times.
- Security gates across fire access roads must be approved by the Skagit County Fire Marshal. Security gates must have an approved means of emergency operation by fire personnel.

[1] SCC 15.04.030(2)(f).

Washington State Department of
Labor & Industries
Contractor Registration

Hiring a Contractor or Remodeler? What You Should Know

Are you planning to hire someone to work on your home or property?

If so, do your homework.

Shop smart

While the law provides some protection from fraudulent or incompetent contractors, it doesn't guarantee honest transactions or perfect performance. Protect your investment by being an informed, cautious consumer.

Generally, work that "adds to or subtracts from real estate" must be done by a registered contractor. Contractor registration is also required for anyone who provides construction consultation, develops residential property or "flips" houses.

Businesses that provide services such as gutter cleaning, pruning, lawn care or window washing do not need to be registered.

What is required by law?

In Washington, all contractors who perform work or who advertise or submit bids in this state must be registered with the Department of Labor & Industries (L&I), post a bond and carry general liability insurance coverage.

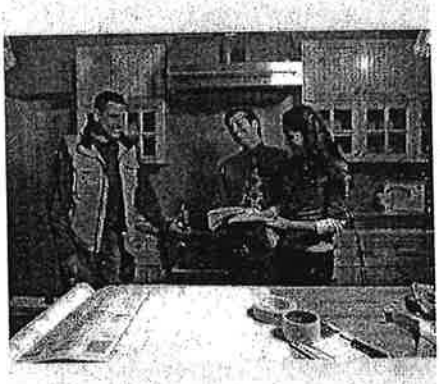
- A general contractor must maintain a $12,000 bond. A specialty contractor, such as a painter, must maintain a $6,000 bond. An electrical contractor must maintain a $4,000 bond. Dissatisfied consumers may pursue restitution by taking civil action in Superior Court against a contractor's bond.
- All registered contractors must carry general liability insurance coverage in the amount of $50,000 property damage and $200,000 public liability or $250,000 combined single limit. (Note: This requirement does not pertain to electrical contractors. Telecommunications contractors must carry $170,000 in general liability insurance.)
- A contractor must have a current business license, and if the contractor has employees, he or she must have workers' compensation coverage.
- A contractor must provide a "Notice to Customer" disclosure statement to you for any residential project with a projected cost of $1,000 or more, and any commercial project of $1,000 to $60,000.

Except for the licensing of electricians and certification of plumbers, there isn't a competency test to become a contractor in Washington State.

Get answers

Visit L&I's Contractor Web site at www.Contractors.Lni.wa.gov, contact your local L&I office or call the toll-free contractor registration hotline at 1-800-647-0982 to learn:

- If a contractor is currently registered and for how long.
- If a contractor has workers' compensation insurance for his or her employees.
- If there is any pending or past action against a contractor's bond.
- Other business names a contractor may have operated under in the past.
- If a contractor has ever been cited for infractions.



Before you hire a contractor or remodeler:

- ☐ Plan your project carefully. If you know what you want done and can clearly explain it, you're less likely to misunderstand instructions or encounter cost overruns.
- ☐ Interview several qualified registered contractors and solicit written bids.
- ☐ Verify that the contractors you are considering are registered by looking them up online at **www.Contractors.Lni.wa.gov**, by phone at 1-800-647-0982 or by contacting a local L&I office (see back page).
- ☐ Ask for references and then check them out. If possible, view the work, interview the homeowner and visit a site with work in progress.
- ☐ Ask for references of suppliers that the contractor works with and check out his or her payment record.
- ☐ Request a copy of the contractor's insurance policy to verify what is covered.
- ☐ Do an Internet search on the owner's name to look for general comments that might be posted.
- ☐ Evaluate all the aspects of the bids, including the scope of work, warranties, references, time frames and price.
- ☐ Request that the contractor post a performance bond for the entire cost of the project if it is more than $6,000.
- ☐ Try to anticipate problems and inconveniences, such as cost overruns or cleanup, and come to an agreement with your contractor on how they will be handled before the work begins.

Once you have chosen a contractor or remodeler:

1. Obtain a written contract that includes price, payment terms, sales tax, permit fees (if applicable), the specific work to be performed, materials to be used, warranties and start and end date. It is also a good idea to include change-order processes, final review and sign-off procedures and cleanup.
2. Ask for a disclosure statement prior to work starting. Sample disclosure statements are available on the L&I web site and at local L&I offices.
3. Make frequent inspections and consult your local building department about required permits. Make sure that all permits are in place and that inspections are in order.
4. When advancing money for materials, it may be possible to make checks payable to both the contractor and the supply house or to pay the supply house directly.
5. Put all change orders in writing and ask questions as work progresses. Avoid verbal contracts, and **be very cautious about paying for work that has not been completed.**
6. Request signed lien releases from all major subcontractors and suppliers on your job before making final payments.

Be wary of contractors who:

- Provide credentials or references that can't be verified.
- Offer a special price only if you sign today or use other high-pressure sales techniques.
- Accept only cash, require large deposits or the entire cost up front or ask you to make the payment in their name.
- Do not provide a written contract or complete bid.
- As you to pick up the building permit. In most instances, the contractor is required to take out the permits. Permits are your protection and help ensure that work will meet local building codes.
- Offer exceptionally long warranties.
- Want to do most or all the work on weekends and after-hours.
- Give you an offer that sounds "too good to be true."

Protect yourself with permits

Manufactured/Mobile Home Permits

L&I has statewide resonsibility for approving plans and inspecting both new and altered manufactured/mobile homes and recreational vehicles for safety. For more information go to **www.FAS.Lni.wa.gov**

Building Permits

Contact your local county or city building department.

Electrical Permits

L&I performs most inspections throughout the state, but some cities do their own electrical inspections. For more information, go to **www.ElecPermit.Lni.wa.gov**.

Avoid lien problems

Ask for the legally required disclosure statement that advised consumers about lien releases.

If any supplier of materials, worker or subcontractor is not paid, a lien may be filed against your property to force you to pay. You could pay twice for the same work. Or worse, an unpaid lien could lead to foreclosure on your home. (For remodeling projects, liens can only be filed for the amount left unpaid to the general contractor.)

If you receive a "notice of intent" to file a lien on your property, ask your general contractor to provide you with lien release documents from the supplier or subcontractor who has sent this notice.

The contractor is required to provide you with more information about lien release documents if you request it.

If you have requested lien release documents, avoid making final payment until you have received a lien release from suppliers and subcontractors.

Local service center phone numbers:

Aberdeen	360-533-8200	Mt. Vernon	360-416-3000
Bellevue	425-990-1400	Port Angeles	360-417-2700
Bellingham	360-647-7300	Pullman	509-334-5296
Bremerton	360-415-4000	Seattle	206-515-2800
Colville	509-684-7417	Spokane	509-324-2600
East Wenatchee	509-886-6500	Tacoma	253-596-3800
Everett	425-290-1300	Tukwila	206-835-1000
Kennewick	509-735-0100	Tumwater	360-902-5799
Longview	360-575-6900	Vancouver	360-896-2300
Moses Lake	509-764-6900	Yakima	509-454-3700

More consumer resources

Office of the Attorney General
Web site: **www.ATG.wa.gov/consumer**
Consumer Resource Center: 1-800-551-4636

Better Business Bureau
Web site: **www.bbb.org**
Telephone: 206-431-2222 (western Washington);
509-838-3841 (eastern Washington)

Contractor information at L&I

On the Web: www.Contractors.Lni.wa.gov

Call toll-free: 1-800-647-0982

Other formats for persons with disabilities are available on request. Call 1-800-647-0982. TDD users, call 360-902-5797. L&I is an equal opportunity employer.

PUBLICATION F625-084-000 [02-2008]

Inspections- IRC section R109 *in Skagit County*

360-416-1330

Types of Inspections

It is the duty of the person doing the work to call for inspections.

1. **Inspection Requests:** It is your responsibility to notify the building inspector that work is ready for inspection, and to provide access to and means for inspection of such work. For example, if a ladder is required to inspect the work, provide a ladder. Call 360-416-1330 for an inspection.

2. **Location:** The inspector will compare the location of the building with the approved site plan. The building, zoning, critical areas and shorelines all have required setbacks. This is normally done at the footing inspection.

3. **Temporary Erosion and Sediment Control:** The inspector will verify that you have taken steps to prevent stormwater contaminated with sediment, concrete or chemicals from leaving the site. This is normally done at the footing inspection.

4. **Foundation Inspection**: Call for a foundation inspection after the footing forms or posts are set and reinforcing bar is tied in place. The foundation inspection shall include excavations for thickened slabs intended to support bearing walls, partitions, structural supports, or equipment and special requirements for wood foundations.

5. **Floodplain Subfloor Inspection:** Before you begin vertical framing, if you are in a regulated FEMA Flood Hazard area, you must submit documentation from a registered land surveyor that the elevation of the lowest floor and the crawlspace ventilation meets FEMA elevation requirements.

6. **Plumbing, Mechanical, Gas System Inspection**: Call for inspection of plumbing, mechanical, gas and electrical systems before fixtures or appliances are set or installed, and prior to framing inspection.
   Exception: *You can* backfill ground-source heat pump loop systems tested in accordance with Section M2105.1 prior to inspection.

7. **Frame and Masonry Inspection:** Call for inspection of framing and masonry after the roof, masonry, all framing, firestopping, draftstopping and bracing are in place and after the plumbing, mechanical and electrical rough inspections are approved.

8. **Other Inspections:**
   a. **Fire-Resistance-Rated Construction Inspection:** Where fire-resistance-rated construction is required between dwelling units or due to location on property, call for inspection after all wallboard is in place, but before any plaster is applied or wallboard joints and fasteners are taped and finished.
   b. **Wallboard and Braced Wall Inspection:** Call for inspection after all wallboard is in place, but before any plaster is applied or wallboard joints and fasteners are taped and finished. The inspector will verify that the right type of wallboard has been used, and that it has been fastened correctly.
   c. **Special Inspections:** Some projects require periodic or continuous inspection by a certified agency for high strength concrete, high strength bolting, medical gas systems, or other specialized construction. These will be identified by the Project Engineer in design, the Plans Examiner or the Fire Marshal during plan review. Submit the reports to the Building Inspector or Fire Marshal, as directed.

9. **Elevation Certificate:** If you are in a regulated FEMA Flood Hazard area, you must submit an Elevation Certificate for the building, based on finished construction. The documentation must be done by a registered land surveyor.

10. **Final Inspection:** Call for a final inspection after the permitted work is complete and prior to occupancy.

11. **Approval is Required:** The building inspector, upon notification, will make the requested inspections and will indicate whether or not the construction is satisfactory as completed. Any portions that do not comply to comply with the code must not be covered or concealed until approved by the Building Inspector.

For more information contact:
Skagit County Planning & Development Services
1800 Continental Place · Mount Vernon, WA 98273
(360) 416-1320 · Fax (360) 336-9416 · web site address: www.skagitcounty.net

SKAGIT COUNTY

Minimum Requirement #2*
Construction Stormwater Pollution Prevention

The objective is to control erosion and prevent sediment and other pollutants from leaving the site during the construction phase of a project. Compliance is required of all projects.

Twelve Elements of Construction Stormwater Pollution Prevention

Element 1: Mark the Clearing Limits

Prior to beginning land disturbing activities, including clearing and grading, all clearing limits, sensitive areas and their buffers, and trees that are to be preserved within the construction area should be clearly marked, both in the field and on the plans, to prevent damage and offsite impacts.

Element 2: Establish the Construction Access

Construction vehicle access and exit shall be limited to one route if possible. Access points shall be stabilized with quarry spall or crushed rock to minimize the tracking of sediment onto public roads. Public roads shall be cleaned thoroughly at the end of each day.

Element 3: Control the Flow Rates

Properties and waterways downstream from development sites shall be protected from erosion due to increases in the volume, velocity, and peak flow rate of stormwater runoff from the project site. Any flow control facilities, if required, shall be functional prior to construction of site improvements, and protected from siltation during the construction phase.

Element 4: Install Sediment Controls

The duff layer, native topsoil, and natural vegetation shall be retained in an undisturbed state to the maximum extent practicable. Sediment ponds, vegetated buffer strips, sediment barriers or filters, dikes, and other protective measures intended to trap sediment on-site shall be constructed as one of the first steps in grading. These protective measures shall be functional before other land disturbing activities take place.

Element 5: Stabilize Soils

All exposed and unworked soils shall be stabilized by application of effective protective measures that protect the soil from the erosive forces of raindrop impact and flowing water, and wind erosion. From October 1 through April 30, no soils shall remain exposed and unworked for more than 2 days. From May 1 to September 30, no soils shall remain exposed and unworked for more than 7 days. Applicable practices include, but are not limited to, temporary and permanent seeding, sodding, mulching, plastic covering, soil application of polyacrylamide (PAM), early application of gravel base on areas to be paved, and dust control. Soil stockpiles must be stabilized and protected with sediment trapping measures.

Element 6: Protect Slopes

Cut and fill slopes shall be designed and constructed in a manner that will minimize erosion. Consider soil type and its potential for erosion. Divert drainage, including stormwater from off-site, from flowing over the slope. Diverted flows shall be redirected to the natural drainage location at or before the property boundary. Contain collected flows in pipes, slope drains, or protected channels. Check dams, or partial barriers, typically constructed of rock or pea-gravel filled bags, shall be placed at regular intervals to reduce the flow velocity within trenches that have a gradient greater than 4%. Stabilize soils on slopes, as specified in Element #5.

*These requirements are from the Western Washington Phase II Municipal Stormwater Permit. Last updated 5/14/2015.

Element 7: Protect Drain Inlets

All storm drain inlets made operable during construction shall be protected so that stormwater runoff shall not enter the conveyance system without first being filtered or treated to remove sediment.

Element 8: Stabilize Channels and Outlets

Stabilization, including armoring material such as rock, adequate to prevent erosion of outlets, adjacent streambanks, slopes and downstream reaches shall be provided at the outlets of all conveyance systems.

Element 9: Control Pollutants

All pollutants, including waste materials and demolition debris, that occur on-site during construction shall be handled and disposed of in a manner that does not cause contamination of stormwater. Management of pH-modifying sources shall prevent contamination of runoff and stormwater collected on the site. These sources include, but are not limited to, bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, and concrete pumping and mixer washout waters.

Element 10: Control De-Watering

All foundation, vault, and trench de-watering water, which has similar characteristics to stormwater runoff at the site, shall be discharged into a controlled conveyance system, prior to discharge to a sediment trap or sediment pond.

Element 11: Maintain BMPs

Best Management Practices (BMPs) are activities, protective measures, and maintenance procedures that, when used singly or in combination, prevent or reduce the impacts of erosion and sediment transport. All temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. Sediment control BMPs shall be inspected weekly or after a runoff-producing storm event during the dry season and daily during the wet season. All temporary erosion and sediment control BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal of BMPs or vegetation shall be permanently stabilized.

Element 12: Manage the Project

Phasing of Construction - Development projects shall be phased where feasible in order to prevent, to the maximum extent practicable, the transport of sediment from the development site during construction. Revegetation of exposed areas and maintenance of that vegetation shall be an integral part of the clearing activities for any phase. Clearing and grading activities shall minimize removal of existing trees and minimizing disturbance/compaction of native soils except as needed for building purposes. If clearing and grading are proposed between October 1 and April 30, silt-laden runoff will be prevented from leaving the construction site by application of erosion and sediment control measures.

*These requirements are from the Western Washington Phase II Municipal Stormwater Permit. Last updated 5/14/2015.

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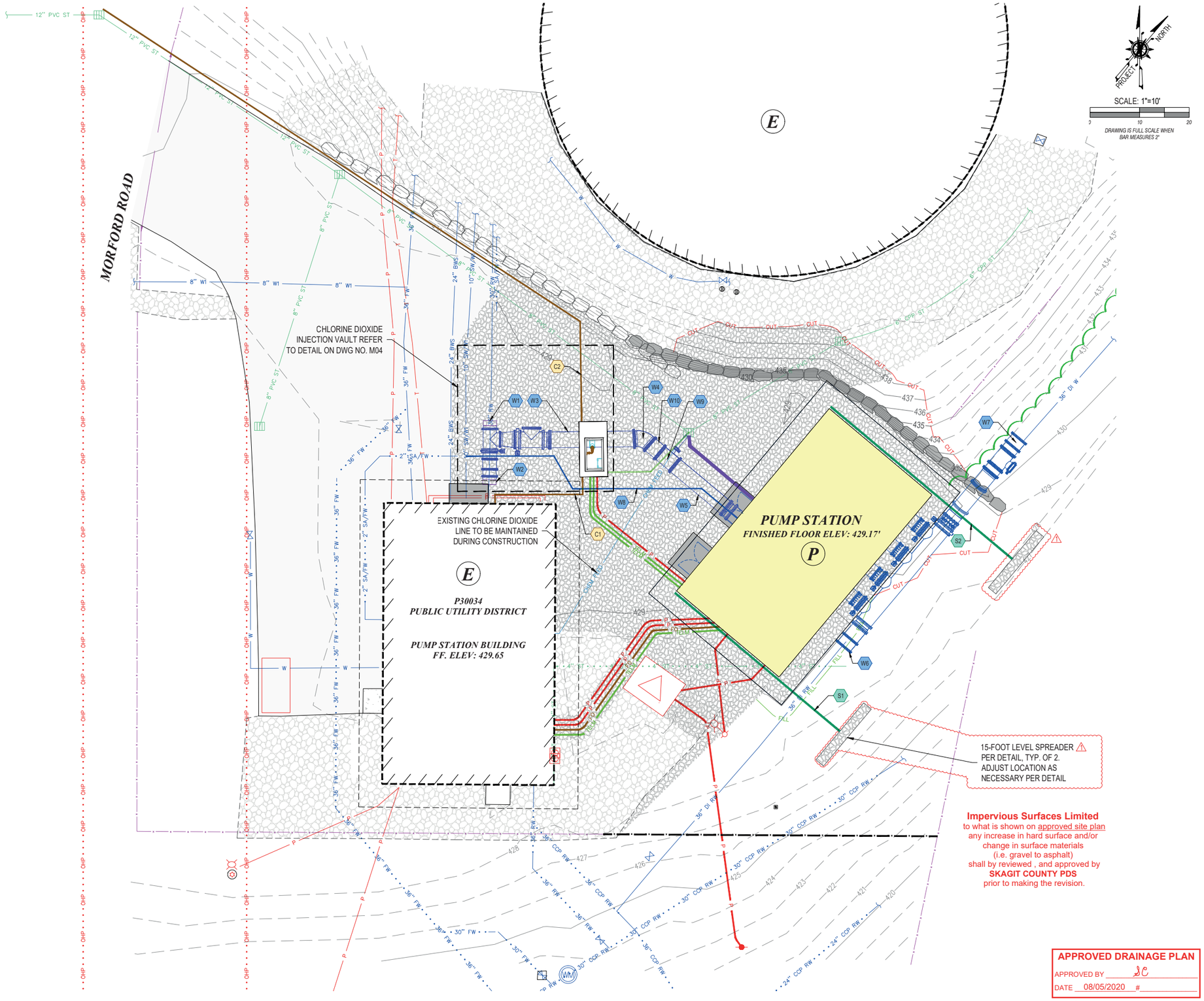


PROPOSED SITE UTILITY PLAN

SITE UTILITY NOTES

WATER

- W1 N:539342.55, E:1311033.39, PROVIDE: (1) - CONNECTION TO EXISTING
- W2 N:539330.16, E:1311033.28, PROVIDE: (1) - CONNECTION TO EXISTING
- W3 PROVIDE APPROX 20 LF of 36" DI PIPE (TRJ)
- W4 N:539339.00, E:1311064.31, PROVIDE: (1) - 36" DI 45° BEND (TRJxTRJ)
- W5 PROVIDE APPROX 16 LF of 36" DI PIPE (TRJ)
- W6 N:539296.78, E:1311104.70, PROVIDE: (1) - CONNECTION TO EXISTING WITH 36" DI SLEEVE (TRJxTRJ)
- W7 N:539338.19, E:1311139.50, PROVIDE: (1) - CONNECTION TO EXISTING WITH 36" DI SLEEVE (TRJxTRJ)
- W8 CONNECT WATER SERVICE TO 10" DI SW/W1 PIPE WITH CORPSTOP. PROVIDE APPROX 37 LF OF 1" REHAU PEX PIPING AND FITTINGS AS NECESSARY TO CONNECT TO NEW PUMP STATION BUILDING. REFER TO DWG NO. M03 FOR CONTINUATION.
- W9 N:539334.86 E:1311069.24, PROVIDE: (1) - 36" x 6" DI TEE (TRJxFL) (1) - 6" GATE VALVE (FLxTRJ) (1) - 6" DI NIPPLE, LENGTH TO FIT. FITTINGS AND PIPE SHALL BE FULLY RESTRAINED
- W10 PROVIDE APPROX 16 LF of 36" DI PIPE (TRJ)

STORMWATER

- S1 PROVIDE APPROX 43 LF DOWNSPOUT ⚠ DRAIN PER DETAIL ON DWG NO C06.
- S2 PROVIDE APPROX 48 LF DOWNSPOUT ⚠ DRAIN PER DETAIL ON DWG NO C06.

MINOR UTILITIES

- C1 PROVIDE APPROX 20 LF of 2" SCH. 80 PVC PIPE. PROVIDE FITTINGS AS NECESSARY PROVIDE FULLY FUNCTIONAL CHLORINE DIOXIDE INJECTION SYSTEM AND TO CONNECT TO EXISTING. ROUTE PIPE THROUGH EXISTING BUILDING PIPE GALLEY. COORDINATE CONNECTION WITH DISTRICT REPRESENTATIVE.
- C2 PROVIDE APPROX 135 LF of 2" SCH. 80 PVC PIPE. PROVIDE FITTINGS AS NECESSARY PROVIDE FULLY FUNCTIONAL CHLORINE DIOXIDE INJECTION SYSTEM AND TO CONNECT TO EXISTING. COORDINATE CONNECTION WITH DISTRICT REPRESENTATIVE.

SITE UTILITY LEGEND

- 1170 MAJOR CONTOUR
- 1171 MINOR CONTOUR
- CUT CUT LIMITS
- FILL FILL LIMITS
- P ELECTRICAL CONDUIT
- FO FIBER OPTIC CONDUIT
- TELM TELEMETRY CONDUIT
- TRENCH DRAIN
- BUILDING DRAIN LINE
- CHLORINE INJECTION LINE
- ROCKERY
- BUILDING ROOF OUTLINE
- BUILDING
- CONCRETE
- CRUSHED SURFACING

GENERAL UTILITY NOTES

- PROVIDE JOINT BONDING FOR DISCHARGE PIPING PER DETAIL ON DWG NO. M06.
- DISCHARGE PIPING SHALL BE POLYWRAPPED IN ACCORDANCE WITH DIVISION 13 OF THE SPECIFICATIONS.

APPROVED DRAINAGE PLAN
APPROVED BY _____
DATE 08/05/2020 #_____
Sheet(s) titled "Stormwater Approval and Inspections Conditions", include additional permit conditions.

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 32875 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

DANIEL W. BURWELL — STATE OF WASHINGTON — 38306 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT
SITE UTILITY PLAN

Skagit PUD — PUBLIC UTILITY DISTRICT

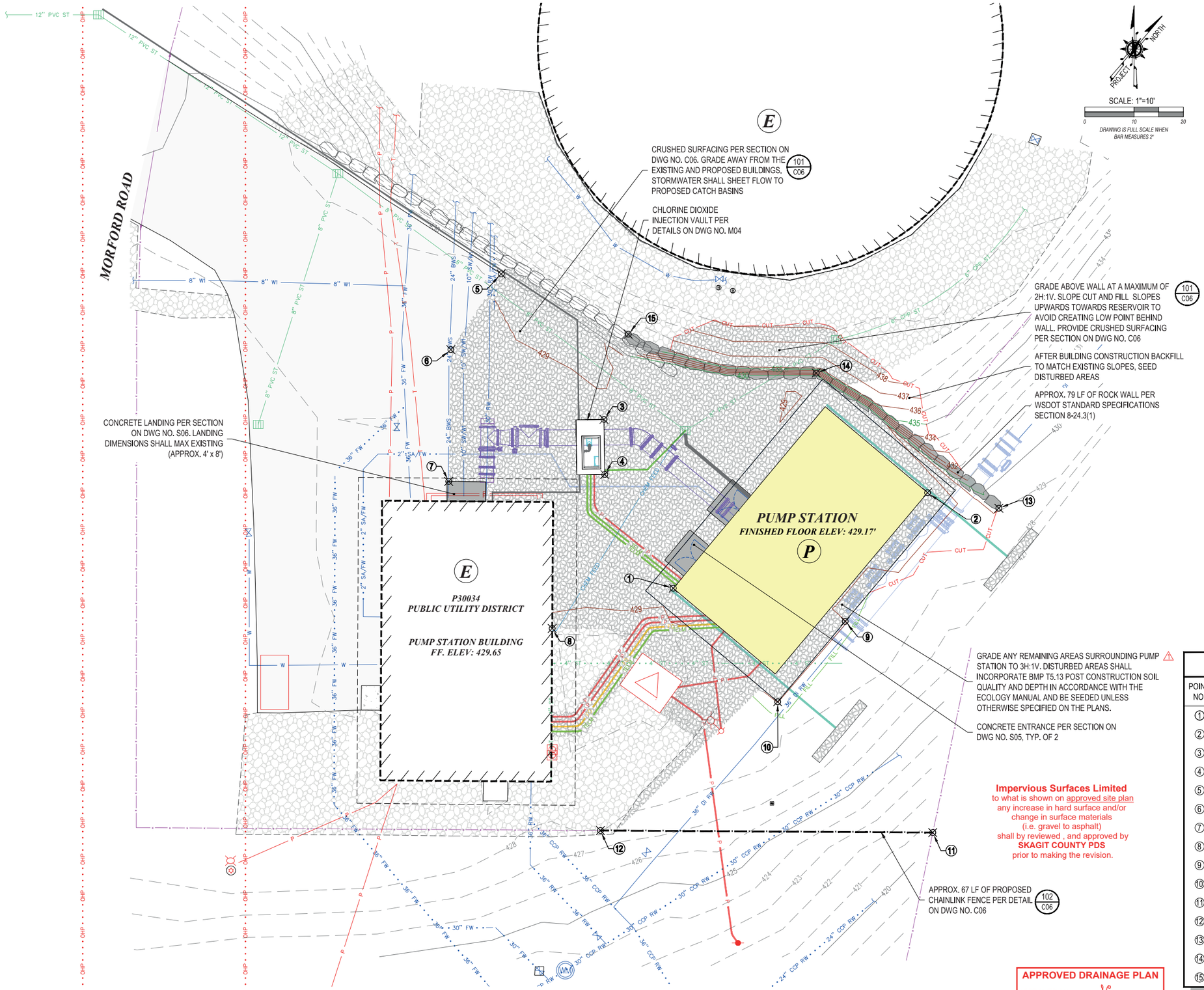
ENGINEER: DWB	JOB NO.: 117.025
REVIEWED: DWB	CLIENT: SPUD
SAVE DATE: Jun 10, 2020	FILENAME: RWPS-D-CIV03.DWG
PLOT DATE: Jun 10, 2020	

REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW
1	6/10/2020	REVISED TO CONFORM TO BUILDING PERMIT	OMP	DWB

P.N. 3766
C.O. 5040

DWG NO.: C04
SHEET NO.: 5 of 37



PROPOSED SITE GRADING PLAN

ROCKERY NOTES

ROCKERY SHALL BE CONSTRUCTED PER STANDARD SPECIFICATIONS 8.24.3(1). BASE ROCK - 3 MAN. ROCK ABOVE BASE ROCK - 2 MAN. BACKFILL SHALL BE CSBC COMPACTED TO FIRM AND UNYIELDING CONDITION. NO GEOTEXTILE REQUIRED. SUBGRADE SHALL BE REVIEWED AND APPROVED JUST PRIOR TO BASE ROCK PLACEMENT BY OWNER REPRESENTATIVE. PROTECT SUBGRADE FROM WEATHER DEGRADATION.

SITE GRADING LEGEND

- 1170 — MAJOR CONTOUR
- 1171 — MINOR CONTOUR
- CUT — CUT LIMITS
- FILL — FILL LIMITS
- P — ELECTRICAL CONDUIT
- FO — FIBER OPTIC CONDUIT
- TELM — TELEMETRY CONDUIT
- TRENCH DRAIN
- BUILDING DRAIN LINE
- CHLORINE INJECTION LINE
- ROCKERY
- BUILDING ROOF OUTLINE
- BUILDING
- CONCRETE
- CRUSHED SURFACING
- CHAINLINK FENCE

POINT TABLE

POINT NO.	ELEV.	NORTHING	EASTING	DESC.
①	SEE DWG NO. A01	539308.20	1311071.05	BUILDING CORNER
②	SEE DWG NO. A01	539327.55	1311122.62	BUILDING CORNER
③	SEE DWG NO. M04	539342.42	1311057.01	VAULT CORNER
④	SEE DWG NO. M04	539331.26	1311057.17	VAULT CORNER
⑤	MATCH EXISTING	539371.91	1311036.17	EDGE OF GRAVEL
⑥	MATCH EXISTING	539356.56	1311025.97	EDGE OF GRAVEL
⑦	MATCH EXISTING	539329.85	1311025.53	EDGE OF GRAVEL
⑧	MATCH EXISTING	539300.04	1311046.51	EDGE OF GRAVEL
⑨	429.05	539301.46	1311105.93	EDGE OF GRAVEL
⑩	429.04	539285.17	1311092.24	EDGE OF GRAVEL
⑪		539258.65	1311123.70	FENCE CORNER
⑫		539259.07	1311056.30	FENCE CORNER
⑬		539324.42	1311137.10	END OF ROCKERY
⑭		539351.81	1311100.05	ROCKERY DEFLECTION
⑮		539359.70	1311061.95	END OF ROCKERY

APPROVED DRAINAGE PLAN
APPROVED BY JC
DATE 08/05/2020 #

RICHARD L. BALLARD — STATE OF WASHINGTON — 52878 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

DANIEL W. BURNHAM — STATE OF WASHINGTON — 38306 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT
SITE GRADING PLAN

Skagit PUD — PUBLIC UTILITY DISTRICT

ENGINEER: CMP	JOB NO.: 117.025
REVIEWED: DWB	CLIENT: SPUD
SAVE DATE: Jun 10, 2020	FILENAME: RWPS-D-CIV04.DWG
PLOT DATE: Jun 10, 2020	

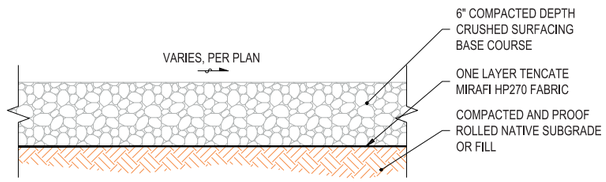
REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW
1	REVISED TO CONFORM TO BUILDING PERMIT	6/10/2020	CMP	DWB

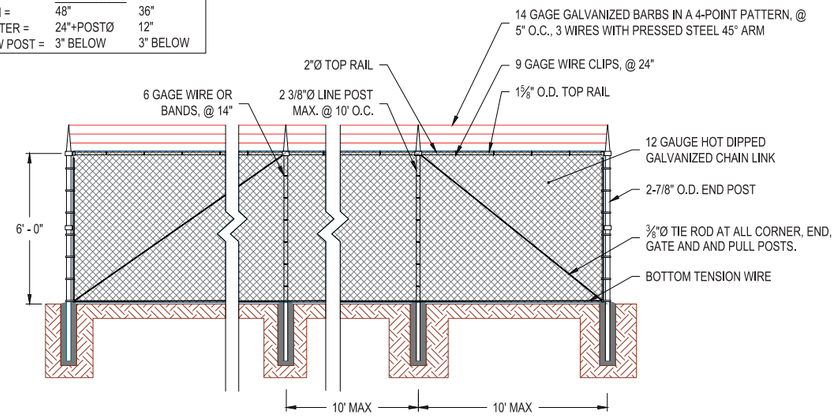
P.N. 3766
C.O. 5040

DWG NO.: C05
SHEET NO.: 6

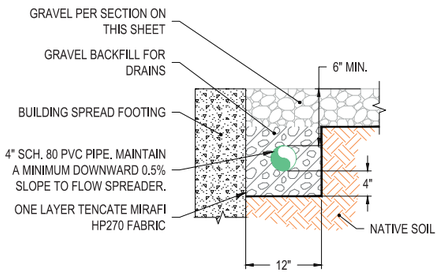
POST HOLE CONCRETE:	GATE POSTS & END POSTS	LINE POSTS
MINIMUM DEPTH =	48"	36"
MINIMUM DIAMETER =	24"+POSTØ	12"
MINIMUM BELOW POST =	3" BELOW	3" BELOW



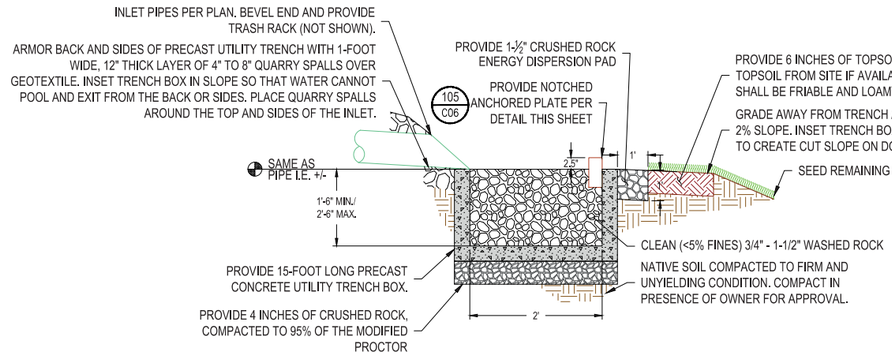
GRAVEL SECTION
NOT TO SCALE
101 / C05



CHAINLINK FENCE DETAIL
NOT TO SCALE
102 / C05

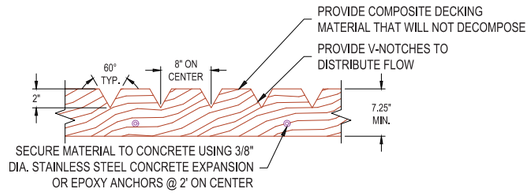


DOWNSPOUT DRAIN DETAIL
NOT TO SCALE
103 / C05



FLOW DISPERSION TRENCH DETAIL
NOT TO SCALE
104 / C05

NOTE:
1. TRENCH AND GRADE BOARD MUST BE LEVEL. ALIGN TO FOLLOW CONTOURS OF SITE.



NOTCHED ANCHORED PLATE DETAIL
NOT TO SCALE
105 / C06

APPROVED DRAINAGE PLAN
APPROVED BY JC
DATE 08/05/2020 #

P.N. 3766
C.O. 5040

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 37875 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

DANIEL W. BURWELL — STATE OF WASHINGTON — 38306 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT

SITE DETAILS

Skagit PUD — PUBLIC UTILITY DISTRICT

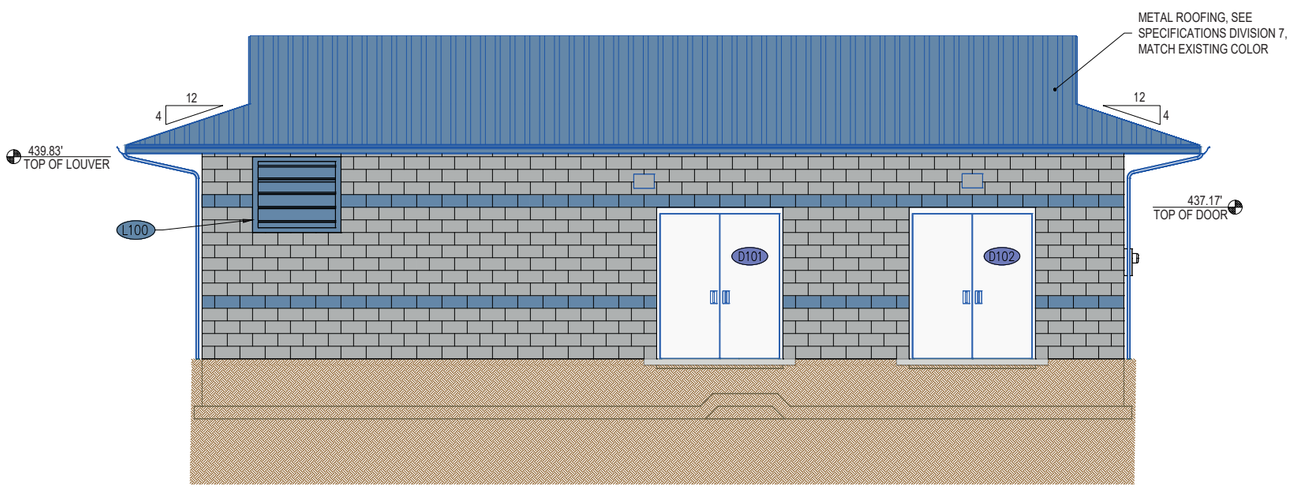
JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-DET.DWG
SAVE DATE: Jun 10, 2020
PLOT DATE: Jun 10, 2020
ENGINEER: CMP
REVIEWED: DWB

REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW
1	6/10/2020	REVISED TO CONFORM TO BUILDING PERMIT	CMP	DWB

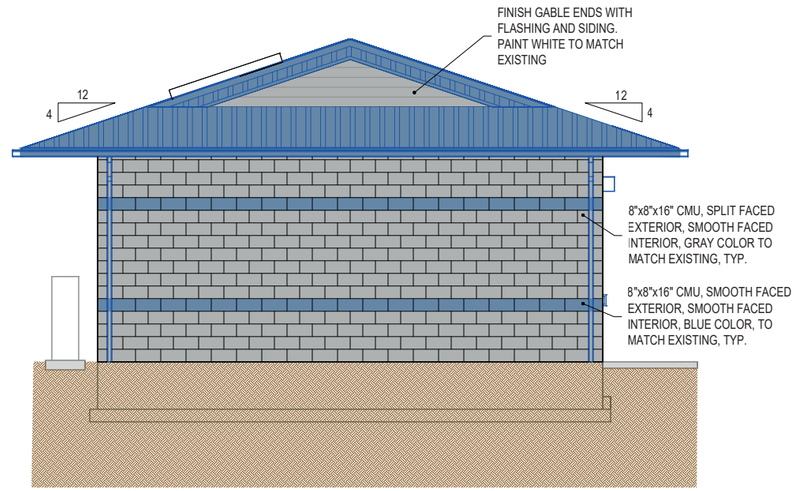
SCALE: SHOWN
0" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: C06
SHEET NO.: 7
37



WEST ELEVATION

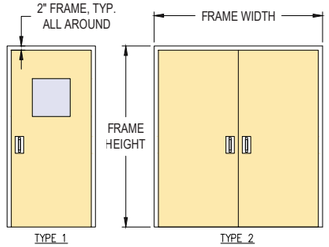
¼" = 1'-0"



NORTH ELEVATION

¼" = 1'-0"

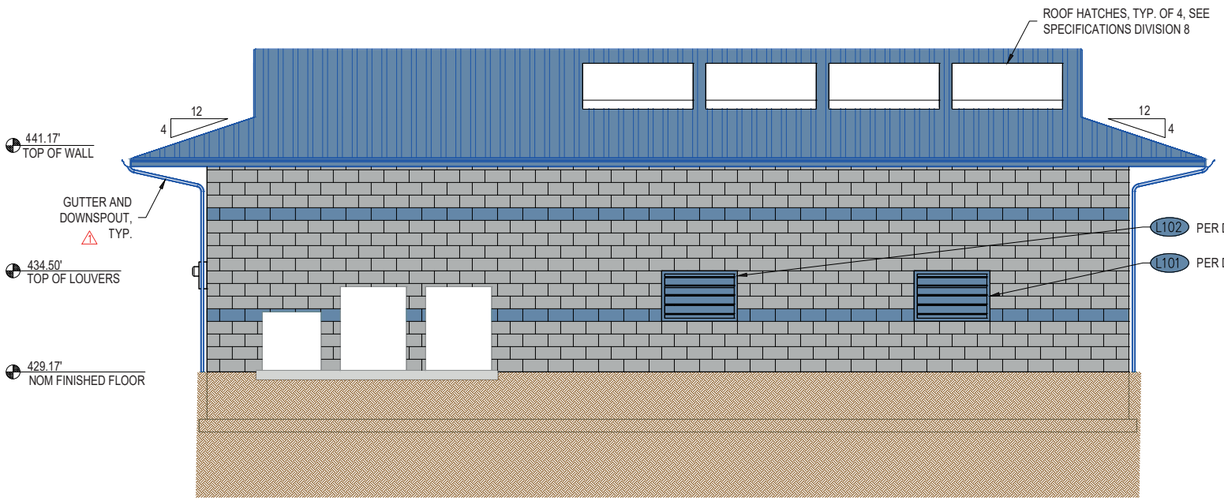
DOOR TYPES:



DOOR SCHEDULE

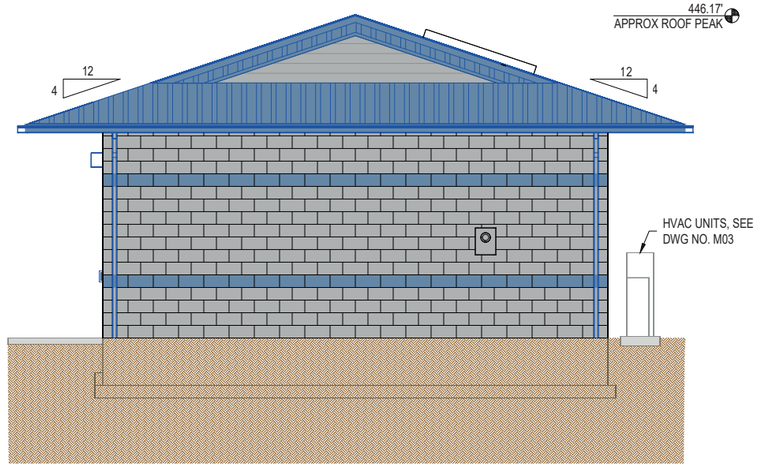
No.	LOCATION	DOOR TYPE	DOOR SIZE WIDTH	DOOR SIZE HEIGHT	DOOR MATERIAL	FRAME SIZE WIDTH	FRAME SIZE HEIGHT	FRAME MATERIAL	NOTES
D100	MECHANICAL ROOM	2	6'-4"	7'-10"	STEEL	6'-8"	8'-0"	STEEL	1
D101	ELECTRICAL ROOM	2	6'-4"	7'-10"	STEEL	6'-8"	8'-0"	STEEL	1
D102	ELECTRICAL ROOM	1	3'-0"	7'-10"	STEEL	3'-4"	8'-0"	STEEL	1

1. PROVIDE HARDWARE TO DOORS AS SPECIFIED IN DIVISION 8. PANIC BARS SHALL BE PROVIDED FOR EACH ACTIVE SIDE DOUBLE EXTERIOR DOOR.
2. COAT DOOR PER SPECIFICATIONS DIVISION 9, MATCH COLOR OF EXISTING



EAST ELEVATION

¼" = 1'-0"



SOUTH ELEVATION

¼" = 1'-0"

RH2

RICHARD L. BALLARD
STATE OF WASHINGTON
22676
REGISTERED PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

JON MARSHALL CONRADI
STATE OF WASHINGTON
22
44672
REGISTERED PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT

Skagit PUD

EXTERIOR ELEVATIONS

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-ARCH01.DWG
DRAWN: DWB
DESIGNED: DND
ENGINEER: DND
REVIEWED: JMC
DATE: Jun 10, 2020
PLOT DATE: Jun 10, 2020

NO.	DATE	DESCRIPTION	BY	REVIEW
	06/10/2020	REVISED TO CONFORM TO BUILDING PERMIT	DND	

REVISIONS

SCALE: SHOWN

0" 1" 2"

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

P.N. 3766
C.O. 5040

DWG NO.: A01

SHEET NO.: 8 / 37

SIDING ON NEW BUILDING SHALL MATCH EXISTING BUILDING

GUTTER ON NEW BUILDING SHALL MATCH EXISTING BUILDING

EAVE ON EXISTING BUILDING SHALL NOT BE INCLUDED IN THE NEW BUILDING, SEE DWG NO. S03 FOR DETAILS

FLASHING ON NEW BUILDING SHALL MATCH EXISTING BUILDING

SOFFIT COLOR FOR NEW BUILDING SHALL MATCH EXISTING AND METAL SOFFITS TO BE INCLUDED IN NEW BUILDING

EXISTING PUMP STATION EXTERIOR

NEW ROOF MATERIAL AND COLOR SHALL MATCH EXISTING, INCLUDING BUT NOT LIMITED TO RIB HEIGHT AND SPACING.

EXISTING PUMP STATION EXTERIOR

NOTE:
-ANY ARCHITECTURAL ITEMS NOT SPECIFICALLY IDENTIFIED IN THESE PLANS SHALL BE CONSTRUCTED TO MATCH THE EXISTING PUMP STATION

-BIDDERS WILL BE ALLOWED TO ACCESS THE SITE TO VERIFY EXISTING BUILDING MATERIALS TO ASSIST IN BID PREPARATION.

NEW BUILDING CMU COLOR TO MATCH EXISTING

EXISTING PUMP STATION EXTERIOR

FLASHING TYPE AND COLOR AROUND NEW ROOF HATCHES SHALL MATCH THE EXISTING BUILDING

TRIM AND FLASHING ON GABLE ENDS OF BUILDING SHALL MATCH EXISTING

FLASHING FOR BUILDING RIDGES SHALL MATCH EXISTING

EXISTING PUMP STATION EXTERIOR

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 32875 — REGISTERED PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

JON MARSHALL CONNER — STATE OF WASHINGTON — 44672 — REGISTERED PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY

JUDY RAW WATER PUMP STATION REPLACEMENT

EXISTING PUMP STATION GRAPHICS

Skagit PUD — PUBLIC UTILITY DISTRICT

ENGINEER: DND	JOB NO.: 117.025
REVIEWED: JMC	CLIENT: SPUD
SAVE DATE: Jun 10, 2020	FILENAME: RWPS-D-ARCH01.DWG
PLOT DATE: Jun 10, 2020	

REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW
1	06/10/2020	REVISED TO CONFORM TO BUILDING PERMIT	DND	DWB

SCALE: SHOWN

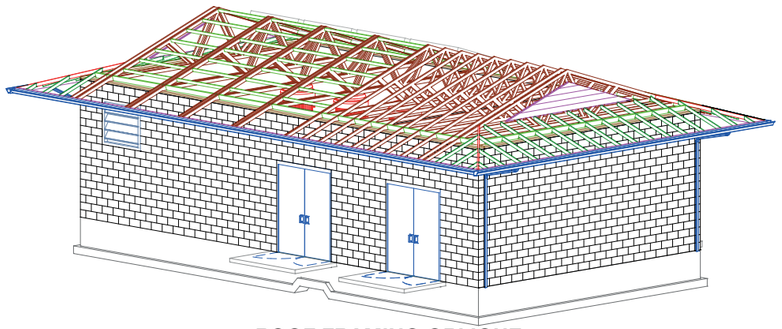
2" 1" 2"

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

P.N. 3766
C.O. 5040

DWG NO.: A02

SHEET NO.: 9 37



ROOF FRAMING OBLIQUE

NOT TO SCALE

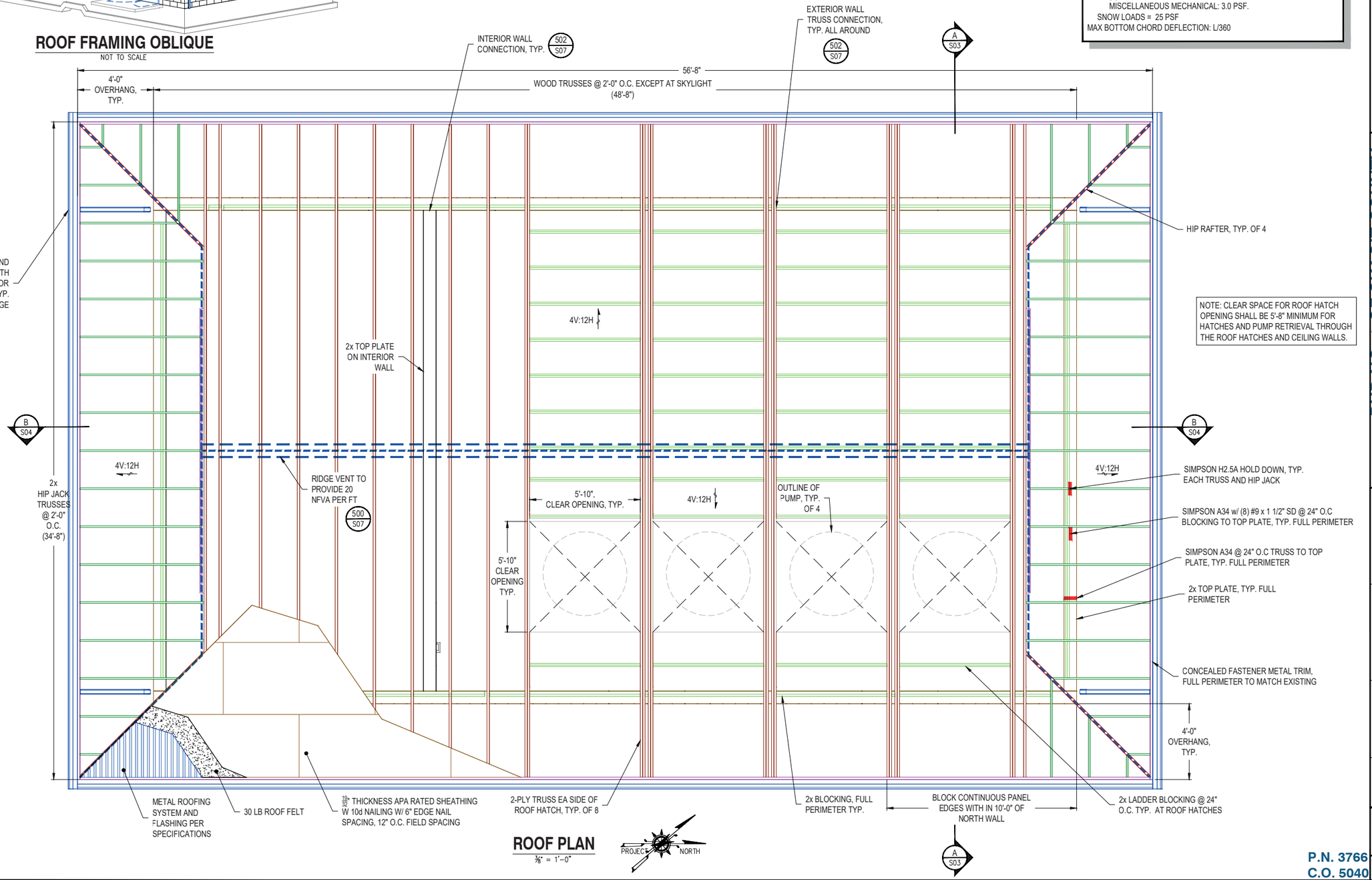
NOTE:

- ALL-FASTENERS INTO PRESSURE TREATED WOOD SHALL BE HOT-DIP GALVANIZED.
- ALL CONNECTORS IN CONTACT WITH PRESSURE TREATED WOOD SHALL BE HOT-DIP GALVANIZED.

TRUSS NOTES

PREFABRICATED CONNECTOR PLATE WOOD ROOF TRUSSES AND OTHER FRAMING SHALL BE DESIGNED BY THE MANUFACTURER IN ACCORDANCE WITH ANSI/TPI 1-1995 FOR THE SPANS AND CONDITIONS SHOWN ON THE DRAWINGS.

LOADING SHALL BE AS FOLLOWS:
ROOF DEAD LOAD:
TOTAL DEAD LOAD = 12 PSF, INCLUDES:
ROOFING: 1.5 PSF
SHEATHING: 2.0 PSF
TRUSSES: 2.0 PSF ASSUMED
INSULATION: 0.5 PSF
(1) LAYER OF 5/8 INCH GYPSUM WALLBOARD: 3.0 PSF
MISCELLANEOUS MECHANICAL: 3.0 PSF.
SNOW LOADS = 25 PSF
MAX BOTTOM CHORD DEFLECTION: L/360



NOTE: CLEAR SPACE FOR ROOF HATCH OPENING SHALL BE 5'-8" MINIMUM FOR HATCHES AND PUMP RETRIEVAL THROUGH THE ROOF HATCHES AND CEILING WALLS.

ROOF PLAN

3/8" = 1'-0"

PROJECT NORTH

RH2

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SIGNED: 04/09/2020

JON MARSHALL CONNELL — STATE OF WASHINGTON — 44672 — REGISTERED STRUCTURAL ENGINEER — PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT
FACILITY ROOF PLAN

Skagit PUD — PUBLIC UTILITY DISTRICT

JOB NO.: 117.025	
CLIENT: SPUD	
FILENAME: RWPS-D-STR02.DWG	
SAVE DATE: Jun 10, 2020	
PLOT DATE: Jun 10, 2020	
ENGINEER: DND	
REVIEWED: JMC	

REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW
1	REVISED TO CONFORM TO BUILDING PERMIT	06/10/2020	DND	DWB

SCALE: SHOWN

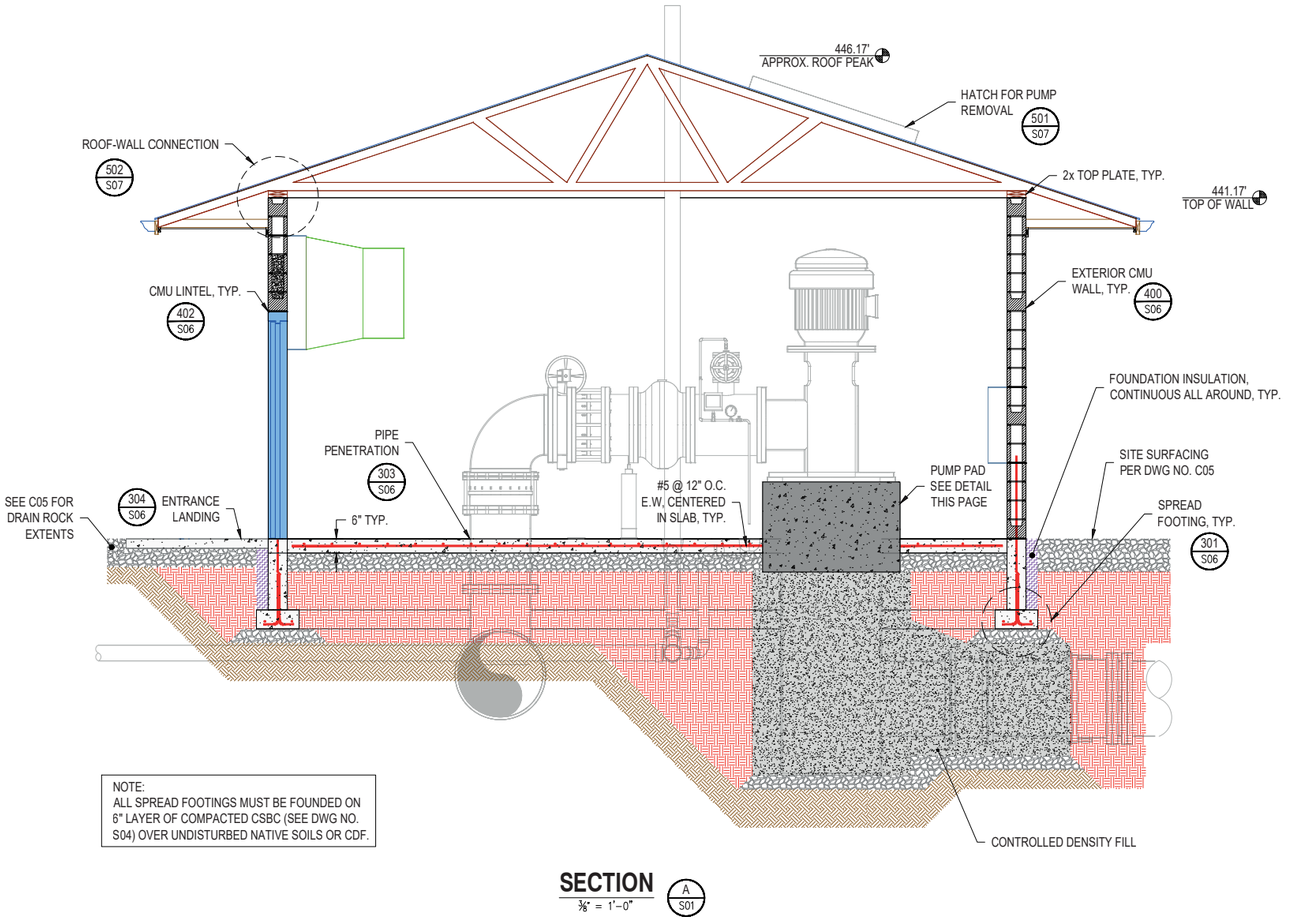
3" 1" 2"

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

P.N. 3766
C.O. 5040

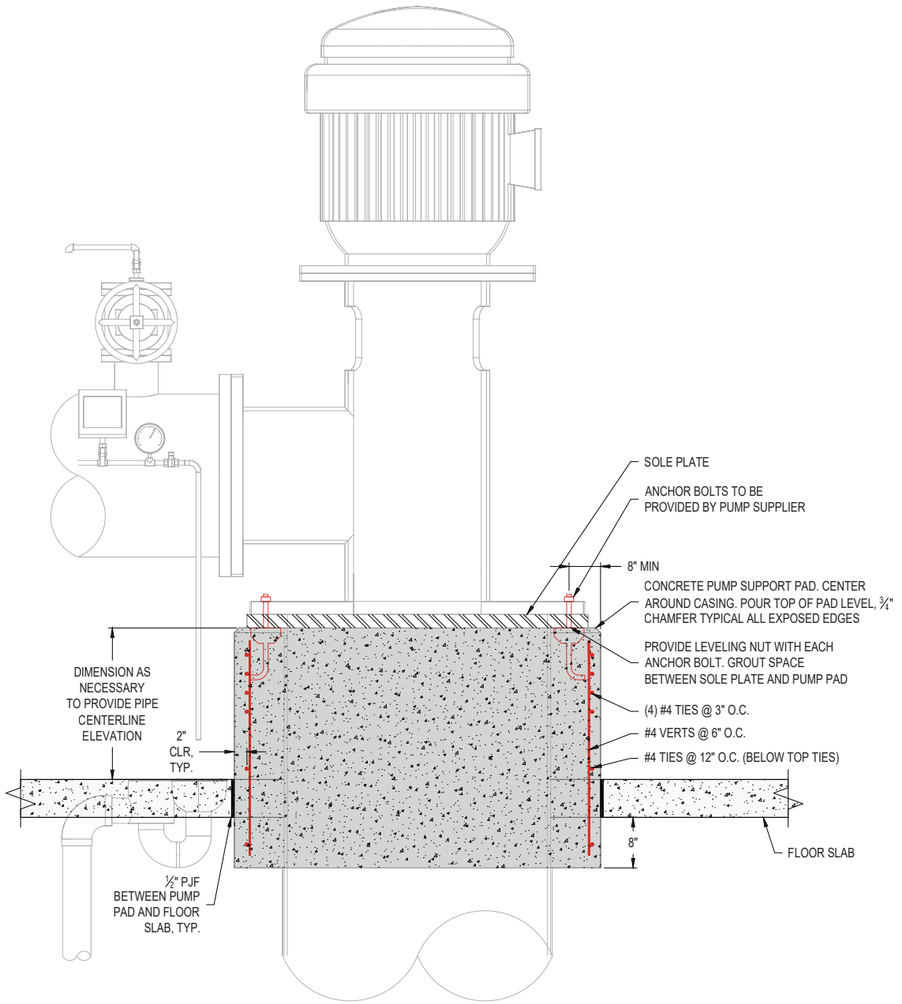
DWG NO.: S02

SHEET NO.: 11 / 37



NOTE:
ALL SPREAD FOOTINGS MUST BE FOUNDED ON 6" LAYER OF COMPACTED CSBC (SEE DWG NO. S04) OVER UNDISTURBED NATIVE SOILS OR CDF.

SECTION
A
S01
⅜" = 1'–0"



PUMP PAD DETAIL SECTION
1" = 1'–0"

RH2

RICHARD L. BALLARD
STATE OF WASHINGTON
22875
REGISTERED PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

JON MARSHALL CONRAD
STATE OF WASHINGTON
44672
REGISTERED STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION
REPLACEMENT

Skagit PUD
PUBLIC UTILITY DISTRICT

STRUCTURAL SECTION I

ENGINEER: DMD	JOB NO.: 117.025
REVIEWED: JMC	CLIENT: SPUD
DATE: Jun 10, 2020	FILENAME: RWPS-D-S-STR03.DWG
PLOT DATE: Jun 10, 2020	

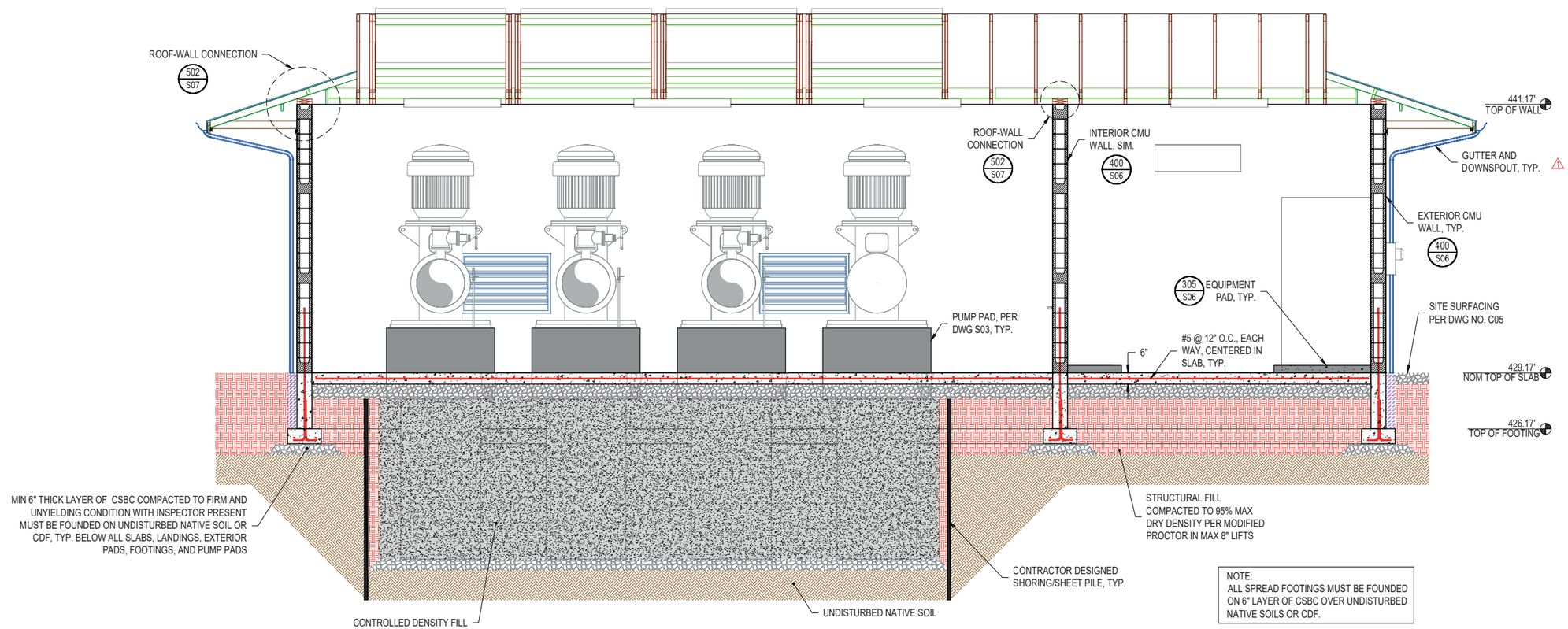
REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW

SCALE: SHOWN
0" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

P.N. 3766
C.O. 5040

DWG NO.: S03
SHEET NO.: 12 37



NOTE:
ALL SPREAD FOOTINGS MUST BE FOUNDED ON 6" LAYER OF CSBC OVER UNDISTURBED NATIVE SOILS OR CDF.

SECTION
B / S01
3/8" = 1'-0"

RH2

RICHARD L. BALLARD
STATE OF WASHINGTON
32875
REGISTERED PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

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44672
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT

Skagit PUD
PUBLIC UTILITY DISTRICT

STRUCTURAL SECTION II

ENGINEER: DND	DATE: Jun 10, 2020	CLIENT: SPUD	JOB NO.: 117.025
REVIEWED: JMC	PLOT DATE: Jun 10, 2020	FILENAME: RWPS-D-STR04.DWG	

REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW
1	06/10/2020	REVISED TO CONFORM TO BUILDING PERMIT	DND	DWB

SCALE: SHOWN
0" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

P.N. 3766
C.O. 5040

DWG NO.: S04
SHEET NO.: 13 / 37

STORMWATER SITE PLAN FOR THE JUDY RAW WATER PUMP STATION REPLACEMENT

Prepared for Public Utility District No. 1 of Skagit County

June 2020

SPUD 117.025.00.0006

Prepared by:

RH2 Engineering, Inc.

22722 29th Drive SE, Suite 210

Bothell, WA 98021

1.800.720.8052 / rh2.com

APPROVED DRAINAGE PLAN

APPROVED BY JC

DATE 08/05/2020 #

Public Utility District No. 1 of Skagit County

Judy Raw Water Pump Station Replacement

June 2020

Prepared by RH2 Engineering, Inc.

Prepared for Public Utility District No. 1 of Skagit County

Note: This Stormwater Site Plan report was completed under the direct supervision of the following Licensed Professional Engineers registered in the State of Washington.

RH2 ENGINEERING, INC.

Signed: 06/10/2020

Signed: 06/10/2020

Reviewed as the Engineer In Responsible Charge

Signed: 06/10/2020

Public Utility District No. 1 of Skagit County

Judy Raw Water Pump Station Replacement

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Minimum Requirement No. 4 – Preservation of Natural Drainage Systems and Outfalls 2
Minimum Requirement No. 5 – On-Site Stormwater Management 2
Off-Site Analysis 3
Permanent Stormwater Control Plan 3
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Pollutant Source Specific Control 4
Conveyance System Analysis and Design 4
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Public Utility District No. 1 of Skagit County

Judy Raw Water Pump Station Replacement

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Appendix D – Source Control BMPs

Appendix E – Geotechnical Report

Public Utility District No. 1 of Skagit County

Judy Raw Water Pump Station Replacement

Stormwater Site Plan

Project Overview

Public Utility District No. 1 of Skagit County (District) will replace the Judy Raw Water Pump Station, which is located on District-owned property (site). The site is located just east of East Morford Road and west of the Judy Reservoir, outside the urban growth area in unincorporated Skagit County at 12115 Morford Road, Sedro Woolley, Washington. The Judy Raw Water Pump Station Replacement project (project) will add a new approximately 1,900 square foot pump station. The project includes water main piping, a new vault, and minor utility installation requiring replacement gravel surfacing, reconstruction of an existing rockery, and other minor site improvements.

Code Compliance Summary Section

This document is prepared in accordance with Skagit County (County) stormwater permitting requirements. As the project site is outside of the County's National Pollutant Discharge Elimination System (NPDES) coverage, the project will comply with the Washington State Department of Ecology's (Ecology) *2012 Stormwater Management Manual for Western Washington* as amended in December 2014 (2014 SWMMWW).

Existing Conditions

The site is located within unincorporated Skagit County. The parcel is approximately 4.92 acres and currently zoned Public Open Space of Regional/Statewide Importance (OSRSI). Properties on the north and east of the site are owned by the District, and are a mix of forested areas or have been developed for utility use. The parcels west and south are zoned Rural Reserve (RRV) and are largely forested with a mix of single-family residences. East Morford Road is adjacent to the entire west property line, and the southern property line borders Old Day Creek Road. The project parcel has existing improvements in the southwest corner that consist of an existing pump station building, paved access road, gravel surfacing, and lawn. The undeveloped portion of the site is mostly forested with some grassy areas around the developed portion of the site. Refer to the project plans for additional information.

Under existing conditions, roof runoff is dispersed and allowed to sheet flow to the south and west or is collected by an on-site storm system and routed across East Morford Road to an existing stormwater facility (pond).

Minimum Requirements

The project parcel is approximately 4.92 acres (per County Assessor's Office mapping), with 2.22 acres being improved; therefore, the site has more than 35-percent of existing impervious surface and is classified as a redevelopment project. The project results in greater than 2,000 square feet of new plus replaced hard surfaces, does not add 5,000 square feet or more of new hard surfaces, is not a road-related project, and the value of the proposed improvements does not exceed 50-percent of the assessed or replaced value of the existing site improvements. As such, Minimum Requirements No. 1 through No. 5 apply. Refer to **Appendix A** for a copy of Figure I-2.4.2 (Flow Chart for Determining Requirements for Redevelopment) from the 2014 SWMMWW, which provides a visual representation of the Minimum Requirements determination for this project, and refer to **Appendix B** for the existing impervious areas.

Minimum Requirement No. 1 – Preparation of Stormwater Site Plans

This comprehensive report contains the technical information and analysis necessary to evaluate a proposed redevelopment project for compliance with the stormwater requirements. This report includes information documenting the construction stormwater pollution prevention plan (SWPPP) and the permanent stormwater control plan.

Minimum Requirement No. 2 – Construction Stormwater Pollution Prevention Plan

A Construction SWPPP has been prepared for the project under the corresponding named section.

Minimum Requirement No. 3 – Source Control of Pollution

Source control Best Management Practices (BMPs) are required and described in the **Permanent Stormwater Control Plan** section of this report.

Minimum Requirement No. 4 – Preservation of Natural Drainage Systems and Outfalls

The proposed project is within a single threshold discharge area (TDA) and will discharge at natural locations. Refer to the **Off-Site Analysis** section that follows.

Minimum Requirement No. 5 – On-Site Stormwater Management

The proposed project will employ On-site Stormwater Management BMPs in accordance with the 2014 SWMMWW and infiltrate, disperse, and retain stormwater run-off on site to the maximum extent feasible without causing flooding or erosion impacts. Refer to the **Permanent Stormwater Control Plan** section of this report.

Off-Site Analysis

Under existing conditions, stormwater either disperses to the southeast or is collected in an on-site conveyance system and routed to an existing stormwater pond located west of the parcel. All discharge from the existing site combines within ¼ mile; therefore, it is located in a single TDA. Under proposed conditions, stormwater flows are anticipated to match the existing conditions.

Contours indicate runoff dispersed from the project site would sheet flow to the southeast prior to being collected by the ditches along Old Day Creek Road. From there, stormwater would enter an unnamed creek, and after traveling approximately 2 miles, would discharge to Beaver Lake. Stormwater collected and detained on site likely are discharged to the west into the unnamed stream prior to discharge into Beaver Lake. Refer to **Appendix C** for maps and information on the downstream flow path.

There are no known drainage problems, erosion concerns, or system deficiencies in the downstream flow path and none are expected to be created by constructing the proposed improvements.

Permanent Stormwater Control Plan

Summary Section

Parking Area – The project proposes to route the existing asphalt parking area and the replaced gravel area to the existing on-site stormwater conveyance system prior to discharging in the existing stormwater pond. Since there is a minimal increase in proposed impervious surfaces being routed to the pond, the pond volume was not analyzed and no adverse effects are anticipated.

Building – The proposed building will be dispersed to the maximum extent feasible to the southeast of the site.

Refer to the project plans for more information.

Low Impact Development Features

Parking Area – The northern half of the existing parking area will be converted from asphalt to gravel surfacing. It will remain approximately the same size, and runoff will be conveyed to an existing stormwater facility northwest of the site where it will be detained.

Building – The proposed building will meet low impact development (LID) requirements through full dispersion. The roof surfaces will be collected by gutters prior to the downspouts discharging to flow dispersion trenches located upstream of the dispersion area. The use of dispersion trenches are due to 25-percent downstream slopes. The dispersion trenches will be placed adjacent to the building and a 100-foot dispersion flow path will be provided through the existing native vegetation. The building roof area is approximately 1,900 square feet; therefore, two 15-foot-long dispersion trenches will be installed in accordance with Figure III-3.1.5 in the 2014 SWMMWW.

Lawn and Landscaped Areas – BMP T5.13: Post-Construction Soil Quality and Depth will be implemented for all lawn and landscaped areas disturbed or created as part of this project. This has been included on the project plans.

Pollutant Source Specific Control

The following source control BMPs should be implemented to prevent stormwater from coming into contact with pollutants.

Source Control BMPs

- S407 BMPs for Dust Control at Disturbed Land Areas and Unpaved Roadways and Parking Lots
- S411 BMPs for Landscaping and Lawn/Vegetation Management
- S415 BMPs for Maintenance of Public and Private Utility Corridors and Facilities
- S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems

Refer to **Appendix D** for copies of the Source Control BMPs.

Conveyance System Analysis and Design

The gravel parking area conversion is the same size as the existing asphalt area it replaces and is already connected to the stormwater pond. No further analysis is warranted.

The conveyance system components proposed for the building and adjacent parking area around the building have sufficient capacity to convey peak flows from the project site by inspection. No further analysis is warranted.

Construction Stormwater Pollution Prevention Plan

The following narrative shall be used in addition to the Temporary Erosion and Sedimentation Control (TESC) Plan(s) in the drawings. The TESC measures and BMPs shown in the plans are the minimum requirements for anticipated site conditions. The contractor shall upgrade and provide additional BMPs as needed for storm events, construction methods, and contractor operations at no additional cost to the agency/owner to ensure sediment-laden water does not leave the project site.

Copies of all BMPs included in the narrative that follows may be obtained from the *2012 Stormwater Management Manual for Western Washington as Amended in December 2014* at:

https://fortress.wa.gov/ecy/madcap/wq/2014SWMMWWinteractive/2014%20SWMMWW.htm

Element No. 1: Preserve Vegetation/Mark Clearing Limits

Before beginning land disturbing activities, including clearing and grading, clearly mark all clearing limits, sensitive areas and their buffers, and trees that are to be preserved within the construction area.

Retain the duff layer, native topsoil, and natural vegetation in an undisturbed state to the maximum degree practicable. If it is not practicable to retain the duff layer in place, it should be stockpiled on- site, covered to prevent erosion, and replaced immediately upon completion of the ground disturbing activities.

Plastic, metal, fabric fence, or other physical barriers may be used to mark the clearing limits.

The contractor shall implement the following BMPs as needed.

- BMP C101: Preserving Natural Vegetation
- BMP C102: Buffer Zones
- BMP C103: High Visibility Plastic or Metal Fence
- BMP C233: Silt Fence

Element No. 2: Establish Construction Access

Limit construction vehicle access and exit to one route, if possible.

If sediment is tracked off site, clean the affected roadway thoroughly at the end of each day or more frequently as necessary (for example, during wet weather). Remove sediment from roads by shoveling, sweeping, or picking up and transporting the sediment to a controlled sediment disposal area.

Conduct street washing only after sediment is removed in accordance with the previous paragraph.

Control street wash wastewater by pumping it back on site or otherwise preventing it from discharging into systems tributary to waters of the State.

The contractor shall implement the following BMPs as needed.

- BMP C105: Stabilized Construction Entrance
- BMP C107: Construction Road/Parking Area Stabilization

Element No. 3: Control Flow Rates

This project constructs minimal new impervious surface, and there is notable downstream area to allow natural flow dispersion that will provide reasonable control of flow rates such that downstream conveyance systems, streambanks, bed sediment, or aquatic habitat will not be adversely affected. As such, this project does not propose to construct temporary detention facilities. Use of the proposed bioretention facility for flow control during construction would be detrimental to the long-term function of the bioretention facility; therefore, it is not proposed to be used during construction for flow control. Additionally, construction is expected to occur during dry summer months and the duration of unstabilized, disturbed soil is expected to be short.

In the event the contractor's operations result in significant increased flows off site such that flow dispersion is not effective, the contractor shall implement straw wattles and/or a sediment trap per the BMPs that follow.

The contractor shall implement the following BMPs as needed.

- BMP C235: Wattles
- BMP C240: Sediment Trap

Element No. 4: Install Sediment Controls

Design, install, and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants.

Construct sediment control BMPs (sediment ponds, traps, filters, etc.) as one of the first steps in grading. These BMPs shall be functional before other land disturbing activities take place.

Minimize sediment discharges from the site. The design, installation, and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity, and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site.

Direct stormwater runoff from disturbed areas through BMP C241: Sediment Pond (Temporary) or other appropriate sediment removal BMP before the runoff leaves the construction site. Runoff from fully stabilized areas may be discharged without a sediment removal BMP but must control flow rates per **Element No. 3: Control Flow Rates**.

Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas to increase sediment removal, and maximize stormwater infiltration, unless infeasible.

Where feasible, design outlet structures that withdraw impounded stormwater from the surface to avoid discharging sediment that is still suspended lower in the water column.

Outlet structures that withdraw impounded stormwater from the surface to avoid discharging sediment that is still suspended lower in the water column are for the construction period only.

If installing a floating pump structure, include a stopper to prevent the pump basket from hitting the bottom of the pond.

Install sediment controls in a manner that protects the sensitive areas and their buffers marked in accordance with **Element No. 1: Preserve Vegetation/Mark Clearing Limits**.

Where feasible, direct stormwater to vegetated areas to increase sediment removal and maximize stormwater infiltration.

Seed and mulch earthen structures such as dams, dikes, and diversions according to the timing indicated in **Element No. 5: Stabilize Soils**.

Full stabilization includes concrete or asphalt paving, quarry spalls used as ditch lining, or the use of rolled erosion products, a bonded fiber matrix product, or vegetative cover in a manner that will fully prevent soil erosion.

The Local Permitting Authority may inspect and approve areas fully stabilized by means other than pavement or quarry spalls.

The contractor shall implement the following BMPs as needed.

- BMP C231: Brush Barrier
- BMP C232: Gravel Filter Berm
- BMP C233: Silt Fence
- BMP C234: Vegetated Strip
- BMP C235: Wattles
- BMP C240: Sediment Trap
- BMP C241: Temporary Sediment Pond
- BMP C250: Construction Stormwater Chemical Treatment
- BMP C251: Construction Stormwater Filtration

Element No. 5: Stabilize Soils

Stabilize exposed and unworked soils by application of effective BMPs that prevent erosion. Applicable BMPs include, but are not limited to, temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, soil application of polyacrylamide (PAM), the early application of gravel base on areas to be paved, and dust control.

Control stormwater volume and velocity within the site to minimize soil erosion.

Control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion.

Soils must not remain exposed and unworked for more than the time periods set forth below to prevent erosion:

- During the dry season (May 1 to September 30): 7 days.
- During the wet season (October 1 to April 30): 2 days.

Stabilize soils at the end of the shift before a holiday or weekend if needed based on the weather forecast.

Stabilize soil stockpiles from erosion, protect with sediment trapping measures, and where possible, locate them away from storm drain inlets, waterways, and drainage channels.

Minimize the amount of soil exposed during construction activity.

Minimize the disturbance of steep slopes.

Minimize soil compaction and, unless infeasible, preserve topsoil.

Soil stabilization BMPs should be appropriate for the time of year, site conditions, estimated duration of use, and potential water quality impacts that stabilization agents may have on downstream waters or ground water.

Ensure that the gravel base used for stabilization is clean and does not contain fines or sediment.

The contractor shall implement the following BMPs as needed.

- BMP C120: Temporary and Permanent Seeding
- BMP C121: Mulching
- BMP C122: Nets and Blankets
- BMP C123: Plastic Covering
- BMP C124: Sodding
- BMP C125: Topsoiling/Composting
- BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection
- BMP C130: Surface Roughening
- BMP C140: Dust Control

Element No. 6: Protect Slopes

Design and construct cut and fill slopes in a manner to minimize erosion. Applicable practices include, but are not limited to, reducing continuous length of slope with terracing and diversions, reducing slope steepness, and roughening slope surfaces (e.g., track walking).

Divert off-site stormwater (run-on) or ground water away from slopes and disturbed areas with interceptor dikes, pipes, and/or swales. Off-site stormwater should be managed separately from stormwater generated on site.

At the top of slopes, collect drainage in pipe slope drains or protected channels to prevent erosion. Temporary pipe slope drains must be a minimum 8-inch diameter and/or sized to convey a minimum of 0.5 cubic feet per second (cfs).

Place excavated material on the uphill side of trenches, consistent with safety and space considerations.

Place check dams at regular intervals within constructed channels that are cut down a slope.

BMP combinations are the most effective method of protecting slopes with disturbed soils. For example, use both BMP C121: Mulching and BMP C122: Nets and Blankets in combination.

The contractor shall implement the following BMPs as needed.

- BMP C120: Temporary and Permanent Seeding
- BMP C121: Mulching
- BMP C122: Nets and Blankets
- BMP C123: Plastic Covering
- BMP C124: Sodding
- BMP C130: Surface Roughening
- BMP C131: Gradient Terraces

- BMP C200: Interceptor Dike and Swale
- BMP C201: Grass-Lined Channels
- BMP C204: Pipe Slope Drains
- BMP C205: Subsurface Drains
- BMP C206: Level Spreader
- BMP C207: Check Dams
- BMP C208: Triangular Silt Dike (Geotextile-Encased Check Dam)

Element No. 7: Protect Drain Inlets

Protect all existing storm drain inlets and those made operable during construction so that stormwater runoff shall not enter the conveyance system without first being filtered or treated to remove sediment.

Clean or remove and replace inlet protection devices when sediment has filled one-third of the available storage (unless a different standard is specified by the product manufacturer).

Keep all approach roads clean. Do not allow sediment and street wash water to enter storm drains without prior and adequate treatment (as defined previously), unless treatment is provided before the storm drain discharges to waters of the State.

Inlets should be inspected weekly at a minimum and daily during storm events.

The contractor shall implement the following BMP as needed.

- BMP C220: Storm Drain Inlet Protection

Element No. 8: Stabilize Channels and Outlets

Design, construct, and stabilize all on-site conveyance channels to prevent erosion from a flow rate of 0.5 cfs.

Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches at the outlets of all conveyance systems.

The best method for stabilizing channels is to completely line the channel with BMP C122: Nets and Blankets first, then add BMP C207: Check Dams as necessary to function as an anchor and slow the flow of water.

The contractor shall implement the following BMPs as needed.

- BMP C122: Nets and Blankets
- BMP C202: Riprap Channel Lining
- BMP C207: Check Dams
- BMP C209: Outlet Protection

Element No. 9: Control Pollutants

Design, install, implement, and maintain effective pollution prevention measures to minimize the discharge of pollutants.

Handle and dispose of all pollutants, including waste materials and demolition debris, that occur on site in a manner that does not cause contamination of stormwater.

Provide cover, containment, and protection from vandalism for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment. On-site fueling tanks must include secondary containment. Secondary containment means placing tanks or containers within an impervious structure capable of containing 110 percent of the volume contained in the largest tank within the containment structure. Double-walled tanks do not require additional secondary containment.

Conduct maintenance, fueling, and repair of heavy equipment and vehicles using spill prevention and control measures. Clean contaminated surfaces immediately following any spill incident.

Discharge wheel wash or tire bath wastewater to a separate on-site treatment system that prevents discharge to surface water, or to the sanitary sewer, with local sewer district approval.

Apply fertilizers and pesticides in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Follow manufacturers' label requirements for application rates and procedures.

Use BMPs to prevent contamination of stormwater runoff by pH-modifying sources. The sources for this contamination include, but are not limited to, recycled concrete stockpiles, bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, concrete pumping, and mixer washout waters.

Adjust the pH of stormwater, if necessary, to prevent violations of water quality standards.

Ensure that washout of concrete trucks is performed off site or in designated concrete washout areas only. Do not wash out concrete truck drums or concrete handling equipment onto the ground, or into storm drains, open ditches, streets, or streams. Wash out of small concrete handling equipment may be disposed of in a formed area awaiting concrete where it will not contaminate surface or ground waters. Do not dump excess concrete on site, except in designated concrete washout area. Concrete spillage or concrete discharge directly to ground water or surface waters of the State is prohibited. Do not wash out to formed areas awaiting infiltration BMPs.

Obtain written approval from Ecology before using chemical treatment other than carbon dioxide, dry ice, or food grade vinegar to adjust pH.

Uncontaminated water from water-only based shaft drilling for construction of building, road, and bridge foundations may be infiltrated provided the wastewater is managed in a way that prohibits discharge to surface waters. Prior to infiltration, water from water-only based shaft

drilling that comes into contact with curing concrete must be neutralized until pH is in the range of 6.5 to 8.5.

Do not use upland land applications for discharging wastewater from concrete washout areas.

Conduct oil changes, hydraulic system drain down, solvent, and degreasing cleaning operations, fuel tank drain down and removal, and other activities that may result in discharge or spillage of pollutants to the ground or into stormwater runoff using spill prevention measures such as drip pans.

Clean contaminated surfaces immediately following any discharge or spill incident. Emergency repairs may be performed on site using temporary plastic placed beneath and, if raining, over the vehicle.

The contractor shall implement the following BMPs as needed.

- BMP C151: Concrete Handling
- BMP C152: Sawcutting and Surfacing Pollution Prevention
- BMP C153: Material Delivery, Storage, and Containment
- BMP C154: Concrete Washout Area
- BMP C250: Construction Stormwater Chemical Treatment
- BMP C251: Construction Stormwater Filtration
- BMP C252: High pH Neutralization Using CO2

Refer to the Source Control BMPs detailed in the *2014 SWMMWW*.

Element No. 10: Control Dewatering

Discharge foundation, vault, and trench dewatering waters that have similar characteristics to stormwater runoff at the site into a controlled conveyance system before discharge to BMP C240: Sediment Trap or BMP C241: Sediment Pond (Temporary).

Discharge clean, non-turbid dewatering water, such as well-point ground water, to systems tributary to, or directly into, surface waters of the State, as specified in **Element No. 8: Stabilize Channels and Outlets**, provided the dewatering flow does not cause erosion or flooding of receiving waters. Do not route clean dewatering water through stormwater sediment BMPs. Note that “surface waters of the State” may exist on a construction site and off site (e.g., a creek running through a site).

Handle highly turbid or otherwise contaminated dewatering water separately from stormwater.

Other dewatering treatment or disposal options may include:

1. Transport off site in a vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute State waters;
2. Treat Ecology-approved on-site chemical or other suitable treatment technologies; and
3. Use of a sedimentation bag that discharges to a ditch or swale for small volumes of

localized dewatering.

Discharging sediment-laden (muddy) water into waters of the State likely constitutes violation of water quality standards for turbidity. The easiest way to avoid discharging muddy water is through infiltration and preserving vegetation.

The contractor shall implement the following BMPs as needed.

- BMP C203: Water Bars
- BMP C236: Vegetative Filtration

Element No. 11: Maintain BMPs

Maintain and repair all temporary and permanent erosion and sediment control BMPs as needed to ensure continued performance of their intended function in accordance with BMP specifications.

Remove all temporary erosion and sediment control BMPs within 30 days after achieving final site stabilization or after the temporary BMPs are no longer needed.

Some temporary erosion and sediment control BMPs are biodegradable and designed to remain in place following construction. BMP C122: Nets and Blankets is an example of a BMP with biodegradable options.

Provide protection to all BMPs installed for the permanent control of stormwater from sediment and compaction. All BMPs that are to remain in place following completion of construction shall be examined and placed in full operating condition. If sediment enters the BMPs during construction, it shall be removed, and the facility shall be returned to the conditions specified in the construction documents.

Remove or stabilize trapped sediment on site. Permanently stabilize disturbed soil resulting from the removal of BMPs or vegetation.

The contractor shall implement the following BMPs as needed.

- BMP C150: Materials On Hand
- BMP C160: Certified Erosion and Sediment Control Lead

Element No. 12: Manage the Project

Phase development projects to the maximum degree practicable and consider seasonal work limitations.

Inspect, maintain, and repair all BMPs as needed to ensure continued performance of their intended function. Projects regulated under the Construction Stormwater General Permit (CSGP) must conduct site inspections and monitoring in accordance with Special Condition S4 of the CSGP.

Maintain, update, and implement the Construction SWPPP.

Projects that disturb 1 or more acres must have site inspections conducted by a Certified Erosion and Sediment Control Lead (CESCL). Project sites disturbing less than 1 acre may have a CESCL or a person without CESCL certification conduct inspections.

By the initiation of construction, the Construction SWPPP must identify the CESCL or inspector, who must always be present on site or on-call.

The project manager must ensure that the project is built in such a way to comply with all Construction SWPPP Elements, as detailed in this section. Considerations for the project manager include, but are not limited to, the following:

- Construction phasing.
- Seasonal work limitations.
- Coordination with utilities and other contractors.
- Inspection.
- Monitoring.
- Maintaining an updated construction SWPPP.

Phasing of Construction

Phase development projects where feasible to prevent soil erosion and transporting of sediment from the site during construction. Revegetate exposed areas and maintain that vegetation as an integral part of the clearing activities for any phase.

Clearing and grading activities for developments shall be permitted only if conducted using an approved site development plan (e.g., subdivision approval) that establishes permitted areas of clearing, grading, cutting, and filling. Minimize removing trees and disturbing or compacting native soils when establishing permitted clearing and grading areas. Show on the site plans and the development site permitted clearing and grading areas and any other areas required to preserve critical or sensitive areas, buffers, native growth protection easements, or tree retention areas as may be required by local jurisdictions.

Inspection

All BMPs must be inspected, maintained, and repaired as needed to ensure continued performance of their intended function. Site inspections must be conducted by a person knowledgeable in the principles and practices of erosion and sediment control. The person must have the skills to: 1) assess the site conditions and construction activities that could impact the quality of stormwater; and 2) assess the effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.

For construction sites 1 acre or larger that discharge stormwater to surface waters of the state, a CESCL must be identified in the construction SWPPP; this person must be on site or on-call at all times. Certification must be obtained through an approved training program that meets the erosion and sediment control training standards established by Ecology. Refer to BMP C160: Certified Erosion and Sediment Control Lead for more information.

Appropriate BMPs or design changes shall be implemented as soon as possible whenever inspection and/or monitoring reveals that the BMPs identified in the Construction SWPPP are inadequate due to the actual discharge of, or the potential to discharge, a significant amount of any pollutant.

The CESCL or inspector must examine stormwater visually for the presence of suspended sediment, turbidity, discoloration, and oil sheen. The CESCL or Inspector must evaluate the effectiveness of BMPs and determine if it is necessary to install, maintain, or repair BMPs to improve the quality of stormwater discharges.

Based on the results of the inspection, construction site operators must correct the problems identified by:

- Reviewing the Construction SWPPP for compliance with the 13 elements and making appropriate revisions within 7 days of the inspection;
- Immediately beginning the process of fully implementing and maintaining appropriate source control and/or treatment BMPs, addressing the problems no later than within 10 days of the inspection. If installation of necessary treatment BMPs is not feasible within 10 days, the construction site operator may request an extension within the initial 10-day response period; and
- Documenting BMP implementation and maintenance in the site log book (applies only to sites that have coverage under the CSGP).

The CESCL or inspector must inspect all areas disturbed by construction activities, all BMPs, and all stormwater discharge points at least once every calendar week and within 24 hours of any discharge from the site. (For purposes of this condition, individual discharge events that last more than 1 day do not require daily inspections. For example, if a stormwater pond discharges continuously over the course of a week, only one inspection is required that week.) The CESCL or inspector may reduce the inspection frequency for temporary stabilized, inactive sites to once every calendar month

Maintaining an Updated Construction SWPPP

Retain the Construction SWPPP on site or within reasonable access to the site.

Modify the Construction SWPPP whenever there is a change in the design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The Construction SWPPP must be modified if, during inspections or investigations conducted by the owner/operator, or the applicable local or state regulatory authority, it is determined that the Construction SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site. Modify the Construction SWPPP as necessary to include additional or modified BMPs designed to correct the problems identified. Complete revisions to the Construction SWPPP within 7 days following the inspection.

Construction Sequence

1. Hold the pre-construction meeting.
2. Flag or fence clearing limits.
3. Post a sign with the name and phone number of the TESC supervisor.
4. Install catch basin protection.
5. Install perimeter protection (silt fence, brush barrier, etc.).
6. Maintain erosion control measures in accordance with the local jurisdiction's standards and manufacturer's recommendations.
7. Relocate surface water controls or erosion control measures or install new measures so that as site conditions change, the erosion and sediment control is always in accordance with the local jurisdiction's standards.
8. Cover all areas that will be unworked for more than 7 days during the dry season or 2 days during the wet season with straw, wood fiber mulch, compost, plastic sheeting, or equivalent.
9. Stabilize all areas within 7 days of reaching final grade.
10. Seed any areas to remain unworked for more than 30 days.
11. Upon completion of the project, stabilize all disturbed areas and remove BMPs if appropriate.

The contractor shall implement the following BMPs as needed.

- BMP C150: Materials On Hand
- BMP C160: Certified Erosion and Sediment Control Lead
- BMP C162: Scheduling

Element No. 13: Protect Low Impact Development BMPs

Protect all LID BMPs (including, but not limited, to BMP T5.13: Post-Construction Soil Quality and Depth and BMP T5.30 Full Dispersion) from sedimentation through installation and maintenance of erosion and sediment control BMPs on portions of the site that drain into the LID BMPs. Restore the BMPs to their fully functioning condition if they accumulate sediment during construction. Restoring the BMP must include removal of sediment and any sediment-laden bioretention soils and replacing the removed soils with soils meeting the design specification.

Protect completed lawn and landscaped areas from compaction due to construction equipment.

Keep all heavy equipment off existing soils under LID BMPs that have been excavated to final grade to retain the infiltration rate of the soils.

The contractor shall implement the following BMPs as needed.

- BMP C102: Buffer Zones
- BMP C103: High-Visibility Fence
- BMP C200: Interceptor Dike and Swale
- BMP C201: Grass-Lined Channels
- BMP C207: Check Dams
- BMP C208: Triangular Silt Dike (TSD) (Geotextile-Encased Check Dam)
- BMP C231: Brush Barrier
- BMP C233: Silt Fence
- BMP C234: Vegetated Strip

Construction Monitoring and Sampling Requirements

Construction monitoring includes visual inspection, sampling for water quality parameters of concern, and documenting the inspection and sampling findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements;
- Site inspections; and
- Stormwater sampling data.

Download the Construction Stormwater Site Inspection Form found on Ecology's website at:.

https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit.

The site log book must be maintained on site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

Site Inspection

Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.

The discharge point(s) are indicated on the Site Plans and are in accordance with the applicable requirements of the CSGP.

Reporting and Record Keeping

Record Keeping – Site Log Book

A site log book will be maintained for all onsite construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements;
- Site inspections; and
- Sample logs.

Records Retention

Records will be retained during the life of the project and for a minimum of 3 years following the termination of permit coverage in accordance with Special Condition S5.C of the CSGP.

The following permit documentation is to be retained onsite:

- CSGP.
- Permit Coverage Letter.
- Construction SWPPP.
- Site Log Book.

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSGP.

Updating the SWPPP

The SWPPP will be modified if:

- It is found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site; or
- There is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The SWPPP will be modified within 7 days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

Discharge Monitoring Reports

Cumulative soil disturbance is less than 1 acre; therefore, Discharge Monitoring Reports (DMRs) will not be submitted to Ecology because water quality sampling is not being conducted at the site.

Notification of Noncompliance

If any of the terms and conditions of the permit are not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24 hours of the failure to comply by calling the applicable Regional office via phone (425) 649-7000 or email nwroerts@ecy.swa.gov More information can be found here: https://ecology.wa.gov/About-us/Get-involved/Report-an-environmental-issue
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within 5 days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within 5 days, unless requested earlier by Ecology.

Specific information to be included in the noncompliance report is found in Special Condition S5.F.3 of the CSGP.

Anytime turbidity sampling indicates turbidity is 250 nephelometric turbidity units (NTU)s or greater, or water transparency is 6 centimeters (cm) or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSGP.

- Northwest Region at (425) 649-7000 for Island, King, Kitsap, San Juan, Skagit, Snohomish, or Whatcom Counties.

Include the following information when notifying the Regional office:

1. Your name and phone number.
2. Permit number.
3. City/County of project.
4. Sample results.
5. Date/time of call.
6. Date/time of sample.
7. Project name.

In accordance with Special Condition S4 of the CSGP, the Ecology Regional office will be notified if chemical treatment other than CO2 sparging is planned for adjustment of high pH water.

This concludes the SWPPP.

Special Reports and Studies

An engineering geology and geotechnical report was prepared by GeoEngineers, dated June 2020 and is included in **Appendix E** under a separate cover. A Washington State Department of Health (DOH) Project Report was completed related to public health of the water system.

Other Permits

The following permits are anticipated for this project:

- DOH Construction Documents.
- Building Permit (Skagit County).
- State Environmental Policy Act (SEPA) Checklist (District).

This concludes the Stormwater Site Plan report.

Appendices

APPENDIX A

Flow Chart for Determining Requirements for Redevelopment

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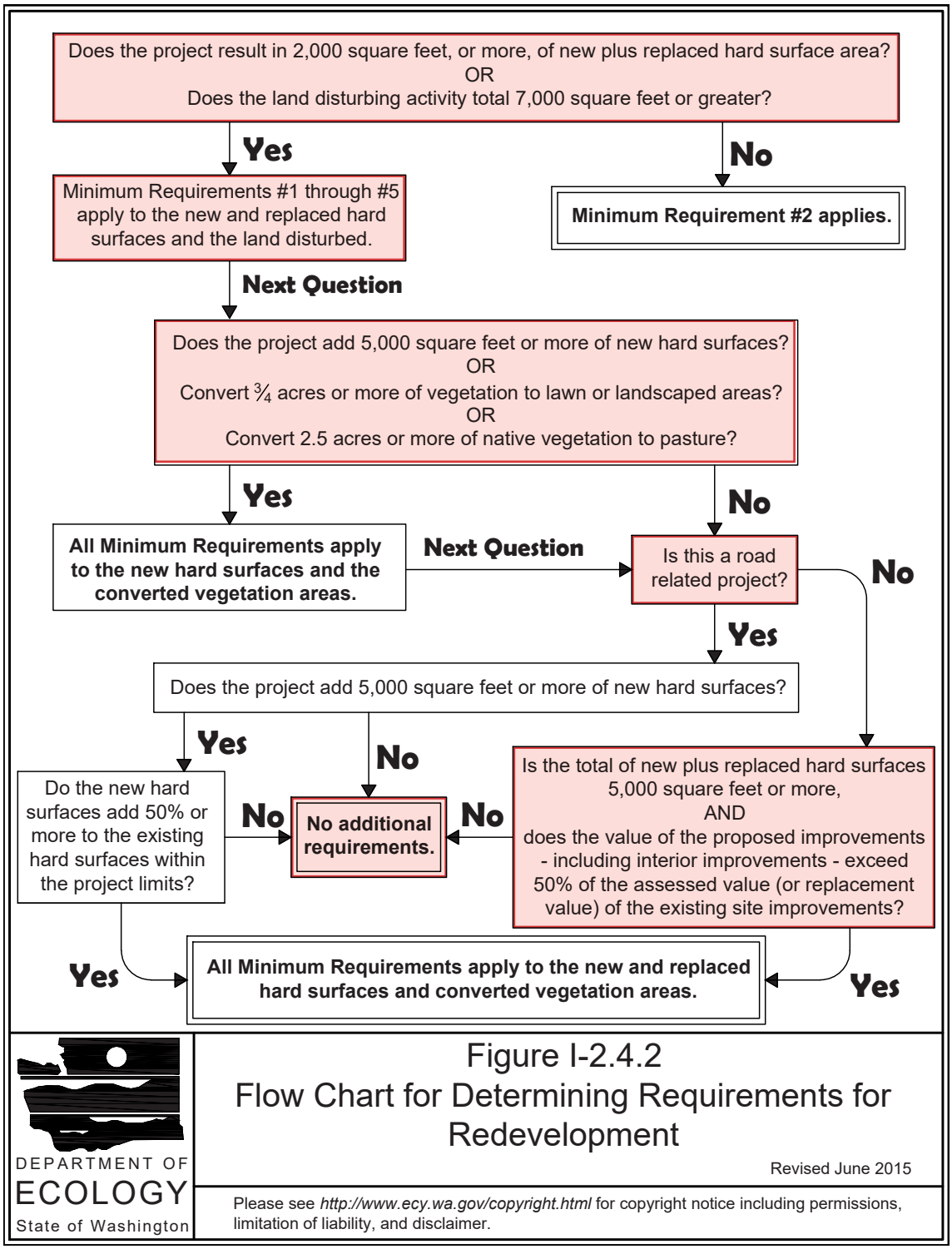
Figure I-2.4.2 Flow Chart for Determining Requirements for Redevelopment



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APPENDIX B
Existing Impervious Areas

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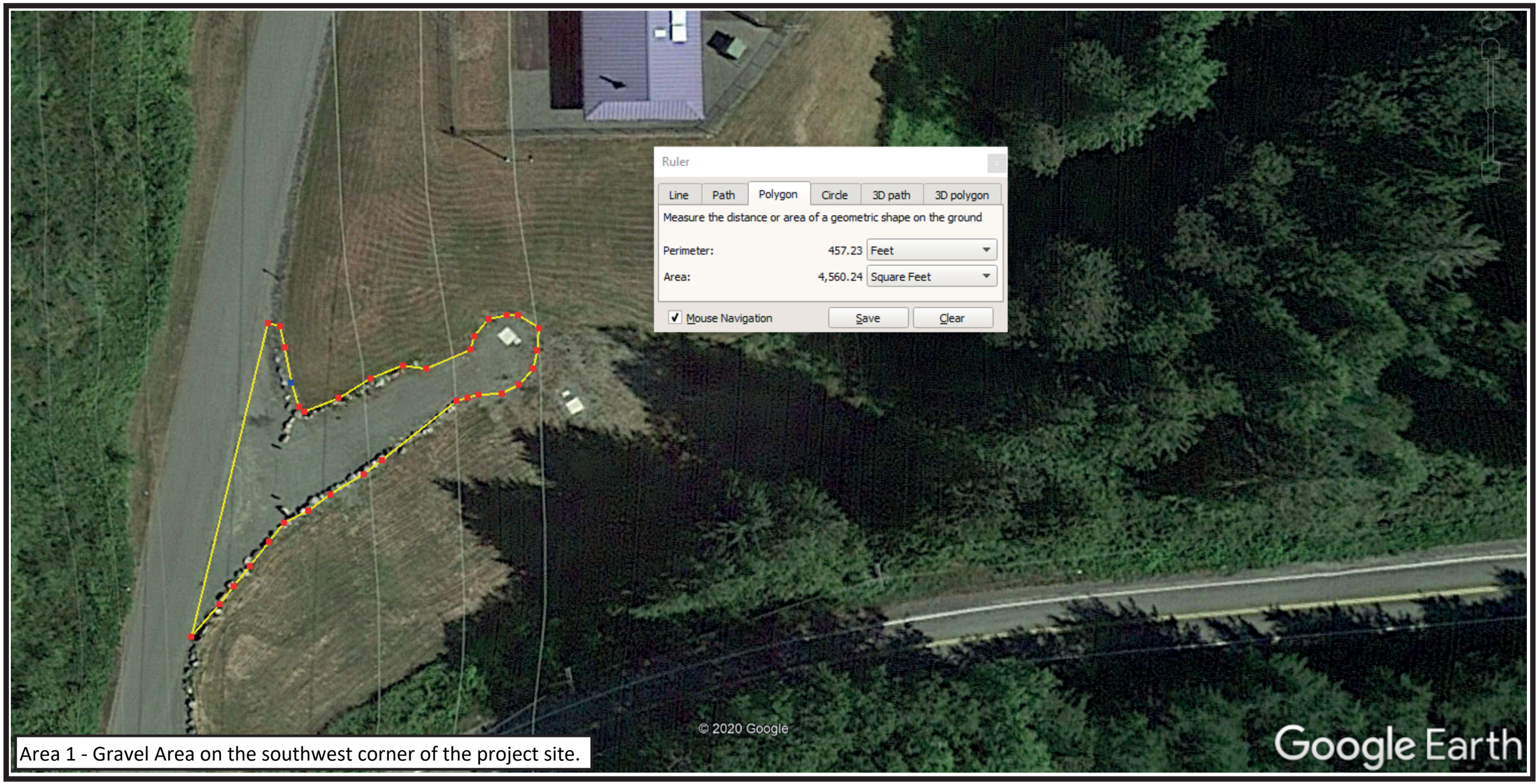
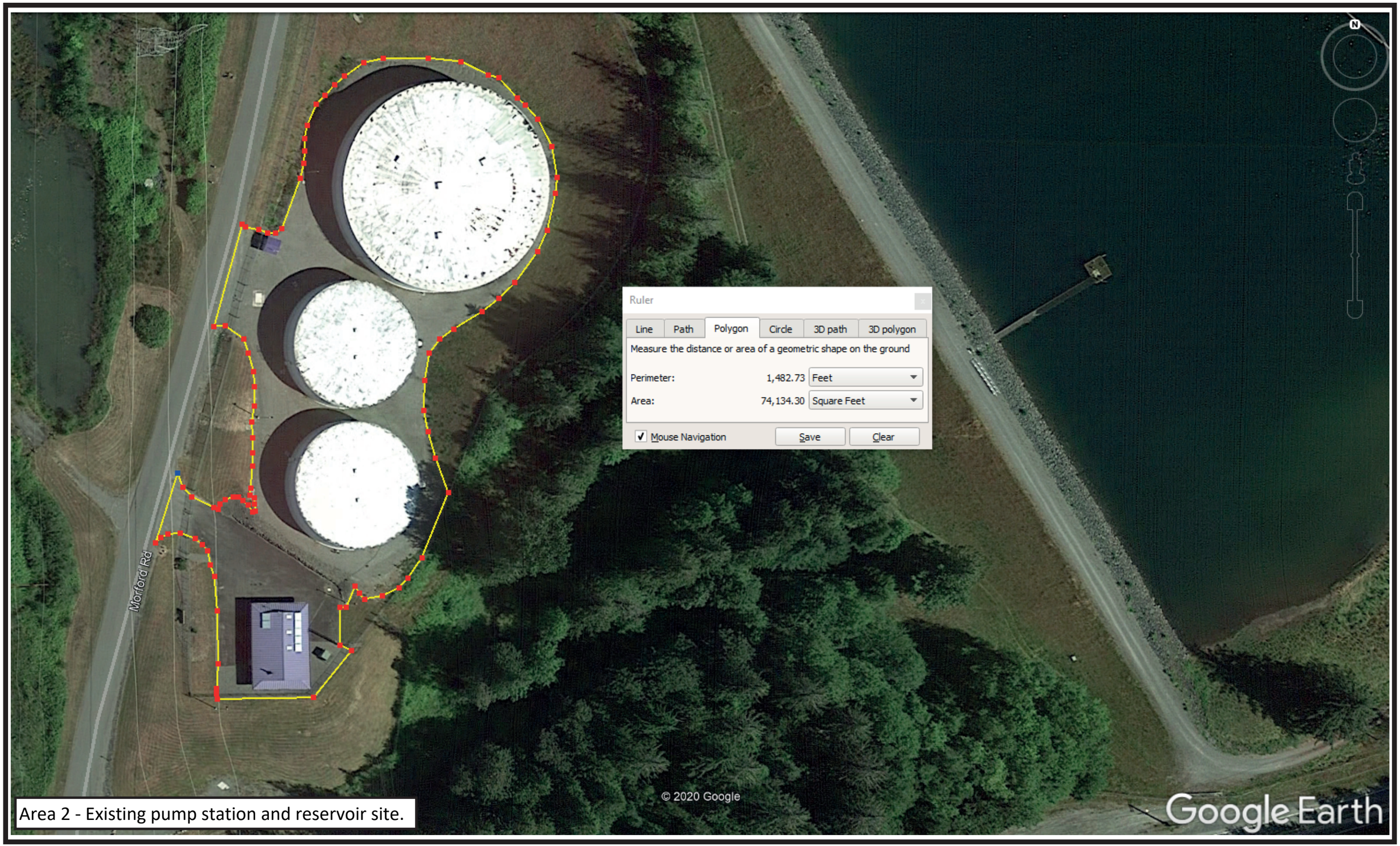
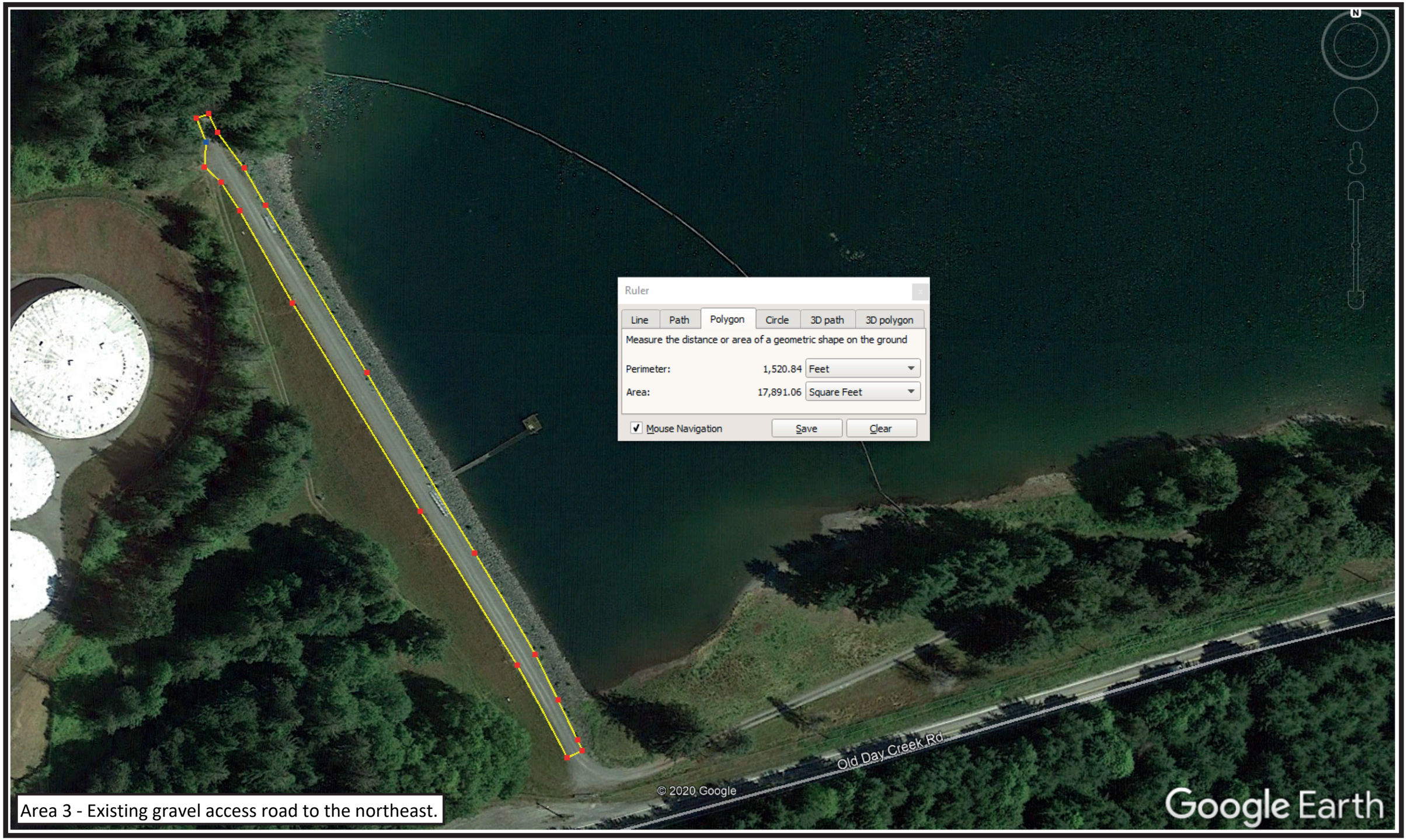


Area 1 - Gravel Area on the southwest corner of the project site.



Area 2 - Existing pump station and reservoir site.



Area 3 - Existing gravel access road to the northeast.

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APPENDIX C
Downstream Flow Path

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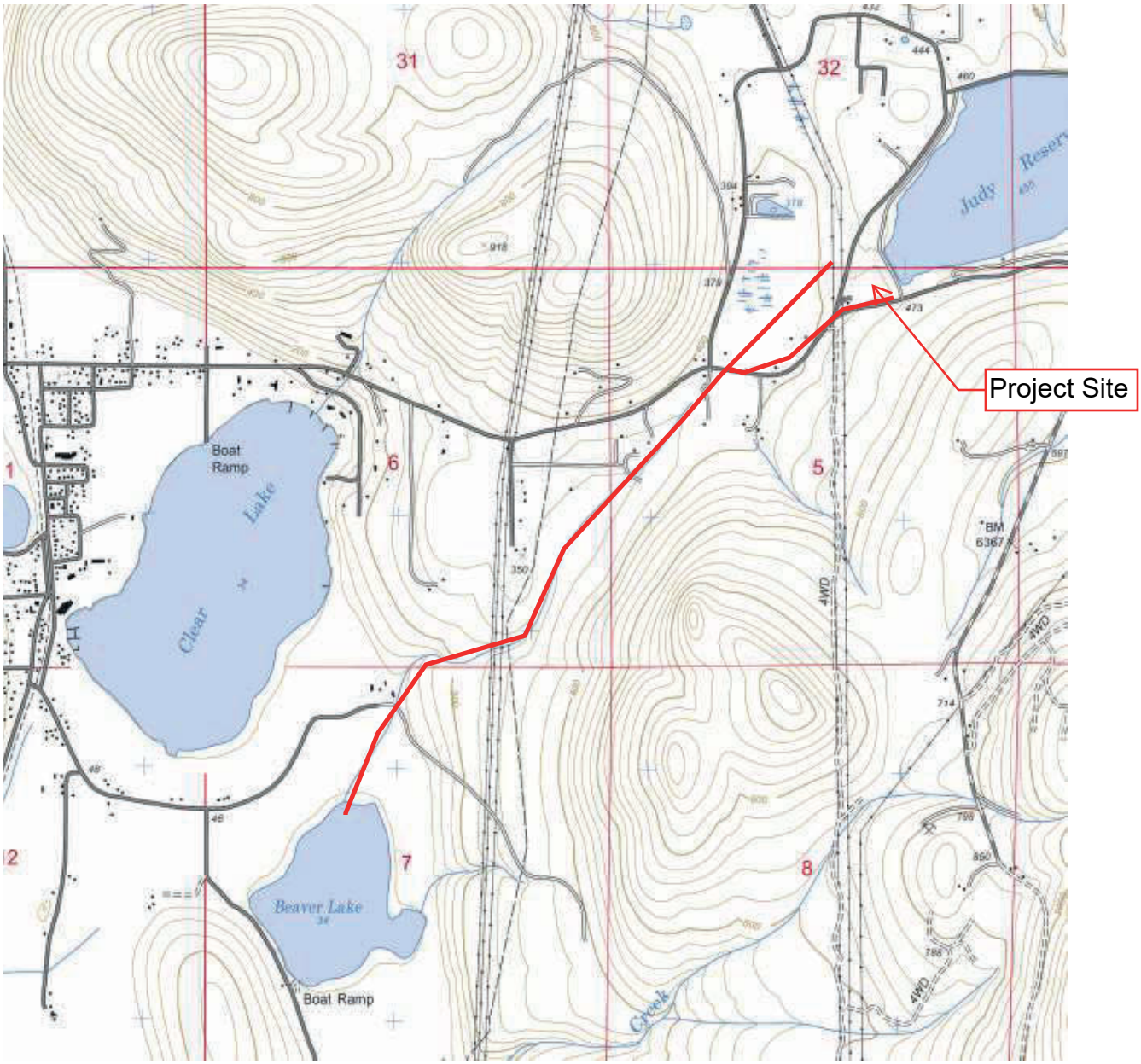
Appendix B – Flow Path



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APPENDIX D
Source Control BMPs

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S406 BMPs for Streets/ Highways

Applicable BMPs:

- Select de and anti-icers that cause the least adverse environmental impact. Apply only as needed using minimum quantities.
- Where practicable use roadway deicers, such as calcium magnesium acetate, potassium acetate, or similar materials, that cause less adverse environmental impact than urea, and sodium chloride.
- Store and transfer de and anti-icing materials on an impervious containment pad in accordance with *BMP Storage or Transfer (Outside) of Solid Raw Materials, By-Products, or Finished Products* in this volume.
- Sweep/clean up accumulated de and anti-icing materials and grit from roads as soon as possible after the road surface clears.

Recommended Additional BMPs

- Intensify roadway cleaning in early spring to help remove particulates from road surfaces.
- Include limits on toxic metals in the specifications for de/anti-icers.

S407 BMPs for Dust Control at Disturbed Land Areas and Unpaved Roadways and Parking Lots

Description of Pollutant Sources: Dust can cause air and water pollution problems particularly at demolition sites and in arid areas where reduced rainfall exposes soil particles to transport by air.

Pollutant Control Approach: Minimize dust generation and apply environmentally friendly and government approved dust suppressant chemicals, if necessary.

Applicable Operational BMPs:

- Sprinkle or wet down soil or dust with water as long as it does not result in a wastewater discharge.
- Use only local and/or state government approved dust suppressant chemicals such as those listed in Ecology Publication #96-433, *Techniques for Dust Prevention and Suppression*.
- Avoid excessive and repeated applications of dust suppressant chemicals. Time the application of dust suppressants to avoid or minimize their wash-off by rainfall or human activity such as irrigation.
- Apply stormwater containment to prevent the conveyance of sediment into storm drains or receiving waters.

- Ecology prohibits the use of motor oil for dust control. Take care when using lignin derivatives and other high BOD chemicals in areas susceptible to contaminating surface water or ground water.
- Consult with Ecology and the local permitting authority on discharge permit requirements if the dust suppression process results in a wastewater discharge to the ground, ground water, storm drain, or surface water.

Recommended Additional Operational BMPs for Roadways and Other Trafficked Areas:

- Consider limiting use of off-road recreational vehicles on dust generating land.
- Consider graveling or paving unpaved permanent roads and other trafficked areas at municipal, commercial, and industrial areas.
- Consider paving or stabilizing shoulders of paved roads with gravel, vegetation, or local government approved chemicals.
- Encourage use of alternate paved routes, if available.
- Vacuum sweep fine dirt and skid control materials from paved roads soon after winter weather ends or when needed.
- Consider using pre-washed traction sand to reduce dust emissions.

Additional Recommended Operational BMPs for Dust Generating Areas:

- Prepare a dust control plan. Helpful references include: Control of Open Fugitive Dust Sources (EPA-450/3-88-088), and Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures (EPA-450/2-92-004).
- Limit exposure of soil (dust source) as much as feasible.
- Stabilize dust-generating soil by growing and maintaining vegetation, mulching, topsoiling, and/or applying stone, sand, or gravel.
- Apply windbreaks in the soil such as trees, board fences, tarp curtains, bales of hay, etc.

S408 BMPs for Dust Control at Manufacturing Areas

Description of Pollutant Sources: Industrial material handling activities can generate considerable amounts of dust that is typically removed using exhaust systems. Mixing cement and concrete products and handling powdered materials can also generate dust. Particulate materials that can cause air pollution include grain dust, sawdust, coal, gravel, crushed rock, cement, and boiler fly ash. Air emissions can contaminate stormwater. The objective of this BMP is to reduce the stormwater pollutants caused by dust generation and control.

of the mixture. Stormwater could be conveyed to a sanitary sewer system if it is determined not to be explosive.

- Transfer the fuel from the delivery tank trucks to the fuel storage tank in impervious contained areas and ensure that appropriate overflow protection is used. Alternatively, cover nearby storm drains during the filling process and use drip pans under all hose connections.

Additional BMP for Vehicles 10 feet in height or greater

A roof or canopy may not be feasible at fueling stations that regularly fuel vehicles that are 10 feet in height or greater, particularly at industrial or WSDOT sites. At those types of fueling facilities, the following BMPs apply, as well as the applicable BMPs and fire prevention (UFC requirements) of this BMP for fueling stations:

- If a roof or canopy is impractical, the concrete fueling pad must be equipped with emergency spill control including a shutoff valve for drainage from the fueling area. Maintain the valve in the closed position in the event of a spill. An electronically actuated valve is preferred to minimize the time lapse between spill and containment. Clean up spills and dispose of materials off-site in accordance with S406 BMPs for Spills of Oil and Hazardous Substances.
- The valve may be opened to convey contaminated stormwater to a sanitary sewer, if approved by the sewer authority, or to oil removal treatment such as an API or CP oil/water separator, catchbasin insert, or equivalent treatment, and then to a basic treatment BMP. Discharges from treatment systems to storm sewer or surface water or to the ground must not display ongoing or recurring visible sheen and must not contain greater than a significant amount of oil and grease.

S410 BMPs for Illicit Connections to Storm Drains

Description of Pollutant Sources: Illicit connections are unpermitted sanitary or process wastewater discharges to a storm sewer or to surface water, rather than to a sanitary sewer, industrial process wastewater, or other appropriate treatment. They can also include swimming pool water, filter backwash, cleaning solutions/washwaters, cooling water, etc. Experience has shown that illicit connections are common, particularly in older buildings.

Pollutant Control Approach: Identify and eliminate unpermitted discharges or obtain an NPDES permit, where necessary, particularly at industrial and commercial facilities.

Applicable Operational BMPs:

- Eliminate unpermitted wastewater discharges to storm sewer, ground water, or surface water.
- Convey unpermitted discharges to a sanitary sewer if allowed by the local sewer authority, or to other approved treatment.
- Obtain appropriate state and local permits for these discharges.

Recommended Additional Operational BMPs: At commercial and industrial facilities, conduct a survey of wastewater discharge connections to storm drains and to surface water as follows:

- Conduct a field survey of buildings, particularly older buildings, and other industrial areas to locate storm drains from buildings and paved surfaces. Note where these join the public storm drain(s).
- During non-stormwater conditions inspect each storm drain for non-stormwater discharges. Record the locations of all non-stormwater discharges. Include all permitted discharges.
- If useful, prepare a map of each area. Show on the map the known location of storm sewers, sanitary sewers, and permitted and unpermitted discharges. Aerial photos may be useful. Check records such as piping schematics to identify known side sewer connections and show these on the map. Consider using smoke, dye, or chemical analysis tests to detect connections between two conveyance systems (e.g., process water and stormwater). If desirable, conduct TV inspections of the storm drains and record the footage on videotape.
- Compare the observed locations of connections with the information on the map and revise the map accordingly. Note suspect connections that are inconsistent with the field survey.
- Identify all connections to storm sewers or to surface water and take the actions specified above as applicable BMPs.

S411 BMPs for Landscaping and Lawn/ Vegetation Management

Description of Pollutant Sources: Landscaping can include grading, soil transfer, vegetation removal, pesticide and fertilizer applications, and watering. Stormwater contaminants include toxic organic compounds, heavy metals, oils, total suspended solids, coliform bacteria, fertilizers, and pesticides.

Lawn and vegetation management can include control of objectionable weeds, insects, mold, bacteria, and other pests with pesticides. Examples include weed control on golf course lawns, access roads, and utility corridors and during landscaping; sap stain and insect control on lumber and logs; rooftop moss removal; killing nuisance rodents; fungicide application to patio decks, and residential lawn/plant care. It is possible to

release toxic pesticides such as pentachlorophenol, carbamates, and organometallics to the environment by leaching and dripping from treated parts, container leaks, product misuse, and outside storage of pesticide contaminated materials and equipment. Poor management of the vegetation and poor application of pesticides or fertilizers can cause appreciable stormwater contamination.

Pollutant Control Approach: Control of fertilizer and pesticide applications, soil erosion, and site debris to prevent contamination of stormwater.

Develop and implement an Integrated Pest Management Plan (IPM) and use pesticides only as a last resort. Carefully apply pesticides/ herbicides, in accordance with label instructions. Maintain appropriate vegetation, with proper fertilizer application where practicable, to control erosion and the discharge of stormwater pollutants. Where practicable grow plant species appropriate for the site, or adjust the soil properties of the subject site to grow desired plant species.

Applicable Operational BMPs for Landscaping:

- Install engineered soil/landscape systems to improve the infiltration and regulation of stormwater in landscaped areas.
- Do not dispose of collected vegetation into waterways or storm sewer systems.

Recommended Additional Operational BMPs for Landscaping:

- Conduct mulch-mowing whenever practicable
- Dispose of grass clippings, leaves, sticks, or other collected vegetation, by composting, if feasible.
- Use mulch or other erosion control measures on soils exposed for more than one week during the dry season or two days during the rainy season.
- Store and maintain appropriate oil and chemical spill cleanup materials in readily accessible locations when using oil or other chemicals. Ensure that employees are familiar with proper spill cleanup procedures.
- Till fertilizers into the soil rather than dumping or broadcasting onto the surface. Determine the proper fertilizer application rate for the types of soil and vegetation encountered.
- Till a topsoil mix or composted organic material into the soil to create a well-mixed transition layer that encourages deeper root systems and drought-resistant plants.
- Use manual and/or mechanical methods of vegetation removal rather than applying herbicides, where practical.

Applicable Operational BMPs for the Use of Pesticides:

- Develop and implement an IPM (See section on IPM in *Applicable Operational BMPs for Vegetation Management*) and use pesticides only as a last resort.
- Implement a pesticide-use plan and include at a minimum: a list of selected pesticides and their specific uses; brands, formulations, application methods and quantities to be used; equipment use and maintenance procedures; safety, storage, and disposal methods; and monitoring, record keeping, and public notice procedures. All procedures shall conform to the requirements of Chapter 17.21 RCW and Chapter 16-228 WAC (Appendix IV-D R.7).
- Choose the least toxic pesticide available that is capable of reducing the infestation to acceptable levels. The pesticide should readily degrade in the environment and/or have properties that strongly bind it to the soil. Conduct any pest control activity at the life stage when the pest is most vulnerable. For example, if it is necessary to use a Bacillus thuringiens application to control tent caterpillars, apply it to the material before the caterpillars cocoon or it will be ineffective. Any method used should be site-specific and not used wholesale over a wide area.
- Apply the pesticide according to label directions. Do not apply pesticides in quantities that exceed manufacturer's instructions.
- Mix the pesticides and clean the application equipment in an area where accidental spills will not enter surface or ground waters, and will not contaminate the soil.
- Store pesticides in enclosed areas or in covered impervious containment. Do not discharge pesticide contaminated stormwater or spills/leaks of pesticides to storm sewers. Do not hose down the paved areas to a storm sewer or conveyance ditch. Store and maintain appropriate spill cleanup materials in a location known to all near the storage area.
- Clean up any spilled pesticides. Keep pesticide contaminated waste materials in designated covered and contained areas.
- The pesticide application equipment must be capable of immediate shutoff in the event of an emergency.
- Spraying pesticides within 100 feet of open waters including wetlands, ponds, and rivers, streams, creeks, sloughs and any drainage ditch or channel that leads to open water may have additional regulatory requirements beyond just following the pesticide product label. Additional requirements may include:
    - Obtaining a discharge permit from Ecology.
    - Obtaining a permit from the local jurisdiction.
    - Using an aquatic labeled pesticide.

- Flag all sensitive areas including wells, creeks, and wetlands prior to spraying.
- Post notices and delineate the spray area prior to the application, as required by the local jurisdiction or by Ecology.
- Conduct spray applications during weather conditions as specified in the label direction and applicable local and state regulations. Do not apply during rain or immediately before expected rain.

Recommended Additional Operational BMPs for the use of pesticides:

- Consider alternatives to the use of pesticides such as covering or harvesting weeds, substitute vegetative growth, and manual weed control/moss removal.
- Consider the use of soil amendments, such as compost, that are known to control some common diseases in plants, such as Pythium root rot, ashy stem blight, and parasitic nematodes. The following are three possible mechanisms for disease control by compost addition (USEPA Publication 530-F-9-044):
    1. Successful competition for nutrients by antibiotic production;
    2. Successful predation against pathogens by beneficial microorganism; and
    3. Activation of disease-resistant genes in plants by composts.

Installing an amended soil/landscape system can preserve both the plant system and the soil system more effectively. This type of approach provides a soil/landscape system with adequate depth, permeability, and organic matter to sustain itself and continue working as an effective stormwater infiltration system and a sustainable nutrient cycle.

- Once a pesticide is applied, evaluate its effectiveness for possible improvement. Records should be kept showing the effectiveness of the pesticides considered.
- Develop an annual evaluation procedure including a review of the effectiveness of pesticide applications, impact on buffers and sensitive areas (including potable wells), public concerns, and recent toxicological information on pesticides used/proposed for use. If individual or public potable wells are located in the proximity of commercial pesticide applications, contact the regional Ecology hydrogeologist to determine if additional pesticide application control measures are necessary.
- Rinseate from equipment cleaning and/or triple-rinsing of pesticide containers should be used as product or recycled into product.

For more information, contact the Washington State University (WSU) Extension Home-Assist Program, (253) 445-4556, or Bio-Integral Resource Center (BIRC), P.O. Box 7414, Berkeley, CA.94707, or EPA to

obtain a publication entitled "Suspended, Canceled, and Restricted Pesticides" which lists all restricted pesticides and the specific uses that are allowed.

Applicable Operational BMPs for Vegetation Management:

- Use at least an eight-inch "topsoil" layer with at least 8 percent organic matter to provide a sufficient vegetation-growing medium. Amending existing landscapes and turf systems by increasing the percent organic matter and depth of topsoil can substantially improve the permeability of the soil, the disease and drought resistance of the vegetation, and reduce fertilizer demand. This reduces the demand for fertilizers, herbicides, and pesticides. Organic matter is the least water-soluble form of nutrients that can be added to the soil. Composted organic matter generally releases only between 2 and 10 percent of its total nitrogen annually, and this release corresponds closely to the plant growth cycle. Return natural plant debris and mulch to the soil, to continue recycling nutrients indefinitely.
- Select the appropriate turfgrass mixture for the climate and soil type. Certain tall fescues and rye grasses resist insect attack because the symbiotic endophytic fungi found naturally in their tissues repel or kill common leaf and stem-eating lawn insects. However, they do not, repel root-feeding lawn pests such as Crane Fly larvae, and are toxic to ruminants such as cattle and sheep. The fungus causes no known adverse effects to the host plant or to humans. Endophytic grasses are commercially available; use them in areas such as parks or golf courses where grazing does not occur. Local agricultural or gardening resources such as Washington State University Extension office can offer advice on which types of grass are best suited to the area and soil type.
- Use the following seeding and planting BMPs, or equivalent BMPs to obtain information on grass mixtures, temporary and permanent seeding procedures, maintenance of a recently planted area, and fertilizer application rates: *Temporary and Permanent Seeding*, *Mulching*, *Plastic Covering*, and *Sodding* as described in Volume II.
- Adjusting the soil properties of the subject site can assist in selection of desired plant species. For example, design a constructed wetland to resist the invasion of reed canary grass by layering specific strata of organic matters (e.g., composted forest product residuals) and creating a mildly acidic pH and carbon-rich soil medium. Consult a soil restoration specialist for site-specific conditions.
- Aerate lawns regularly in areas of heavy use where the soil tends to become compacted. Conduct aeration while the grasses in the lawn are growing most vigorously. Remove layers of thatch greater than ¾-inch deep.

- Mowing is a stress-creating activity for turfgrass. Grass decreases its productivity when mown too short and there is less growth of roots and rhizomes. The turf becomes less tolerant of environmental stresses, more disease prone and more reliant on outside means such as pesticides, fertilizers, and irrigation to remain healthy. Set the mowing height at the highest acceptable level and mow at times and intervals designed to minimize stress on the turf. Generally mowing only 1/3 of the grass blade height will prevent stressing the turf.

Irrigation:

- The depth from which a plant normally extracts water depends on the rooting depth of the plant. Appropriately irrigated lawn grasses normally root in the top 6 to 12 inches of soil; lawns irrigated on a daily basis often root only in the top 1 inch of soil. Improper irrigation can encourage pest problems, leach nutrients, and make a lawn completely dependent on artificial watering. The amount of water applied depends on the normal rooting depth of the turfgrass species used, the available water holding capacity of the soil, and the efficiency of the irrigation system. Consult with the local water utility, Conservation District, or Cooperative Extension office to help determine optimum irrigation practices.

Fertilizer Management:

- Turfgrass is most responsive to nitrogen fertilization, followed by potassium and phosphorus. Fertilization needs vary by site depending on plant, soil, and climatic conditions. Evaluation of soil nutrient levels through regular testing ensures the best possible efficiency and economy of fertilization. For details on soils testing, contact the local Conservation District, a soils testing professional, or a Washington State University Extension office.
- Apply fertilizers in amounts appropriate for the target vegetation and at the time of year that minimizes losses to surface and ground waters. Do not fertilize when the soil is dry. Alternatively, do not apply fertilizers within three days prior to predicted rainfall. The longer the period between fertilizer application and either rainfall or irrigation, the less fertilizer runoff occurs.
- Use slow release fertilizers such as methylene urea, IDBU, or resin coated fertilizers when appropriate, generally in the spring. Use of slow release fertilizers is especially important in areas with sandy or gravelly soils.
- Time the fertilizer application to periods of maximum plant uptake. Ecology generally recommends application in the fall and spring, although Washington State University turf specialists recommend four fertilizer applications per year.

- Properly trained persons should apply all fertilizers. Apply no fertilizer at commercial and industrial facilities, to grass swales, filter strips, or buffer areas that drain to sensitive water bodies unless approved by the local jurisdiction.

Integrated Pest Management

An IPM program might consist of the following steps:

Step 1: Correctly identify problem pests and understand their life cycle

Step 2: Establish tolerance thresholds for pests.

Step 3: Monitor to detect and prevent pest problems.

Step 4: Modify the maintenance program to promote healthy plants and discourage pests.

Step 5: Use cultural, physical, mechanical or biological controls first if pests exceed the tolerance thresholds.

Step 6: Evaluate and record the effectiveness of the control and modify maintenance practices to support lawn or landscape recovery and prevent recurrence.

For an elaboration of these steps, refer to Appendix IV-F.

S412 BMPs for Loading and Unloading Areas for Liquid or Solid Material

Description of Pollutant Sources: Operators typically conduct loading/unloading of liquid and solid materials at industrial and commercial facilities at shipping and receiving, outside storage, fueling areas, etc. Materials transferred can include products, raw materials, intermediate products, waste materials, fuels, scrap metals, etc. Leaks and spills of fuels, oils, powders, organics, heavy metals, salts, acids, alkalis, etc. during transfer may cause stormwater contamination. Spills from hydraulic line breaks are a common problem at loading docks.

Pollutant Control Approach: Cover and contain the loading/unloading area where necessary to prevent run-on of stormwater and runoff of contaminated stormwater.

Applicable Operational BMPs:

At All Loading/ Unloading Areas:

- A significant amount of debris can accumulate at outside, uncovered loading/unloading areas. Sweep these surfaces frequently to remove loose material that could contaminate stormwater. Sweep areas temporarily covered after removal of the containers, logs, or other material covering the ground.
- Place drip pans, or other appropriate temporary containment device, at locations where leaks or spills may occur such as hose connections, hose reels and filler nozzles. Always use drip pans when making and

- Use a ground cloth, pail, drum, drip pan, tarpaulin, or other protective device for activities such as outdoor paint mixing and tool cleaning, or where spills can contaminate stormwater.
- Properly dispose of all wastes and prevent all uncontrolled releases to the air, ground, or water.
- Clean brushes and tools covered with non-water-based paints, finishes, or other materials in a manner that allows collection of used solvents (e.g., paint thinner, turpentine, xylol) for recycling or proper disposal.
- Store toxic materials under cover (tarp, etc.) during precipitation events and when not in use to prevent contact with stormwater.

Applicable Structural Source Control BMPs: Enclose and/or contain all work while using a spray gun or conducting sand blasting and in compliance with applicable air pollution control, OSHA, and WISHA requirements. Do not conduct outside spraying, grit blasting, or sanding activities during windy conditions that render containment ineffective.

Recommended Additional Operational BMPs:

- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers. Dump pollutants collected in portable containers into a sanitary sewer drain, NOT a stormwater drain.
- Recycle paint, paint thinner, solvents, pressure washwater, and any other recyclable materials.
- Use efficient spray equipment such as electrostatic, air-atomized, high volume/low pressure, or gravity feed spray equipment.
- Purchase recycled paints, paint thinner, solvents, and other products, if feasible.

S421 BMPs for Parking and Storage of Vehicles and Equipment

Description of Pollutant Sources: Public and commercial parking lots such as retail store, fleet vehicle (including rent-a-car lots and car dealerships), equipment sale and rental parking lots, and parking lot driveways, can be sources of toxic hydrocarbons and other organic compounds, including oils and greases, metals, and suspended solids.

Pollutant Control Approach: If the parking lot is a **high-use site** as defined below, provide appropriate oil removal equipment for the contaminated stormwater runoff.

Applicable Operational BMPs:

- If washing a parking lot, discharge the washwater to a sanitary sewer, if allowed by the local sewer authority, or other approved wastewater treatment system, or collect washwater for off-site disposal.

- Do not hose down the area to a storm sewer or receiving water. Vacuum sweep parking lots, storage areas, and driveways regularly to collect dirt, waste, and debris.

Applicable Treatment BMPs: An oil removal system such as an API or CP oil and water separator, catch basin filter, or equivalent BMP, approved by the local jurisdiction, is necessary for parking lots meeting the threshold vehicle traffic intensity level of a *high-use site.*

Vehicle High-Use Sites

Establishments subject to vehicle high-use intensity are significant sources of oil contamination of stormwater. Examples of potential high use areas include customer parking lots at fast food stores, grocery stores, taverns, restaurants, large shopping malls, discount warehouse stores, quick-lube shops, and banks. If the PGIS for a high-use site exceeds 5,000 square feet in a threshold discharge area, an oil control BMP from the Oil Control Menu (in Volume V) is necessary. A high-use site at a commercial or industrial establishment has one of the following characteristics: (Gaus/King County, 1994)

- Is subject to an expected average daily vehicle traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area: or
- Is subject to storage of a fleet of 25 or more diesel vehicles that are over 10 tons gross weight (trucks, buses, trains, heavy equipment, etc.).

S422 BMPs for Railroad Yards

Description of Pollutant Sources: Pollutant sources can include:

- Drips/leaks of vehicle fluids onto the railroad bed
- Human waste disposal
- Litter
- Locomotive/railcar/equipment cleaning areas
- Fueling areas
- Outside material storage areas
- Erosion and loss of soil particles from the railroad bed
- Maintenance and repair activities at railroad terminals
- Switching and maintenance yards
- Herbicides used for vegetation management.

Waste materials can include waste oil, solvents, degreasers, antifreeze solutions, radiator flush, acids, brake fluids, soiled rags, oil filters, sulfuric acid and battery sludges, and machine chips with residual machining oil and toxic fluids/solids lost during transit. Potential pollutants include oil and grease, TSS, BOD, organics, pesticides, and metals.

APPENDIX E
Geotechnical Report

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Geotechnical Engineering Services

Raw Water Pump Station Replacement Project
12061 Morford Road
Sedro-Woolley, Washington

for
Public Utility District No. 1 of Skagit County

June 24, 2020

GeoEngineers
Earth Science + Technology

Geotechnical Engineering Services

Raw Water Pump Station Replacement Project
12061 Morford Road
Sedro-Woolley, Washington

for
Public Utility District No. 1 of Skagit County

June 24, 2020

GeoEngineers

600 Dupont Street
Bellingham, Washington 98225
360.647.1510

Geotechnical Engineering Services

Raw Water Pump Station Replacement Project
12061 Morford Road
Sedro-Woolley, Washington

File No. 2402-038-00

June 24, 2020

Prepared for:

Public Utility District No. 1 of Skagit County
P.O. Box 1436
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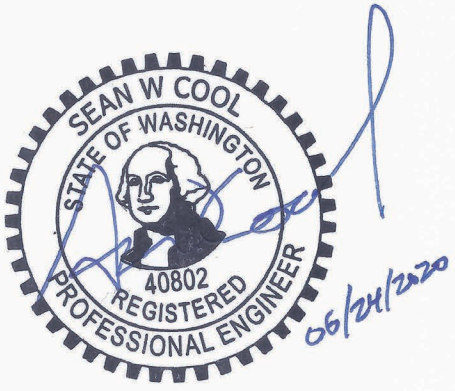

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1.0 INTRODUCTION

This report presents the results of GeoEngineers, Inc.'s (GeoEngineers') geotechnical engineering services for the proposed improvements to the Public Utility District No. 1 of Skagit County (District) Raw Water Pump Station Replacement Project located at 12061 Morford Road in Sedro-Woolley, Washington. The site location is shown in the Vicinity Map, Figure 1. Existing site conditions and the location of the new structure are shown in the Site and Exploration Plan, Figure 2.

Our understanding of the project is based on information provided by Mark Semrau, Capital Projects Manager, with the District, our previous experience in the vicinity of the site, and our experience on similar projects. We understand the District intends to construct a new Raw Water Pump Station structure east of the existing Pump Station Building structure. The new Raw Water Pump Station will consist of a at-grade concrete structure approximately 30 by 50 feet and yard piping at a depth of 6 to 8 feet deep below existing site grades.

Our scope of services for this report included reviewing available geotechnical information at the site, excavating two test pits, completing laboratory testing on the samples obtained from the test pits, and providing geotechnical conclusions and recommendations for design and construction of the new pump station. Our specific scope of services is described in our proposal for the project dated March 23, 2020, and was authorized via Task Order No. 012 by the District on April 13, 2020.

2.0 SITE CONDITIONS

2.1. Surface Conditions

The project site is currently a developed area located between the existing Pump Station Building and Clearwell No. 1 southwest of Judy Reservoir. The site is bounded by Clearwell No. 1 to the north, existing pavement and Pump Station Building to the west, lawn to the south, and forested area to the east. The site surface is generally vegetated with grass and slopes up to the north toward the existing Clearwell No. 1 with a low-height rockery wall.

2.2. Geology

We reviewed a 1989 U.S. Geological Survey (USGS) geologic map for the project area, titled "Surficial Geologic Map of the Port Townsend 30- by 60-Minute Quadrangle, Puget Sound Region, Washington". The geologic soil deposits are the result of both glacial and non-glacial processes that have occurred during the last 12,000 years. The most recent glacial event includes the Vashon Stade of the Fraser Glaciation. Sea level fluctuated significantly relative to the land surface and present-day sea level, in response to the glacial advance and retreat (melting).

Glacial till is mapped at the project site. Glacial till consists of an unsorted mixture of silt, sand, and gravel that was deposited under the glaciers. Large erratics (very large boulders) occur sporadically. These deposits were consolidated by the weight of the advancing glacier and are therefore typically very dense.

Bedrock is mapped just southwest of the site. The bedrock unit is predominantly Darrington phyllite (Jph[d]). The phyllite contains metasandstone with either flattened grains of sand or thin lamellae of quartz and plagioclase separated by fine graphitic material. Shuksan greenschist also occurs as layers within the phyllite.

2.3. Subsurface Exploration

Subsurface soil and groundwater conditions were evaluated by completing two test pits (TP-1 and TP-2) on April 23, 2020 using an excavator subcontracted to GeoEngineers. The test pits were completed to depths of about 3¼ to 8 feet below ground surface (bgs). The locations of the test pits are shown in Figure 2. Details of the field exploration program, laboratory testing, and test pit logs are presented in Appendix A.

2.4. Subsurface Conditions

2.4.1. Soil Conditions

A general description of each of the soil units encountered at the project site is provided below. Our interpretation is based on soil conditions encountered during our geotechnical test pits, and our understanding of the local geologic conditions.

- **Sod/Topsoil** – A 6- to 8-inch thick layer of topsoil was encountered at the surface of TP-1 and TP-2 exploration locations.
- **Fill** – Below the sod/topsoil, fill extended to a depth of 1-foot bgs in TP-1 and approximately 2½ feet bgs in TP-2 which was located on the slope between the existing pump station and Clearwell. The fill consisted of stiff sandy silt with gravel and loose to medium dense silty sand with gravel.
- **Glacial Till** – Glacial till was encountered underlying the fill in TP-1 at a depth of 1 foot bgs and 2½ feet bgs in TP-2. Glacial till at this site consisted of very dense silty sand with occasional gravel and very stiff to hard sandy silt with clay. This unit was encountered to the full depth explored of 8 feet bgs and 3¼ feet in TP-1 and TP-2, respectively. Because of the density, the glacial till required considerable effort with the excavator to reach the full 8 feet depth of exploration.
- **Bedrock** – Although not encountered in the explorations to the depth explored, bedrock is expected to be present below the glacial till. The bedrock surface may be highly variable and encountered within the depth of excavation.

2.4.2. Groundwater Conditions

No groundwater seepage was observed in our test pits at the time of excavation. The glacial till commonly has isolated saturated sandier zones or "pods" at variable depths and locations. Although not observed at the time of our explorations, perched groundwater conditions can develop within fill or topsoil during the wetter portions of the year where underlying low permeability glacial till soil limits downward infiltration. The regional groundwater table is likely well below the anticipated foundation depth. The groundwater conditions should be expected to vary as a function of season, precipitation and other factors.

3.0 CONCLUSIONS AND RECOMMENDATIONS

It is our opinion that the site is suitable for the new Raw Water Pump Station structure and associated site improvements, and new structures can be supported on shallow spread footing or mat foundations. A summary of the primary design and construction considerations for the project is provided below. This summary is presented for introductory purposes and should only be used in conjunction with the complete recommendations presented in this report.

- A seismic Site Class C is appropriate for design. The site soils are not considered liquefiable based on our explorations and local knowledge.
- The undisturbed native, dense glacial till will provide adequate support for shallow spread footings designed using an allowable soil bearing pressure of 4,000 pounds per square foot (psf).
- We estimate postconstruction settlement of properly prepared footings founded on dense to very dense native soils will be less than ¾-inch. Differential settlement between comparably loaded column footings or along a 50-foot section of continuous wall footing should be less than about ¼-inch.
- Standard slab-on-grade considerations are appropriate based on providing a minimum 6-inch thick layer of granular capillary break/leveling material.
- The site soils are highly moisture sensitive and will not support rubber-tired or other heavy equipment during wet weather. Earthwork should be planned for the drier summer months to reduce costs.

3.1. Seismic Design Considerations

3.1.1. Seismicity

The site is located within the Puget Sound region, which is seismically active. Seismicity in this region is attributed primarily to the interaction between the Pacific, Juan de Fuca, and North American plates. The Juan de Fuca plate is subducting beneath the North American plate. It is thought that the resulting deformation and breakup of the Juan de Fuca plate might account for the deep-focus earthquakes in the region. Hundreds of earthquakes have been recorded in the Puget Sound area. In recent history, four of these earthquakes were large events: (1) in 1946, a Richter magnitude 7.2 earthquake occurred in the Vancouver Island, British Columbia area; (2) in 1949, a Richter magnitude 7.1 earthquake occurred in the Olympia area; (3) in 1965, a Richter magnitude 6.5 earthquake occurred between Seattle and Tacoma; and (4) in 2001, a Richter magnitude 6.8 earthquake occurred near Olympia.

Research has concluded that historical large magnitude subduction-related earthquake activity has occurred along the Washington and Oregon coasts. Evidence suggests several large magnitude earthquakes (Richter magnitude 8 to 9) have occurred in the last 1,500 years, the most recent of which occurred about 300 years ago. No earthquakes of this magnitude have been documented during the recorded history of the Pacific Northwest. Local design practice in Puget Sound and local building codes consider these seismic conditions including known faults for the design of structures. The nearest fault is the Devil's Mountain Fault which is mapped approximately 7 miles south of the site. Therefore, the risk of surface rupture at the site is low.

3.1.2. 2015 IBC Seismic Design Information

The project will be designed utilizing the 2015 International Building Code (IBC). We recommend the project site be classified as Site Class C as defined in the IBC based on the interpretation of shallow bedrock. The design parameters for the 2015 IBC are summarized in Table 1 below. These values are based on an earthquake event that has a 2 percent chance of exceedance in a 50-year period.

TABLE 1: SPECTRAL RESPONSE ACCELERATIONS (SRAs)

SRA and Site Coefficients	Short Period	1 Second Period
Mapped SRA	S_S = 1.001	S_1 = 0.39
Site Coefficients	F_a = 1.2	F_v = 1.41
Max. Considered Earthquake SRA	S_{MS} = 1.001	S_{M1} = 0.55
Design SRA	S_{DS} = 0.667	S_{D1} = 0.367

Note: Soil Profile Type C Description: Very dense soil and soft rock (N>50)

3.1.3. Liquefaction Potential

Liquefaction is a phenomenon where soils experience a rapid loss of internal strength as a consequence of strong ground shaking. Ground settlement, lateral spreading and/or sand boils may result from liquefaction. Structures supported on liquefied soils could suffer foundation settlement or lateral movement that could be severely damaging to the structure. Conditions favorable to liquefaction occur in loose to medium dense, clean to moderately silty sand that is below the groundwater level. Dense soils or soils that exhibit cohesion are less susceptible to liquefaction. The proposed building is underlain by generally cohesive or dense granular soils which are not considered susceptible to liquefaction.

3.2. Shallow Foundation Design

We recommend that the new Raw Water Pump Station structure be supported on shallow spread footings or mat foundation that bears directly on undisturbed, glacial till deposits, or on compacted structural fill placed directly over undisturbed glacial till.

3.2.1. Building Footing Subgrade Preparation

As currently planned, all topsoil and fill will be removed during the excavation for the new pump station structure. Based on our explorations, glacial till was observed at the proposed foundation elevation.

- We recommend the final excavations for the footings be accomplished with a smooth bucket to reduce subgrade disturbance. We recommend that a GeoEngineers representative observe the footing subgrades to confirm suitable bearing conditions are present. Any specific overexcavation recommendations can be provided at that time.
- The native subgrade soils will be susceptible to disturbance when wet. To minimize disturbance of the footing subgrades that consist of the native silt during wet weather, a layer of sand and gravel, crushed rock or a “mud mat” is recommended. Structural fill may be placed directly over the dense to very dense undisturbed glacial till deposits.

3.2.2. Foundation Design

For shallow foundation support, we recommend minimum widths of 18 and 24 inches, respectively, for continuous wall and isolated column footings supporting the proposed pump station structure. Exterior footings should be founded a minimum of 18 inches below the lowest adjacent grade. Interior footings should be founded a minimum of 12 inches below top of slab.

Provided that footings are supported as recommended above, an allowable bearing pressure of 4,000 psf may be used for the design of footings supported on the dense to very dense till-like deposits. The allowable

bearing pressures applies to the total dead and long-term live loads and may be increased up to one-third for short-term live loads such as wind or seismic forces.

For foundations designed as a beam on an elastic foundation (structural mats or grade-beams), a modulus of subgrade reaction of 300 pounds per cubic inch (pci) may be used for foundations bearing on glacially consolidated soils. This modulus value is for a 1-foot by 1-foot square plate. The actual modulus for a foundation element varies based on the footing size according to the following equation:

$$k_s = k_{s1}[(B+1)/2B]^2$$

Where k_s is the actual footing modulus, k_{s1} is the modulus for 1-foot by 1-foot plate, and B is the width or lateral dimension of the footing.

3.2.3. Foundation Settlement

Based on anticipated loads, we estimate that the postconstruction settlement of footings supported as recommended will be less than ¾-inch. Differential settlement along a 25-foot section of continuous wall footing should be about ½-inch or less. We expect settlement will occur rapidly as loads are applied. Loose or disturbed soils not removed from footing excavations before placing concrete will result in additional settlement.

3.2.4. Lateral Resistance

Lateral loads can be resisted by passive resistance on the sides of the footings and by friction on the base of the footings. Passive resistance should be evaluated using an equivalent fluid density of 300 pounds per cubic foot (pcf) where footings are poured neat against native soil or are surrounded by structural fill compacted to at least 95 percent of maximum dry density (MDD) per ASTM International (ASTM) D 1557, as recommended. The value assumes that the soil in front of the foundation element is horizontal for a lateral distance equivalent to 2.5 times the depth of the element. Resistance to passive pressure should be calculated from the bottom of adjacent floor slabs and paving, or from a depth of 1 foot below site grades where the adjacent area is unpaved, as appropriate. Frictional resistance can be evaluated using 0.4 for the coefficient of base friction against footings. The above values incorporate a factor of safety of about 1.5.

If soils adjacent to footings are disturbed during construction, the disturbed soils adjacent to foundation elements must be recompacted or replaced with compacted structural fill; otherwise, the lateral passive resistance value must be reduced.

3.3. Slab-on-Grade Support

If conventional slab-on-grade will be used for the proposed structures, the native glacial till will provide suitable support for the slab. Slabs-on-grade should be supported on a minimum 6-inch-thick capillary break/leveling layer of gravel or sand and gravel over suitably firm subgrade soils or on structural fill prepared in accordance with the site preparation recommendations. The capillary break/leveling material should consist of 1- or ¾-inch minus clean sand and gravel, or crushed rock with less than 3 percent fines and should be uniformly compacted to a minimum of 95 percent of MDD per ASTM D 1557. A suitable Washington State Department of Transportation (WSDOT) 2020 Standard Specification for Road, Bridge and Municipal Construction (hereinafter referred to as WSDOT Standard Specification) for this material is 9-03.1(4) C Grading No. 67.

3.4. Retaining Wall Considerations

3.4.1. Below-Grade Building Wall Design

Lateral soil pressures acting on the below-grade retaining walls will depend on the nature and density of soil behind the wall, the amount of lateral wall movement which occurs as backfill is placed, the inclination of the backfill surface, surcharge, and seismic loading. For walls free to yield at the top at least one-thousandth of the wall height (i.e., wall height times 0.001), soil pressures will be less (termed "active earth pressures") than if wall movement is restrained (termed "at-rest earth pressures"). Structures with internal bracing at the time of backfill should be modeled with at-rest earth pressures. We recommend the following lateral earth pressures be considered for design:

- **Active earth pressure for level backfill** – Equivalent fluid pressure (triangular distribution) of 35 pcf for drained conditions and 18 pcf plus hydrostatic pressure for undrained conditions.
- **At-rest earth pressure for level backfill** – Equivalent fluid pressure of 55 pcf for drained conditions and 28 pcf plus hydrostatic pressure for undrained conditions.
- **Traffic surcharge pressure** – Typical vehicle traffic surcharge may be modeled assuming an additional 2 feet of soil (approximately 250 psf surcharge), or a uniform (rectangular) lateral pressure of about 70 psf. Other temporary surcharge loading during construction resulting from equipment and soil stockpiles will depend on specific loading type and location and should be evaluated by the contractor.
- **Seismic earth pressure** – Earth pressures resulting from seismic conditions may be modeled as a uniform (rectangular) lateral pressure of 8*H psf (H = height of wall) for the design level earthquake, with a corresponding reduction in the factors of safety to 1.1 or greater. Lateral pressure resulting from seismic surcharge loading is additive to lateral soil pressures computed as recommended above.

All pressures above assume structures are backfilled with granular structural fill and have relatively level grades behind the walls. In order to prevent overstressing the concrete retaining walls and causing bulging or rotation, we recommend that structural fill placed against the back of the wall be compacted with lighter weight hand-operated equipment and within the range of 90 to 92 percent of the MDD per ASTM D 1557. Backfill should only be placed after the concrete has had sufficient time to cure and develop the necessary strength.

3.4.2. Wall Drainage Considerations

Where noted above, the recommended lateral earth pressures assume a free-draining condition behind the wall. For backfilled walls (adjacent to temporary cut slopes) positive drainage should consist of placing a minimum 18-inch wide zone of free-draining gravel backfill immediately adjacent to the walls. Gravel backfill for walls should consist of well-graded sand and gravel with less than 5 percent fines. A suitable WSDOT Standard Specification is Section 9-03.12(2). A 4-inch minimum diameter perforated drainpipe should be embedded in the free-draining sand and gravel zone along the base of the building retaining walls as described in Site Drainage Considerations, Section 3.7 of this report.

3.5. Temporary Shoring

Installation of yard piping will require excavations on the order of 6 to 8 feet below existing site grades. The excavation will likely be completed with temporary slopes; however, the size, depth, and location of the structure may require temporary shoring where sufficient space is not available for open cuts adjacent to

existing structures and utilities. For the planned excavation depth, it is likely that cantilevered soldier pile shoring will be sufficient. We anticipate that driven diaphragm type shoring, systems such as driven sheet pile walls, will not adequately penetrate glacial till without pre-drilling. GeoEngineers can provide additional recommendations for temporary shoring prior to final design if necessary. Additional recommendations for temporary cut slopes and excavations shored with trench boxes are provided in Section 3.8.2.

3.6. Pipe Design Considerations

Various piping and utility corridors will be required to connect the new pump station structure and existing infrastructure. The contractor should anticipate, at a minimum, all utility excavations will require a trenchbox for sidewall support and sumps and pumps to control groundwater seepage as necessary, as described in Section 3.8 of this report.

The work areas should be cleared of all surface and subsurface deleterious matter, including debris, vegetation and root wads, and stripped of any organic soil, if present. The cleared/stripped material will not be suitable for use as structural fill, which includes trench backfill.

3.6.1. Pipeline Support

Depending on the pipe depth and location on site, the soils expected to be encountered at the subgrade level for new piping will likely consist of glacial till. In general, the glacial till will provide adequate support for proposed piping throughout the site. If the pipe subgrade soils are very soft, organic, become disturbed, or are otherwise unsuitable, it may be necessary to over-excavate the unsuitable material and backfill with pipe bedding or crushed surfacing material. General recommendations for pipe bedding support are presented below:

- Pipe bedding material, placement, compaction, and shaping should be in accordance with the project specifications, the pipe manufacturer's recommendations, and Section 7-09 of the WSDOT Standard Specifications. At a minimum, the pipe bedding should meet the gradation requirements for Gravel Backfill for Pipe Zone Bedding Section 9-03.12(3) of the WSDOT Standard Specifications, unless otherwise stated by the project specifications.
- If the trench bottom encounters any soft or organic-rich subgrade soils, it may be necessary to overexcavate the unsuitable material and backfill with additional pipe bedding material. In wet conditions, 1½-inch minus granular fill meeting the gradation requirements for Crushed Surfacing Base Course (WSDOT 9-03.9[3]) or Permeable Ballast (WSDOT 9-03.9[2]) should be used to backfill the overexcavated portion of the trench.
- Pipe bedding material should be used as backfill up to at least the spring line of the pipe or in accordance with the manufacturer's specifications for the type of pipe chosen.
- Prior to the installation of the pipe, the bedding should be shaped to fit the lower part of the pipe exterior with reasonable closeness to provide continuous support along the pipe.
- Pipe bedding material and/or backfill around the pipe should be placed in layers and tamped around the pipe to obtain complete contact per the project plans. In areas where a trench box is used, the bedding material should be placed before the trench box is advanced.

3.6.2. Structural and Trench Backfill

We recommend that trench backfill consist of structural fill as described in Section 3.8.3 of this report. The suitability of the on-site material as structural fill is discussed below. During placement of the initial lifts, the backfill material should not be bulldozed into the trench or dropped directly on the pipe. Furthermore, heavy vibratory equipment should not be permitted to operate directly over the pipe until a minimum of 2 feet of backfill has been placed. Backfill should be placed in lifts to achieve the required compaction using the mechanical equipment chosen by the contractor. We recommend that the MDD be determined based on ASTM D 1557 or in accordance with WSDOT Standard Specification 2-03.3(14)D.

- In non-settlement sensitive areas, such as landscaping, we recommend that the trench backfill be compacted to at least 85 percent of the MDD.
- In settlement sensitive areas, such as existing or future roadways and driveways, backfill placed at depths greater than 2 feet below the ground surface should be compacted to at least 90 percent of the MDD. The upper 2 feet of backfill should be compacted to at least 95 percent of the MDD in existing/future pavement or yard areas. This is consistent with Method B of WSDOT Standard Specification 2-03.3(14)C.

3.6.3. Pipe Settlement

The likely mechanisms for pipe settlement include poor bearing support immediately below the pipe. Provided pipe subgrade and backfilled as recommended above, we estimate that the increased weight of the structural backfill will be negligible and will not lead to significant settlement.

3.7. Site Drainage Considerations

We recommend that final site grading direct water away from the structures to the extent practical. The site may experience seasonally perched groundwater conditions because of the relatively low permeability of glacial till. Additionally, the excavation for the below-grade structure into the glacial till unit has the potential to create a “bathtub” that will retain water when backfilled with granular structural fill. Therefore, we recommend the structures be provided with a perimeter drainage system or be designed for hydrostatic pressures. The footing drains should be installed at the base of footings and retaining walls and sloped to drain. The drains should consist of rigid perforated pipe, a minimum of 4 inches in diameter, enveloped within a minimum thickness of 6 inches of 1-inch washed gravel. A non-woven geotextile fabric such as Mirafi 140N, or similar as approved by GeoEngineers, should be placed between the 1-inch washed gravel and the native soils to prevent movement of the soils into the drainage material. This drainage should be tightlined to the stormwater system. Consideration should be given to the use of clean-outs for drain pipe maintenance. A larger diameter pipe will facilitate maintenance of drainage systems. Additional drainage recommendations are provided below:

- Subsurface slabs and walls should be adequately waterproofed as appropriate for the intended use. As noted previously, the below-grade excavation will create a “bathtub” in the fine-grained glacial till that retains water if drainage provisions are not included.
- If earthwork will occur during the wet season, perimeter ditching or interceptor trenches may be required to manage surface water and perched groundwater entering the site and excavation.
- We recommend all downspouts be tightlined away from the foundation area to the storm drain system. Downspouts should not be connected to footing drains.

3.8. Earthwork

The site soils within the excavation depths anticipated for the project generally consist of silty sand with variable gravel content. These soils are very moisture sensitive and susceptible to disturbance by construction equipment during wet weather. These soils are very difficult or impossible to use as structural fill except during dry weather and on dry subgrades. If practical, the excavation to design subgrades should be performed during extended periods of dry weather. Exposed subgrades should not be left exposed to inclement weather. Earthwork costs will be significantly greater if performed during wet weather.

3.8.1. Subgrade Preparation

The exposed subgrade should be evaluated after the excavation and site grading is complete. GeoEngineers recommends that all subgrade surfaces be evaluated for suitability by a qualified geotechnical engineer or their representative. The structure subgrade should consist of unweathered, dense to very dense glacial till. Proof-rolling with heavy, rubber-tired construction equipment should be used for this purpose during dry weather and if access for this equipment is practical. Probing should be used to evaluate the subgrade during periods of wet weather or if access is not feasible for construction equipment. Soft areas noted during proof-rolling or probing should be excavated and replaced with compacted structural fill.

3.8.2. Excavation and Temporary Slopes

Excavation for the proposed site improvements will extend primarily through existing topsoil and fill into dense to very dense glacial till. Excavation of the site soils can be completed using conventional earthwork equipment. As noted, the test pit excavations encountered difficult excavation and larger horsepower excavators will be more efficient for excavating the harder till soils, or if large cobbles and boulders are encountered in the deeper excavations. The test pits did not encounter bedrock within the depth of excavation but is expected at relatively shallow depths. We suggest a contingency and/or line item included in the base bid for removal of bedrock if encountered within the required depth of excavation.

Perched shallow groundwater and isolated deeper seepage pockets conditions could develop and cause water to run into excavations and hamper earthwork. We expect that sumps and pumps should be adequate to handle any groundwater seepage.

3.8.2.1. Temporary Cut Slopes

Regardless of the soil type encountered in the excavation, either shoring, trench boxes or sloped sidewalls will be required for excavations deeper than 4 feet under Washington State Administrative Code (WAC) 296-155, Part N. We expect that the excavations will be made as open cuts in conjunction with the use of a trench box and/or sloped sidewalls for shielding workers. Based on our explorations, the fill soils at the site would be classified as “Type C” and require slopes not exceeding 1.5H:1V (horizontal to vertical). The dense to very dense/very stiff to hard glacial till encountered at the site would be classified as “Type A” and require slopes not exceeding 0.75H:1V.

The above regulations assume that surface loads such as construction equipment and storage loads will be kept a sufficient distance away from the top of the cut so that the stability of the excavation is not affected. Flatter slopes and/or shoring will be necessary for those portions of the excavations which are subjected to significant seepage in order to maintain the stability of the cut. It should be expected that unsupported cut slopes will experience some sloughing and raveling if exposed to surface water. Berms,

hay bales or other provisions should be installed along the top of the excavation to intercept surface runoff to reduce the potential for sloughing and erosion of cut slopes during wet weather.

In our opinion, the contractor will be in the best position to observe subsurface conditions continuously throughout the construction process and to respond to the soil and groundwater conditions. Construction site safety is generally the sole responsibility of the contractor, who also is solely responsible for the means, methods, and sequencing of the construction operations and choices regarding temporary excavations and shoring. We are providing this information only as a service to our client. Under no circumstances should the information provided below be interpreted to mean that GeoEngineers, Inc. is assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

3.8.2.2. Temporary Shoring – Trench Boxes

We recommend that a shoring system be used where excavations are located adjacent to existing utilities, roadways or structures where soil movement or ground loss could result in damage to these facilities. Generally, a trench box is not considered appropriate in areas where soil movement adjacent to the trench is unacceptable. Typically, a trench box is used to protect workers from injury should the sidewall collapse. If a sidewall collapses, a contractor typically will backfill the void space in the trench box to the extent practical. Upon completion of the work the contractor will then pull the trench box out and the sidewalls cave and surface distress or disruption occurs.

A trench box can be used where sidewall support is required provided that it is (1) designed for anticipated earth pressures and hydrostatic pressures if appropriate; and (2) the installation, moving, and backfilling can be accomplished in such a manner that significant yielding does not occur. Braced or unbraced shoring (several types of adjustable braced trench shoring systems are available) of various types could be used where protection of existing infrastructure is necessary.

The following should be implemented for the shoring systems for the project:

- At locations where settlement could be detrimental to adjacent structures, utilities, or pavements, the shoring system should be designed to prevent significant lateral movement of the existing soils.
- Precautions should be taken during removal of the shoring or sheeting materials to minimize disturbance of the pipe, underlying bedding materials, and natural soils.
- Trench boxes should be of sufficient size, both vertically and horizontally, to support the excavation without excessive deformation of the natural soils.
- The open excavations should be backfilled as soon as practical after the shoring has been removed.
- Heavy construction equipment, construction materials, and excavated soil should not be allowed within a distance, measured from the edge of the excavation, equal to half the depth of the excavation unless the shoring system has been designed for the additional lateral pressure.

Because of the diversity of available shoring systems and construction techniques, the design of temporary shoring is most appropriately left up to the contractor proposing to complete the installation. We recommend that the shoring be designed by an engineer licensed in Washington, and the PE stamped shoring plans and calculations be submitted to the engineer prior to construction.

3.8.3. Structural Fill

Structural fill materials should be free of debris, organic contaminants and rocks or rock fragments larger than 6 inches or half the lift thickness, whichever is smaller. All fill placed beneath future structures or pavement should be placed as structural fill. Structural fill should be placed in horizontal lifts and uniformly compacted. The appropriate lift thickness will depend on the material and the compaction equipment being used. Loose lift thicknesses of 8 to 10 inches are typical when using heavy self-propelled vibratory equipment. All excavations should be wide enough to accommodate the appropriate compaction equipment for the thickness of the fill.

3.8.3.1. Suitability of On-site Soil

The on-site fill soils contain significant fines content and some organics that will make them difficult to compact to specified densities during wet or dry weather. Therefore, the existing fill soils are not considered suitable for reuse at the site. The moisture content of the glacial till is low enough that compaction during dry conditions is likely feasible. For planning purposes, we recommend that on-site glacial till soils be considered suitable as structural fill during dry weather only and imported fill, conforming to the recommendations in Section 3.8.3.2 below, should be used as structural fill during wet weather.

3.8.3.2. Select Import Fill

We recommend using a select import fill for earthwork on this project site. Unless other specific materials are recommended in this report, the select import should consist of well-graded sand and gravel, with at least 30 percent retained on the No. 4 sieve and less than 5 percent passing the U.S. No. 200 sieve. The percentage passing the No. 200 sieve should be based on that fraction passing the ¾-inch sieve. Requiring use of this type of material below structures would significantly aid quality control and reduce compaction effort during earthwork procedures.

3.8.3.3. Fill Placement and Compaction Criteria

Structural fill should be mechanically compacted to a firm, non-yielding condition. Structural fill should be placed in lifts not exceeding 10 inches in loose thickness or that necessary to attain the specified compaction. Each lift should be conditioned to the proper moisture content and compacted to the specified density before placing subsequent lifts. Structural fill should be compacted to the following criteria:

- Structural fill placed in structure areas (supporting foundations or slab on grade floors) should be compacted to at least 95 percent of the MDD estimated in accordance with ASTM D-1557.
- Structural fill placed in pavement and hardscape areas should be compacted to at least 90 percent MDD where 2 feet below the pavement subgrade, and 95 percent MDD in the top 2 feet.
- Structural fill placed against retaining walls should be compacted to between 90 and 92 percent MDD. Care should be taken when compacting fill against subsurface walls to avoid overcompaction and overstressing the walls.
- Fill in non-structural areas should be compacted to at least 85 percent MDD to limit excessive postconstruction settlement.

Sufficient earthwork monitoring and a sufficient number of in-place density tests should be performed to evaluate fill placement and compaction operations and to confirm that the required compaction is being achieved.

3.8.4. Weather Considerations

During wet weather, the silty glacial till will become muddy and trafficability may become very difficult with rubber-tired equipment. We provide the following wet weather considerations:

- Construction activities should be scheduled so that the length of time that soils are left exposed to moisture is reduced to the extent practical and limit the size of areas that are stripped of topsoil or gravel surfacing and left exposed.
- The ground surface in and around the work area should be sloped so that surface water is directed to a sump or discharge location. The ground surface should be graded such that areas of ponded water do not develop.
- Slopes with exposed soils should be covered with plastic sheeting or similar means.
- Providing up-gradient perimeter ditches or low earthen berms and using temporary sumps to collect runoff and prevent water from ponding and damaging exposed subgrades.
- The site soils should not be left uncompacted and exposed to moisture. Sealing the surficial soils by rolling with a smooth-drum roller prior to periods of precipitation will reduce the extent to which these soils become wet or unstable.
- Limiting construction traffic over unprotected soil and by limiting the size and type of construction equipment used.
- Providing gravel "working mats" over areas of prepared subgrade.

3.9. Recommended Additional Geotechnical Services

GeoEngineers should be retained to review the project plans and specifications when complete to confirm that our design recommendations have been implemented as intended. During construction, GeoEngineers should, at a minimum, evaluate the suitability of the foundation and slab-on-grade subgrades. The purposes of GeoEngineers construction phase services are to confirm that the subsurface conditions are consistent with those observed in the explorations and other reasons described in Appendix B, Report Limitations and Guidelines for Use.

4.0 LIMITATIONS

We have prepared this report for the exclusive use by the Public Utility District No. 1 of Skagit County, and their authorized agents for the proposed Raw Water Pump Station Project in Sedro-Woolley, Washington.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

Please refer to Appendix B titled Report Limitations and Guidelines for Use for additional information pertaining to the use of this report.

5.0 REFERENCES

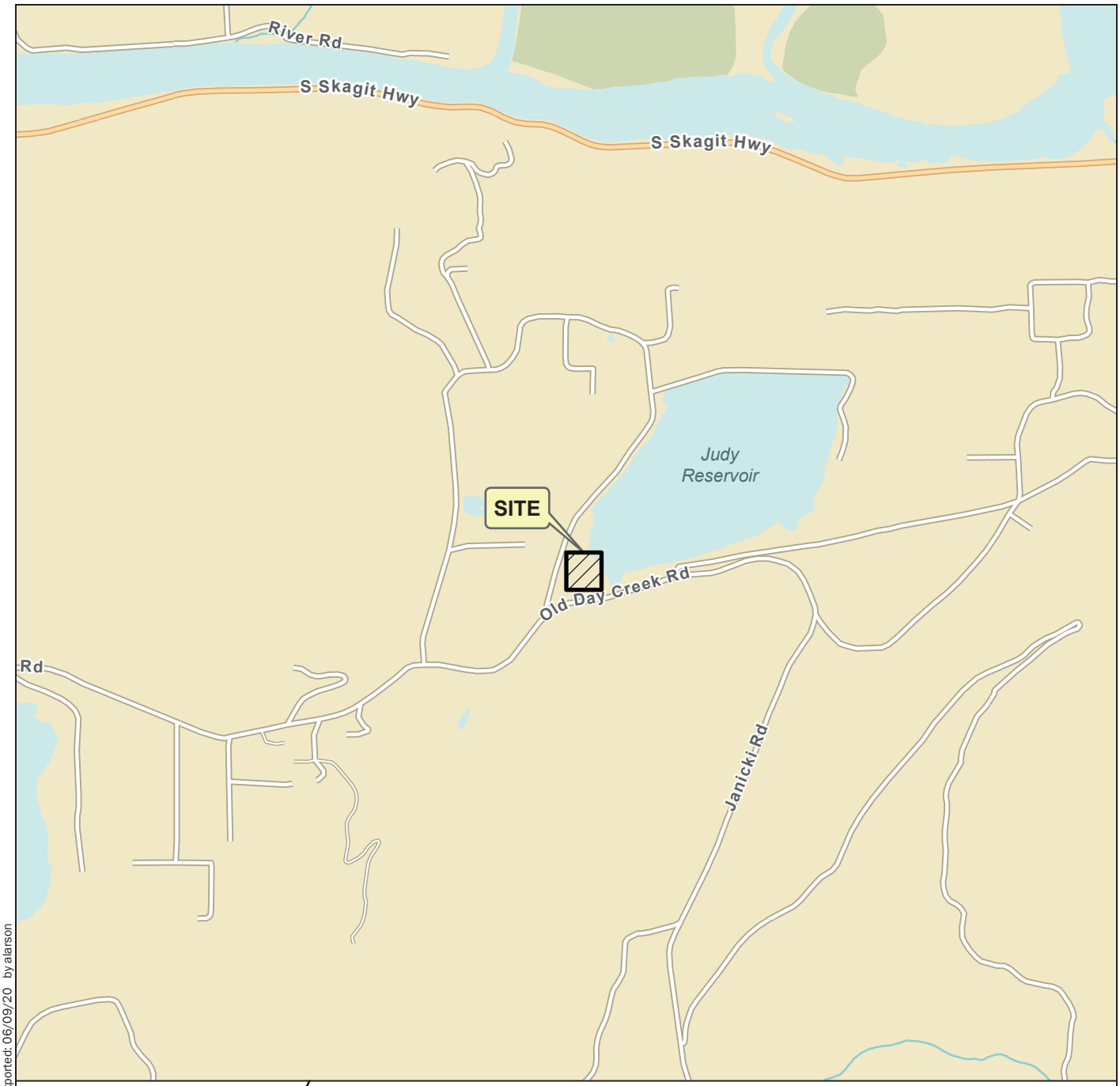
International Code Council. 2015. "International Building Code."

F. Pessl, Jr., D.P. Dethier, D.B. Booth, and J.P. Minard. 1989. Surficial Geologic Map of the Port Townsend 30- by 60- Minute Quadrangle, Puget Sound Region, Washington. United States Geological Survey. Map I-1198-F

Washington State Department of Transportation. 2020. "Standard Specifications for Road, Bridge and Municipal Construction," M 41-10.

FIGURES

GeoEngineers



N
W E
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2,000 0 2,000
Feet

Vicinity Map

Raw Water Pump Station Replacement Project
12061 Morford Road, Sedro-Woolley, Washington

GeoEngineers

Figure 1

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: ESRI

Projection:

P:\2_2402038\GIS\SkagitPUD_RawWaterPump_Maps.aprx\VicinityMap Date Exported: 06/09/20 by alarson

P:\2\2402038\GIS\SkagitPUD_RawWaterPump_Maps.aprx\SitePlan Date Exported: 06/09/20 by alarson

Legend

TP-1 Approximate GeoEngineers test pit location, 2020

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

N W E S

100 0 100

Feet

Site Plan

Raw Water Pump Station Replacement Project
12061 Morford Road, Sedro-Woolley, Washington

GeoEngineers

Figure 2

APPENDICES

GeoEngineers

APPENDIX A
Field Explorations and Laboratory Testing

APPENDIX A
FIELD EXPLORATIONS AND LABORATORY TESTING

Field Explorations

GeoEngineers explored subsurface conditions at the site by completing two geotechnical test pits on April 23, 2020. The test pits were completed using an excavator subcontracted to GeoEngineers. The approximate locations of the explorations are shown in the Site and Exploration Plan, Figure 2. The locations of the explorations were determined by recreational grade global positioning system (GPS) and relationship to existing site features; therefore, the locations shown in Figure 2 should be considered approximate.

Disturbed soil samples were obtained from the sides of the test pits and the bucket of the excavator. The samples were placed in plastic bags to maintain the moisture content, and were transported back to our laboratory for analysis and testing.

The explorations were continuously monitored by a geotechnical engineer from our firm who examined and classified the soils encountered, obtained representative soil samples, observed groundwater conditions and prepared a detailed log of each exploration. Soils encountered were classified visually in general accordance with ASTM International (ASTM) D-2488-90, which is described in Figure A-1. An explanation of our exploration log symbols is also shown on Figure A-1.

The logs of the test pits are presented in Figures A-2 and A-3. The exploration logs are based on our interpretation of the field and laboratory data and indicate the various types of soils encountered. Each log also indicates the depths at which these soils or their characteristics change, although the change might actually be gradual. If the change occurred between samples in the test pit, it was interpreted.

Laboratory Test Results

General

Soil samples obtained from the explorations were transported to our laboratory and examined to confirm or modify field classifications, as well as to evaluate index properties of the soil samples. Representative samples were selected for laboratory testing consisting of the determination of the moisture content, and sieve analysis. The tests were performed in general accordance with test methods of ASTM or other applicable procedures.

Moisture Content Testing

The natural moisture contents of selected soil samples obtained from the exploratory borings were determined in general accordance with ASTM D 2216 test procedures. The results from the moisture content determinations are displayed shown on the exploration logs in Figures A-2 and A-3 in the column labeled “Moisture Content %” adjacent to the corresponding samples.

Percent Passing U.S. No. 200 Sieve

Selected samples were “washed” through the U.S. No. 200 mesh sieve to determine the relative percentages of coarse- and fine-grained particles in the soil. The percent passing value represents the percentage by weight of the sample finer than the U.S. No. 200 sieve. These tests were conducted to verify field descriptions and to determine the fines content for analysis purposes. The tests were conducted in general accordance with ASTM D 1140, and the results are shown on the exploration logs in Figures A-2 and A-3 in the column labeled “Fines Content %” adjacent to the corresponding samples.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE			GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE			SP	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/ Quarry Spalls
	SOD	Sod/Forest Duff
	TS	Topsoil

Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata

Approximate contact between soil strata

Material Description Contact

Contact between geologic units

Contact between soil of the same geologic unit

Sampler Symbol Descriptions

2.4-inch I.D. split barrel

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PL	Point lead test
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

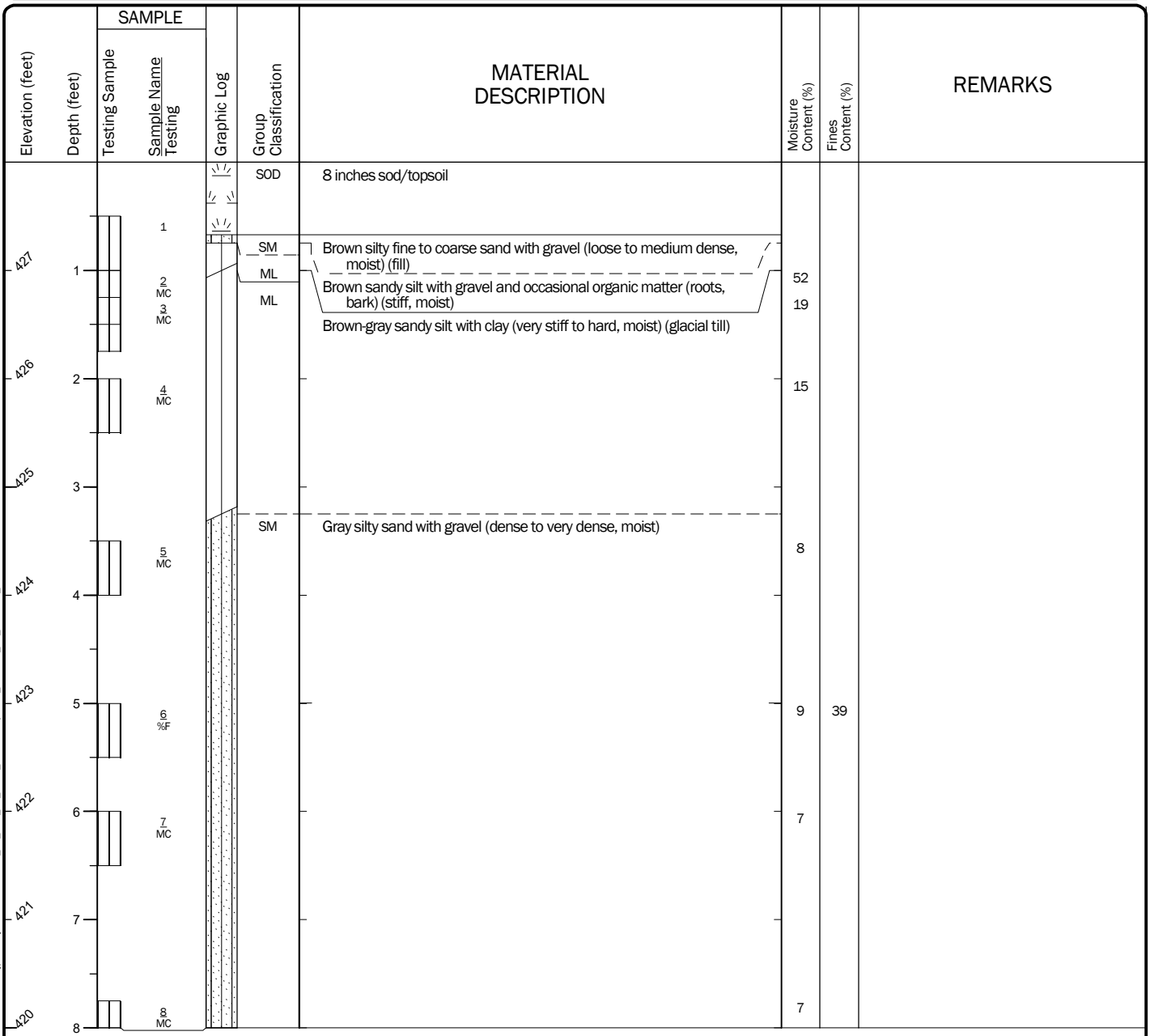
NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

GeoEngineers

Figure A-1

Date Excavated 4/23/2020	Total Depth (ft) 8	Logged By AF2 Checked By	Excavator RAM Construction Equipment Hitachi 85 Excavator	Groundwater not observed Caving not observed
Surface Elevation (ft) 428 Vertical Datum NAVD88		Easting (X) 1311087 Northing (Y) 539312	Coordinate System WA State Plane North Horizontal Datum NAD83 (feet)	



Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Locational Survey.

Log of Test Pit TP-1

GeoEngineers

Project: Raw Water Pump Station Replacement Project
Project Location: 12061 Morford Road, Sedro-Woolley, Washington
Project Number: 2402-038-00

Figure A-2
Sheet 1 of 1

Date:6/9/20 Path:\\GEOENGINEERS.COM\WAN\PROJECTS\2\2402038\GINT\240203800.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEIB_TESTPIT_1P_GEOTEC_%F

Date Excavated 4/23/2020	Total Depth (ft) 3.25	Logged By AF2 Checked By	Excavator RAM Construction Equipment Hitachi 85 Excavator	Groundwater not observed Caving not observed
Surface Elevation (ft) 428 Vertical Datum NAVD88	Easting (X) 1311102 Northing (Y) 539338	Coordinate System WA State Plane North Horizontal Datum NAD83 (feet)		

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
					SOD	6 inches sod			
427	1		1 MC		ML	Gray sandy silt with clay and gravel (stiff, moist) (fill)	13		
			2 MC				11		
426	2		3 %F		SM	Brown silty fine to medium sand with gravel (loose to medium dense, moist)	9	26	
425	3		4 %F		SM	Brown silty sand with clay and occasional gravel (dense to very dense, moist) (glacial till)	8	43	

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Locational Survey.

Log of Test Pit TP-2

GeoEngineers

Project: Raw Water Pump Station Replacement Project
Project Location: 12061 Morford Road, Sedro-Woolley, Washington
Project Number: 2402-038-00

Figure A-3
Sheet 1 of 1

Date:6/9/20 Path:\\GEOENGINEERS.COM\WAN\PROJECTS\2\2402038\GINT\240203800.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEIB_TESTPIT_1P_GEOTEC_%F

APPENDIX B
Report Limitations and Guidelines for Use

APPENDIX B
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

Geotechnical Services are Performed for Specific Purposes, Persons and Projects

This report has been prepared for the exclusive use of the Public Utility District No. 1 of Skagit County and its authorized agents. This report may be made available to other members of the design team. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, a geotechnical or geologic study conducted for a civil engineer or architect may not fulfill the needs of a construction contractor or even another civil engineer or architect that is involved in the same project. Because each geotechnical or geologic study is unique, each geotechnical engineering or geologic report is unique, prepared solely for the specific client and project site. Our report is prepared for the exclusive use of our Client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. This requirement is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted geotechnical practices in this area at the time this report was prepared. This report should not be applied for any purpose or project except the one originally contemplated.

A Geotechnical Engineering or Geologic Report is Based on a Unique Set of Project-specific Factors

This report has been prepared for the proposed Raw Water Pump Station Replacement Project in Sedro-Woolley, Washington. GeoEngineers considered several unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure;
- elevation, configuration, location, orientation or weight of the proposed structure;
- composition of the design team; or

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org.

- project ownership.

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying a report to determine if it remains applicable.

Most Geotechnical and Geologic Findings are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

Geotechnical Engineering Report Recommendations are Not Final

Do not over-rely on the preliminary construction recommendations included in this report. These recommendations are not final, because they were developed principally from GeoEngineers' professional judgment and opinion. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for this report's recommendations if we do not perform construction observation.

Sufficient monitoring, testing and consultation by GeoEngineers should be provided during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions.

A Geotechnical Engineering or Geologic Report Could be Subject to Misinterpretation

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having GeoEngineers confer with appropriate members of the design team after submitting the report. Also retain GeoEngineers to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having GeoEngineers participate in pre-bid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable but recognize that separating logs from the report can elevate risk.

Give Contractors a Complete Report and Guidance

Some owners and design professionals believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering or geologic report, but preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer. A pre-bid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might an owner be in a position to give contractors the best information available, while requiring them to at least share the financial responsibilities stemming from unanticipated conditions. Further, a contingency for unanticipated conditions should be included in your project budget and schedule.

Contractors are Responsible for Site Safety on Their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and to adjacent properties.

Read These Provisions Closely

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering or geology) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory "limitations" provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear how these "Report Limitations and Guidelines for Use" apply to your project or site.

Geotechnical, Geologic and Environmental Reports Should Not be Interchanged

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding a specific project.

Topsoil

For the purposes of this report, we consider topsoil to consist of generally fine-grained soil with an appreciable amount of organic matter based on visual examination and to be unsuitable for direct support of the proposed improvements. However, the organic content and other mineralogical and gradational characteristics used to evaluate the suitability of soil for use in landscaping and agricultural purposes was not determined, nor considered in our analyses. Therefore, the information and recommendations in this report and our logs and descriptions should not be used as a basis for estimating the volume of topsoil available for such purposes.

Biological Pollutants

GeoEngineers' Scope of Work expressly excludes the investigation, detection, prevention or assessment of the presence of biological pollutants. Accordingly, this report does not include any interpretations, recommendations, findings, or conclusions regarding the detecting, assessing, preventing or abating of biological pollutants and no conclusions or inferences should be drawn regarding biological pollutants, as they may relate to this project. The term "biological pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts.

If Client desires these specialized services, they should be obtained from a consultant who offers services in this specialized field.

GeoEngineers

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PUBLIC UTILITY DISTRICT NO. 1 OF SKAGIT COUNTY

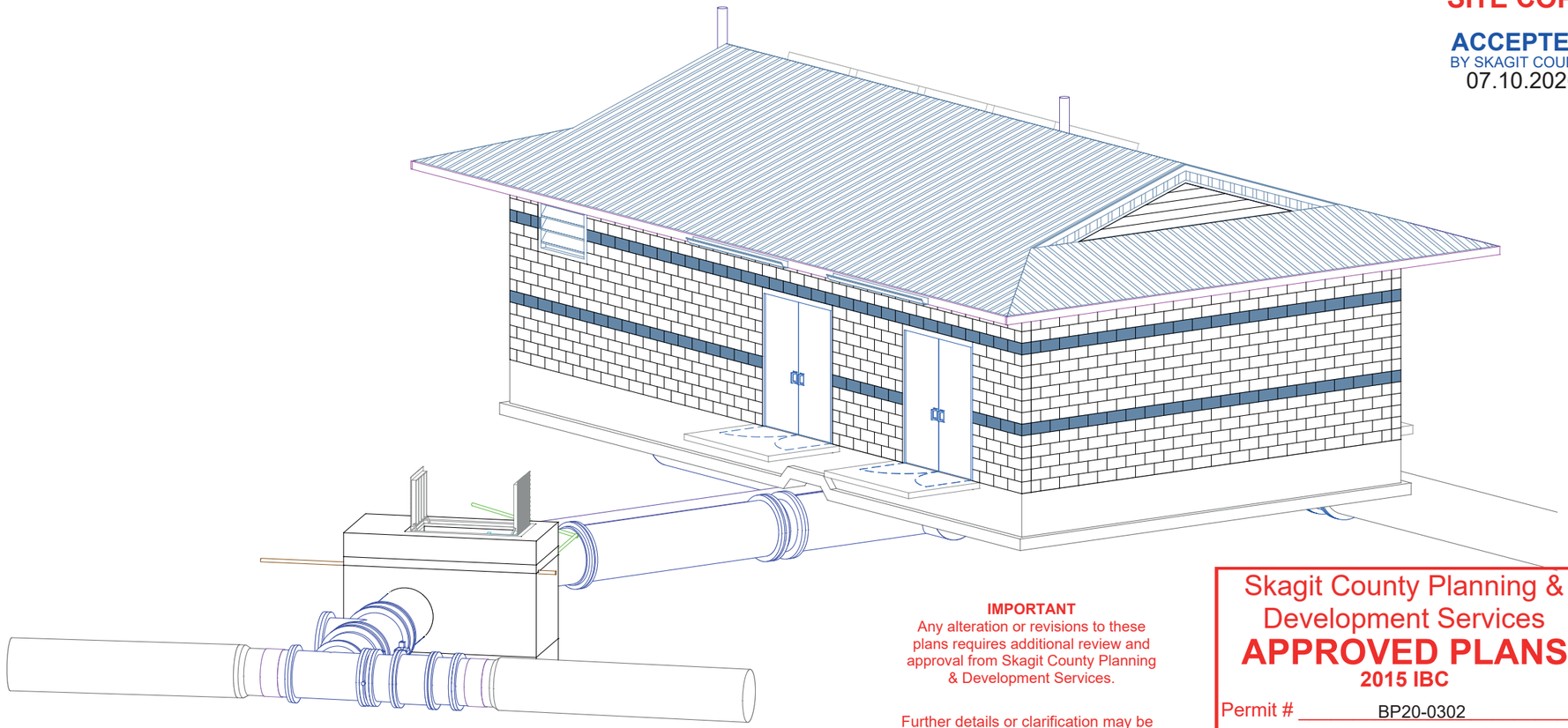
JUDY RAW WATER PUMP STATION REPLACEMENT

NOT FOR CONSTRUCT
AGENCY REVIEW ON
BUILDING PERMIT RE

VOL II of II PROJECT NO. 3766
C.O. 5040

BP20-0302
SITE COPY

ACCEPTED
BY SKAGIT COUNTY
07.10.2020



IMPORTANT
Any alteration or revisions to these plans requires additional review and approval from Skagit County Planning & Development Services.

Further details or clarification may be required by the Skagit County Building Inspector based on construction methods or site conditions

Skagit County Planning & Development Services
APPROVED PLANS
2015 IBC
Permit # BP20-0302
Occupancy Type UTILTY
Date 07.10.2020
Plans Examiner _____

DRAWING INDEX

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2	EXISTING SITE PLAN	G
3	DEMOLITION AND TESC PLAN	G
4	DEMOLITION AND TESC DETAILS	G
5	SITE UTILITY PLAN	G
6	SITE GRADING PLAN	G
7	SITE DETAILS	G
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10	FACILITY FLOOR PLAN	S
11	FACILITY ROOF PLAN	S
12	STRUCTURAL SECTION I	S
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17	MAJOR MECHANICAL PLAN	M
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29	VFD PANEL LAYOUT	E
30	CONTROL LOGIC DIAGRAMS I	E
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32	ELECTRICAL DETAILS	E
33	ELECTRICAL SCHEDULES	E
34	RTU PANEL LAYOUT	E
35	RTU - POWER AND COMMUNICATIONS DIAGRAM	E
36	RTU - INPUT AND OUTPUT WIRING 1	E
37	RTU - INPUT AND OUTPUT WIRING 2	E

CONTACT PERSONNEL

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GARY TOLLEFSON (WTP OPERATOR)	SKAGIT PUD	360.848.2148
ROB SAGER (WTP OPERATOR)	SKAGIT PUD	360.848.2126
BRANDT BARNES (CHIEF INSPECTOR)	SKAGIT PUD	360.399.5251

CALL 48 HOURS BEFORE YOU DIG
ONE CALL 811

REPORT ALL SPILLS

ADDRESS IDENTIFICATION
Address shall be placed (on the Structure) in such a position as to be plainly visible from the street. Lettering shall be not less than 4" high and ½" wide. Where access is by means of a private road and building address is not visible from a public way, a monument, pole or other sign shall be used in addition to one identifying the structure.

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020

RICHARD L. BALLARD STATE OF WASHINGTON 32678 REGISTERED PROFESSIONAL ENGINEER
DANIEL W. BURWELL STATE OF WASHINGTON 35301 REGISTERED PROFESSIONAL ENGINEER
ORIN M. PAUL STATE OF WASHINGTON 57679 REGISTERED PROFESSIONAL ENGINEER
LYON MARSHALL CONNER STATE OF WASHINGTON 44672 STRUCTURAL ENGINEER PROFESSIONAL ENGINEER
MARK W. BRAAKSMA STATE OF WASHINGTON 51635 REGISTERED PROFESSIONAL ENGINEER

RH2

GENERAL CONSTRUCTION NOTES

CRITERIA

1. CONSTRUCTION OF IMPROVEMENTS SHALL BE IN ACCORDANCE WITH CURRENT AWWA SPECIFICATIONS.

2. ALL MATERIALS, WORKMANSHIP, DESIGN, AND CONSTRUCTION SHALL CONFORM WITH THESE PLANS (VOLUME II OF II) AND CONTRACT DOCUMENTS AND SPECIFICATIONS (VOLUME I OF II) AND BE IN ACCORDANCE WITH ALL PERMITTING CONDITIONS OF APPROVAL.

GENERAL CONSTRUCTION

1. SITE ACCESS
WTP ACCESS DRIVEWAY AND PARKING LOT IS LOCATED OFF OF MORFORD ROAD. TWO SECURITY GATE ENTRANCES ARE LOCATED IN FRONT OF THE WTP. THE OWNER WILL PROVIDE INSTRUCTIONS FOR GATE ACCESS WHEN CONSTRUCTION BEGINS.

2. APPROVED PLANS AND SPECIFICATIONS
A COPY OF THE APPROVED PLANS AND SPECIFICATIONS MUST BE ON-SITE WHENEVER CONSTRUCTION IS IN PROGRESS.

3. PRE-CONSTRUCTION CONFERENCE
A PRE-CONSTRUCTION CONFERENCE WITH THE CONTRACTOR, OWNER, AND ENGINEER FOLLOWED BY 24-HOUR ADVANCE NOTICE IS REQUIRED PRIOR TO STARTING CONSTRUCTION.

4. CONSTRUCTION SAFETY
THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT THE PUBLIC AND PREVENT NUISANCES WHILE PERFORMING CONSTRUCTION WORK ON THIS PROJECT.

5. DAILY CLEANUP
THE CONTRACTOR SHALL CLEANUP ALL AREAS AFFECTED BY CONSTRUCTION ACTIVITIES ON A DAILY BASIS TO THE SATISFACTION OF THE OWNER. THIS INCLUDES REMOVAL OF ALL DUST, MUD, ROCKS, ASPHALT DEBRIS, AND REFUSE FROM STREETS, SIDEWALKS, DRIVEWAYS, AND ANY OTHER AREAS AFFECTED BY THE CONSTRUCTION ACTIVITIES. FAILURE TO CLEANUP TO THE SATISFACTION OF THE OWNER WILL NECESSITATE A SHUTDOWN OF THE PROJECT UNTIL CLEANUP IS PROPERLY PERFORMED.

6. EXISTING FACILITIES
A. EXISTING INFRASTRUCTURE AND LOCATIONS SHOWN IN THESE PLANS ARE BASED ON EXISTING WTP CONSTRUCTION RECORD DRAWINGS AND FIELD MEASUREMENTS. CONTRACTOR IS RESPONSIBLE FOR PERFORMING THEIR OWN FIELD VERIFICATION AND MEASUREMENTS OF EXISTING INFRASTRUCTURE TO CONSTRUCT THE PROPOSED IMPROVEMENTS.
B. CONTRACTOR SHALL USE CAUTION DURING CONSTRUCTION TO PREVENT DAMAGE TO EXISTING INFRASTRUCTURE UNLESS NOTED TO BE REMOVED OR MODIFIED. EXISTING CONSTRUCTION RECORD DRAWINGS WILL BE AVAILABLE FOR THE CONTRACTOR TO REFER TO DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE OWNER IF CONFLICTS BETWEEN THE CONSTRUCTION RECORD DRAWINGS AND FIELD CONDITIONS ARE DISCOVERED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACING OR REPAIRING ANY EXISTING INFRASTRUCTURE DAMAGED DURING CONSTRUCTION THAT IS INTENDED TO BE UNDISTURBED.
C. IMPROVEMENT CONFLICTS: THE CONTRACTOR SHALL NOTIFY THE OWNER OF ANY CONFLICTS WITH THE PROPOSED IMPROVEMENTS AND EXISTING INFRASTRUCTURE.

7. PERMITS
PRIOR TO BEGINNING CONSTRUCTION, CONTRACTOR IS RESPONSIBLE FOR OBTAINING ANY OTHER REQUIRED OR RELATED PERMITS THAT HAVE NOT BEEN PROVIDED BY THE OWNER. THE CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH THE PROVISIONS OF ALL PERMITS.

8. DEMOLITION OF AND CONNECTION TO EXISTING EQUIPMENT OR PIPING
THE CONTRACTOR SHALL COORDINATE WITH THE OWNER PRIOR TO PERFORMING DEMOLITION WORK ON EXISTING EQUIPMENT OR PIPING AND PRIOR TO CONNECTING PROPOSED PIPING TO EXISTING PIPING TO ENSURE VALVES ARE CLOSED TO PREVENT LEAKS OR SPILLS AND ACTIVE PROCESSES ARE NOT INTERRUPTED.

9. WATER OR POWER SHUTDOWNS
EXISTING PROCESSES FOR WATER AND POWER MAY NOT BE SHUT DOWN FOR ANY PERIOD WITHOUT PRIOR APPROVAL FROM THE OWNER. SEE GENERAL PHASING PLAN AND SPECIFICATIONS DIVISION 1 FOR REQUIREMENTS. THE CONTRACTOR SHALL NOT OPERATE EXISTING PROCESS OR POWER SYSTEM EQUIPMENT (VALVES, SWITCHES, ETC.).

SECTION AND DETAIL REFERENCES

THE FOLLOWING CONVENTIONS HAVE BEEN USED WITHIN THESE DRAWINGS TO REFER THE READER BETWEEN THE SECTION/DETAIL AND THE PLAN FROM WHICH IT IS REFERENCED.
REFERENCE BUBBLES

X / X000 — PLAN REFERENCE BUBBLE - REFERS READER BACK TO THE PLAN FROM WHICH THE DETAIL OR SECTION ORIGINATED.

X / X000 — DETAIL/SECTION REFERENCE BUBBLE - REFERS READER TO THE DRAWING ON WHICH THE DETAIL OR SECTION IS LOCATED.

WHERE, ID = SECTION/DETAIL REFERENCE NUMBER
= DRAWING NUMBER ON WHICH DETAIL ORIGINATED OR RESIDES.

SECTION/DETAIL REFERENCE NUMBER CONVENTIONS:
SECTIONS OR ELEVATIONS SHOULD HAVE A LETTER REFERENCE NUMBER (A THROUGH ZZ).

SURVEY NOTES

1) THIS TOPOGRAPHIC SURVEY WAS PERFORMED AND PREPARED IN ACCORDANCE WITH WAC 332-130-145

2) DATA FOR THIS SURVEY WAS GATHERED BY FIELD TRAVERSE UTILIZING ELECTRONIC DATA COLLECTION IN APRIL 2019.

3) EQUIPMENT USED: THEOMAT 00'01.5"
EDM: ± 2 PPM, ± 3 MM

4) HORIZONTAL DATUM: NAD 83/91 WASHINGTON STATE PLAN NORTH ZONE
- COORDINATES AND DISTANCES ARE GRID, WASHINGTON STATE PLAN, NORTH ZONE NAD81/91, (SUPERSEDED CONTROL) BASED ON G.P.S. STATIC TIES TO WASHINGTON DEPARTMENT OF TRANSPORTATION MONUMENTS

GP29009-11, N. 538,397.253, E. 1,299,999.913, ELEV.=45.876 FEET (NAVD88),
GP29009-24, N. 526,860.039, E. 1,293,033.739, ELEV.=22.234 (NAVD88),
GP29536-73, N. 525,429.209, E. 1,268,122.057, ELEV.=25.561 FEET (NAVD88)

5) VERTICAL DATUM: NAVD88
- SEE NOTE ABOVE

TEMPORARY BENCH MARK: PSE CONTROL ON-SITE, AS SHOWN

6) CONTOURS DEPICTED HERON MEET OR EXCEED NATIONAL MAPPING STANDARDS FOR 1-FOOT ACCURACY TOPOGRAPHIC SURVEYS AND HAVE BEEN COMPUTER GENERATED FROM GROUND FIELD TOPOGRAPHY GATHERED FOR THIS SUVEY UTILIZING ELECTRONIC DATA COLLECTION.

7) CONDUCTIBLE UNDERGROUND UTILITY LOCATES SERVICES WERE PERFORMED AND PAINTED ON-SITE BY APPLIED PROFESSIONAL SERVICES AND SURVEYED BY PSE FIELD CREWS IN APRIL 2019. UTILITIES ARE KNOWN TO EXIST WITHIN THE LIMITS OF THIS SURVEY THAT WERE UNDETECTABLE. ADDITIONAL UTILITY VERIFICATION MAY BE WARRANTED IN AREAS CONSIDERED FOR CONSTRUCTION.

8) UTILITY LOCATION AREAS AND LEVEL OF LOCATE ACCURACY WERE DETERMINED BY SURVEYOR AND CLIENT PRIOR TO COMMENCEMENT OF FIELD WORK.

9) THIS MAP IS NOT INTENDED TO REPRESENT A FORMAL BOUNDARY SURVEY, NOR DOES IT REFLECT ELEMENTS THAT A BOUNDARY SURVEY MAY DISCLOSE. BOUNDARY RELATED ELEMENTS DEPICTED HERON ARE SHOWN PER AVAILABLE RECORD INFORMATION.

10) A CURRENT TITLE REPORT WAS NOT PROVIDED FOR THIS SURVEY. EASEMENTS AND/OR TITLE ENCUMBRANCES MAY EXIST THAT ARE NOT SHOWN HEREON.

ABBREVIATIONS

CB	CATCH BASIN	PROP	PROPOSED
CONC	CONCRETE	PS	PUMP STATION
CL	CENTERLINE	PVC	POLYVINYL CHLORIDE
CPEP	CORRUGATED POLYETHYLENE	R	RIGHT
CSBC	CRUSHED SURFACING BASE COURSE	RT	RIGHT
CSTC	CRUSHED SURFACING TOP COURSE	ROW	RIGHT-OF-WAY
DIAM	DIAMETER	SPEC	SPECIFICATIONS
DI	DUCTILE IRON	SS	SANITARY SEWER
DWG	DRAWING	SSMH	SANITARY SEWER MANHOLE
E	EASTING	ST	STORM
ELEV	ELEVATION	STA	STATION LINE
EOP	EDGE OF PAVEMENT	STD	STANDARD
EX	EXISTING	SY	SQUARE YARDS
GV	GATE VALVE	TRJ	TRUE RESTRAINED JOINT (REFER TO SPECIFICATIONS DIVISION 15.22 FOR DEFINITION)
HMA	HOT MIXED ASPHALT		
L	LEFT	TYP	TYPICAL
LT	LEFT	W	WATER
LF	LINEAR FEET		
N	NORTHING		
PE	POLYETHYLENE		

SUBSURFACE UTILITY LEGEND

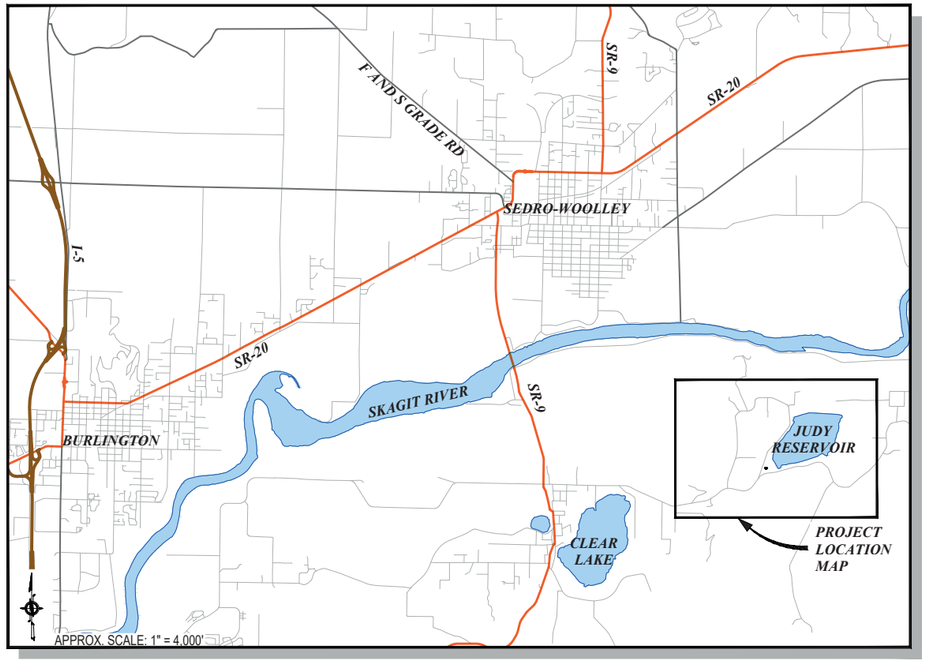
THE CLASSIFICATIONS FOR SUBSURFACE UTILITIES ARE OUTLINED AND EXPLAINED IN THE FOLLOWING LIST:

UTILITY QUALITY LEVEL A. —— W —— W —— W —— - INFORMATION OBTAINED THROUGH THE APPLICATION OF APPROPRIATE SURFACE GEOPHYSICAL METHODS TO DETERMINE THE EXISTENCE AND APPROXIMATE HORIZONTAL POSITION OF SUBSURFACE UTILITIES.

UTILITY QUALITY LEVEL B. —— • • • W • • • • W • • • • W —— - INFORMATION DERIVED FROM EXISTING RECORDS OR ORAL RECOLLECTIONS

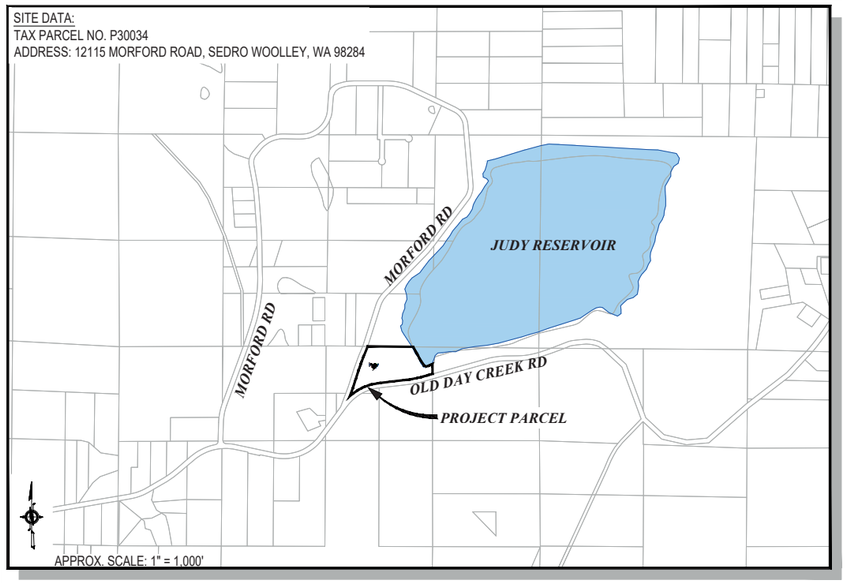
NOTE: THE USE OF THE LINE TYPES PROVIDED ABOVE WAS A PRIMARY METHOD FOR INDICATING THE ACCURACY OF THE UTILITIES SHOWN WITHIN THESE PLANS. WHEN THE SOURCE OF THE INFORMATION WAS UNKNOWN OR THE METHOD FOR LOCATING THE UTILITIES WAS UNAVAILABLE, QUALITY LEVEL WAS USED AS THE DEFAULT.

PROJECT VICINITY MAP



PROJECT LOCATION MAP

SITE DATA:
TAX PARCEL NO. P30034
ADDRESS: 12115 MORFORD ROAD, SEDRO WOOLLEY, WA 98284



BP20-0302
SITE COPY
ACCEPTED
BY SKAGIT COUNTY
07.10.2020

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020

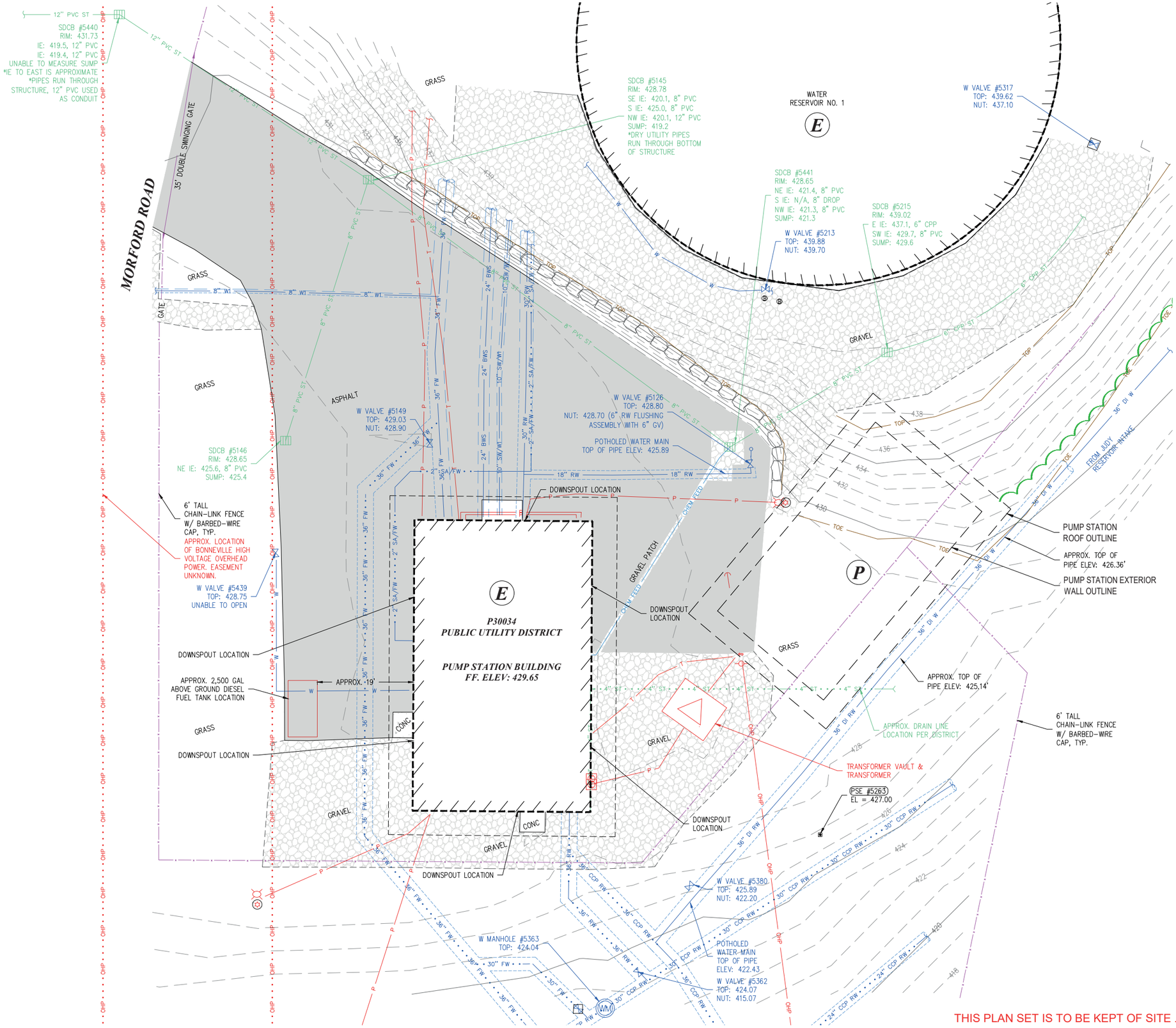
PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION
REPLACEMENT

Skagit PUD
PUBLIC UTILITY DISTRICT

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-COV.DWG
SAVE DATE: Apr 9, 2020
PLOT DATE: Apr 9, 2020
ENGINEER: OMP
REVIEWED: DWB

REVISIONS

SCALE



EXISTING SITE LEGEND

- SET HUB AND MAG
- MAJOR CONTOUR
- MINOR CONTOUR
- WATER VALVE
- WATER MANHOLE
- WATER BLOWOFF
- WATER MAIN
- WATER MAIN FROM RECORD DRAWINGS
- WATER MAIN APPROX. OUTSIDE OF PIPE
- UTILITY POLE
- UTILITY POLE WITH STREET LIGHT
- GROUND GUY ANCHOR
- POWER METER
- TRANSFORMER
- OVERHEAD POWER
- OVERHEAD POWER FROM AERIAL RECORDS
- UNDERGROUND POWER
- UNDERGROUND TELECOMMUNICATION
- CATCH BASIN
- STORM PIPE
- DRAIN FROM DISTRICT RECORDS
- ROCKERY
- VEGETATION LIMITS
- CHAINLINK FENCE
- BUILDING EDGE
- TOE OF SLOPE
- TOP OF SLOPE
- GRAVEL
- ASPHALT

BP20-0302
SITE COPY
ACCEPTED
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07.10.2020

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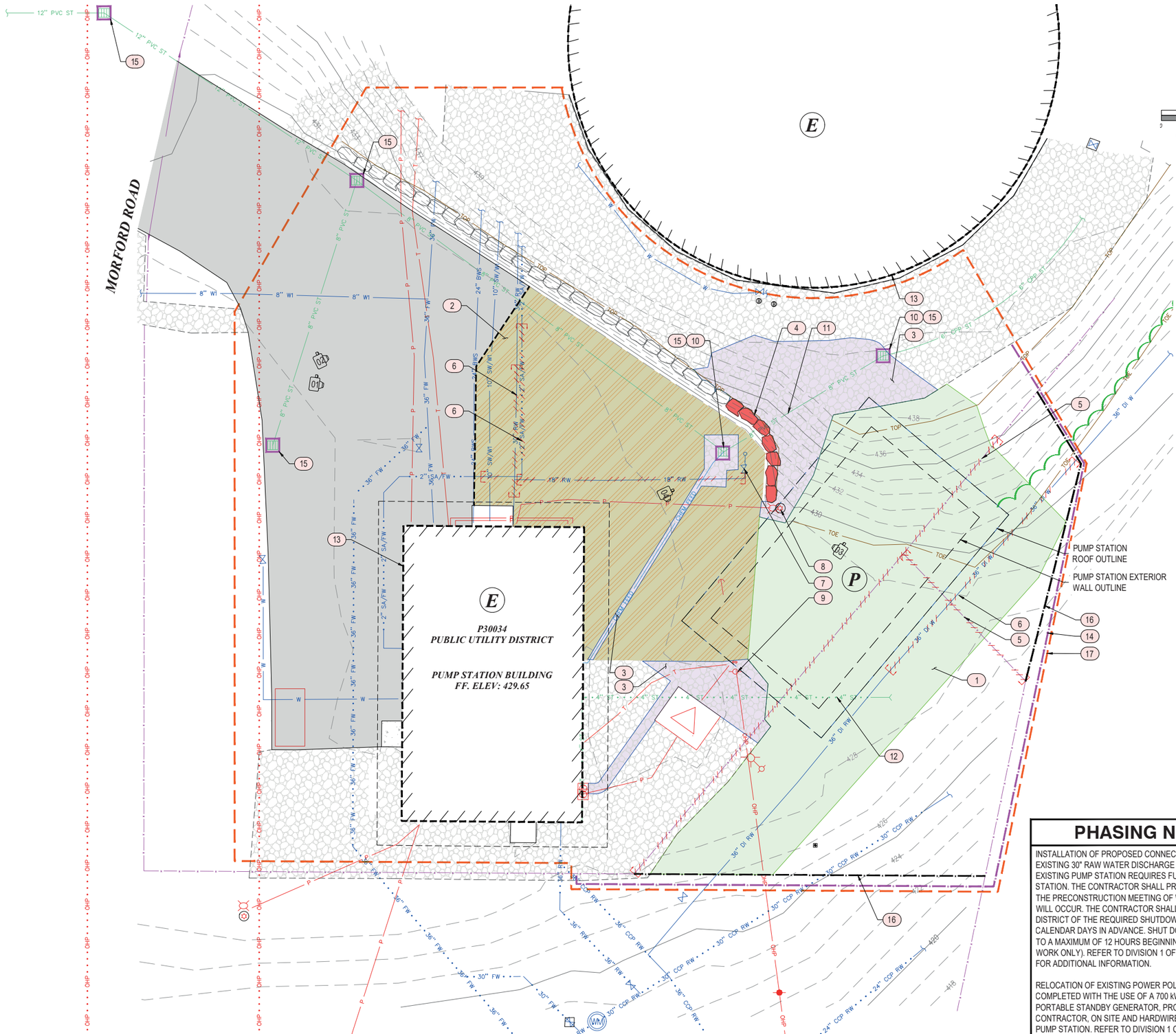
PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION
REPLACEMENT

Skagit PUD
PUBLIC UTILITY DISTRICT

ENGINEER: CMP	JOB NO.: 117.025
REVIEWED: DWB	CLIENT: SPUD
SAVE DATE: Apr 9, 2020	FILENAME: RWPS-D-CIV01.DWG
PLOT DATE: Apr 9, 2020	

REVISIONS



BP20-0302
SITE COPY

ACCEPTED
BY SKAGIT COUNTY
07.10.2020

DEMOLITION NOTES

1. CLEAR AND GRUB. EXCAVATE AREAS SHOWN AS NECESSARY TO CONSTRUCT PROPOSED IMPROVEMENTS.
2. SAWCUT AND REMOVE EXISTING ASPHALT AND BASE TO DEPTHS AS NECESSARY TO CONSTRUCT PROPOSED IMPROVEMENTS.
3. REMOVE EXISTING GRAVEL AND EXCAVATE AS NECESSARY TO CONSTRUCT IMPROVEMENTS.
4. REMOVE PORTION OF EXISTING ROCKERY AS SHOWN ON THIS SHEET. CONTRACTOR IS RESPONSIBLE FOR SLOPE STABILIZATION THROUGHOUT CONSTRUCTION.
5. REMOVE EXISTING CHAIN LINK FENCE TO NEAREST POST IN ORDER TO CONSTRUCT PROPOSED FENCE SHOWN ON DWG NO. C05.
6. REMOVE EXISTING WATER MAIN TO THE LIMITS SHOWN. ADJUST LIMITS TO MAKE PROPOSED CONNECTIONS. COORDINATE SHUT DOWN AND TIE IN WITH THE OWNER.
7. REMOVE EXISTING WATER MAIN APPURTENANCES. RETURN ANY FITTINGS TO THE OWNER SHOPS.
8. RELOCATE LIGHT PER DWG NO. E03. REMOVE EXISTING FOUNDATION AND CONDUIT.
9. EXISTING POWER POLE AND GUY ANCHOR TO BE RELOCATED. CONTRACTOR SHALL COORDINATE WITH PUGET SOUND ENERGY (PSE) REGARDING LOCATION.
10. PROTECT EXISTING CB #5215 AND CB #5441 IN PLACE.
11. EXPOSE 8" PVC STORM PIPE AND ENCASE IN CDF UNDER NEW ROCKERY LOCATION. BUILD ROCKERY ABOVE AND AROUND THE EXISTING PIPE.
12. LOCATION OF EXISTING DRAIN LINE IS UNKNOWN. IF LOCATED DURING CONSTRUCTION NOTIFY THE OWNER PRIOR TO ANY CHANGES.
13. PROTECT EXISTING STRUCTURE IN PLACE.
14. PROVIDE SILT FENCE PER DETAIL ON DWG NO. C03. (100/C03)
15. PROVIDE INLET PROTECTION PER WSDOT STANDARD PLAN I-40.20-00.
16. TEMPORARY CHAIN LINK FENCE MINIMUM 6-FOOT HEIGHT WITH THREE STRAND BARBED WIRE ACROSS TOP.
17. CONSTRUCTION LIMITS. CONTRACTOR RESPONSIBLE FOR SITE SECURITY AT ALL TIMES THROUGHOUT CONSTRUCTION.

DEMOLITION LEGEND

- SAWCUT LINE
- ASPHALT REMOVAL
- GRAVEL REMOVAL
- VEGETATION REMOVAL AREA
- ROCKERY REMOVAL
- INLET PROTECTION
- SILT FENCE
- TEMPORARY CHAINLINK FENCE
- UTILITY REMOVAL LIMITS
- CONSTRUCTION LIMITS

PHASING NOTES

INSTALLATION OF PROPOSED CONNECTION INTO THE EXISTING 30" RAW WATER DISCHARGE LINE FROM THE EXISTING PUMP STATION REQUIRES FULL SHUT DOWN OF THE STATION. THE CONTRACTOR SHALL PROVIDE A SCHEDULE AT THE PRECONSTRUCTION MEETING OF WHEN THIS SHUT DOWN WILL OCCUR. THE CONTRACTOR SHALL AGAIN NOTIFY THE DISTRICT OF THE REQUIRED SHUTDOWN A MINIMUM OF 14 CALENDAR DAYS IN ADVANCE. SHUT DOWN WILL BE LIMITED TO A MAXIMUM OF 12 HOURS BEGINNING AT 6 PM (NIGHT WORK ONLY). REFER TO DIVISION 1 OF THE SPECIFICATIONS FOR ADDITIONAL INFORMATION.

RELOCATION OF EXISTING POWER POLE SHALL BE COMPLETED WITH THE USE OF A 700 kW OR LARGER PORTABLE STANDBY GENERATOR, PROVIDED BY THE CONTRACTOR, ON SITE AND HARDWIRED INTO THE EXISTING PUMP STATION. REFER TO DIVISION 1 OF THE SPECIFICATIONS FOR ADDITIONAL INFORMATION. POWER RELOCATION SHALL NOT OCCUR CONCURRENTLY WITH CONNECTION TO PROPOSED WATER MAIN.

GENERAL NOTES

- CONTRACTOR SHALL ALLOW ACCESS TO THE OWNER AT ALL TIMES THROUGHOUT THE DURATION OF CONSTRUCTION.
- DO NOT BLOCK DOORS, GATES, STAIRWAYS AND OTHER ACCESS POINTS TO OWNER FACILITIES.
- SITE SECURITY AND PUBLIC SAFETY IS THE CONTRACTOR'S RESPONSIBILITY AT ALL TIMES DURING CONSTRUCTION. CONTRACTOR SHALL CONTAIN ALL CONSTRUCTION ACTIVITIES TO WITHIN THE CONSTRUCTION LIMITS UNLESS OTHERWISE APPROVED BY THE DISTRICT. CONTRACTOR SHALL PROVIDE TEMPORARY FENCING AS SHOWN UNTIL FINAL FENCE IS INSTALLED.
- LOCATION OF PORTA-POTTIES SHOULD BE A MINIMUM OF 25-FEET AWAY FROM DRAIN INLETS OR CRITICAL AREAS AND LOCATED WITHIN THE CONSTRUCTION LIMITS SHOWN ON THIS SHEET.
- ONSITE MATERIALS STOCKPILES, EQUIPMENT AND SUPPLY STAGING AREAS SHALL BE LIMITED TO THE CONSTRUCTION LIMITS AS SHOWN ON THIS SHEET.

DEMOLITION AND TESC PLAN VIEW

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 52575 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

DANIEL W. BURNETT — STATE OF WASHINGTON — 38306 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT

Skagit PUD — PUBLIC UTILITY DISTRICT

DEMOLITION AND TESC PLAN

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-CIV02.DWG
SAVE DATE: Apr 9, 2020
PLOT DATE: Apr 9, 2020
ENGINEER: CMP
REVIEWED: DWB

REVISIONS

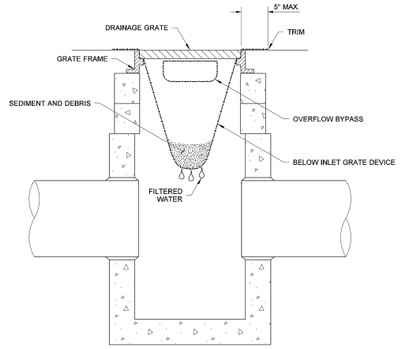
NO.	DESCRIPTION	DATE	BY	REVIEW

P.N. 3766
C.O. 5040

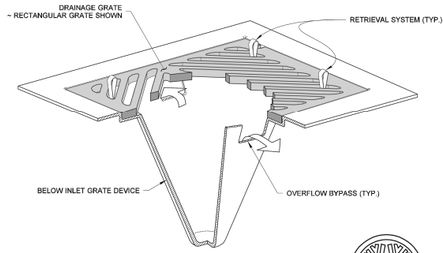
DWG NO.: C02
SHEET NO.: 3 / 37

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020

DRAWN BY: LISA CYFORD



SECTION VIEW
NOT TO SCALE



ISOMETRIC VIEW

NOTES

1. Size the Below Inlet Grate Device (BIGD) for the storm water structure it will service.
2. The BIGD shall have a built-in high-flow relief system (overflow bypass).
3. The retrieval system must allow removal of the BIGD without spilling the collected material.
4. Perform maintenance in accordance with Standard Specification 8-01.3(15).

STATE OF WASHINGTON
REGISTERED
LANDSCAPE ARCHITECT
MARK W. MAURER
CERTIFICATE NO. 000598

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST

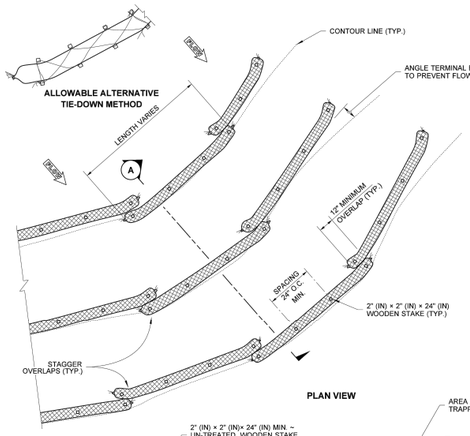
STORM DRAIN INLET PROTECTION

STANDARD PLAN I-40.20-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Pasco Bakotich III 09-20-07
STATE DESIGN ENGINEER — DATE
Washington State Department of Transportation

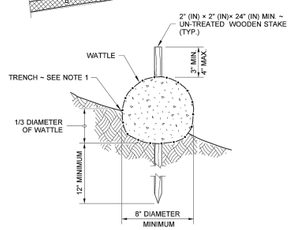
DRAWN BY: FERN LIDDELL



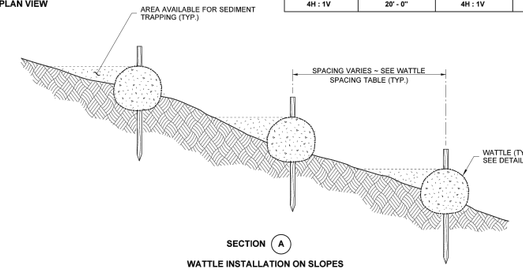
NOTES

1. Wattles shall be in accordance with **Standard Specification, Section 9-14.5(5).** Install Wattles along contours. Installation shall be in accordance with **Standard Specification, Section 8-01.3(10)**.
2. Securely knot each end of Wattle. Overlap adjacent Wattle ends 12" (in) behind one another and securely tie together.
3. Compact excavated soil and trenches to prevent undercutting. Additional staking may be necessary to prevent undercutting.
4. Install Wattle perpendicular to flow along contours.
5. Wattles shall be inspected regularly, and immediately after a rainfall produces runoff, to ensure they remain thoroughly entrenched and in contact with the soil.
6. Perform maintenance in accordance with **Standard Specification, Section 8-01.3(15).**
7. Refer to **Standard Specification, Section 8-01.3(16)** for removal.

WATTLE SPACING TABLE			
TEMPORARY		PERMANENT	
8" - 10" OR 10" - 12" DIAM.		10" - 12" DIAM.	
SLOPE	MAX. SPACING	SLOPE	MAX. SPACING
1H : 1V	5' - 0"	-	-
2H : 1V	10' - 0"	2H : 1V	5' - 0"
3H : 1V	15' - 0"	3H : 1V	10' - 0"
4H : 1V	20' - 0"	4H : 1V	15' - 0"



WATTLE DETAIL



WATTLE INSTALLATION ON SLOPES

STATE OF WASHINGTON
JULI DEE HARTWIG
NO. 1423 EXP. 08/17/2021
LANDSCAPE ARCHITECT
Hartwig, Juli
Jun 4 2019 8:05 AM

WATTLE INSTALLATION ON SLOPE

STANDARD PLAN I-30.30-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Rash, Steve
Jun 12 2019 7:41 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation

RH2

RICHARD L. BALLARD
STATE OF WASHINGTON
17875
REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

DANIEL W. BROWNELL
STATE OF WASHINGTON
38306
REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION
REPLACEMENT

Skagit PUD — PUBLIC UTILITY DISTRICT

DEMOLITION AND TESC DETAILS

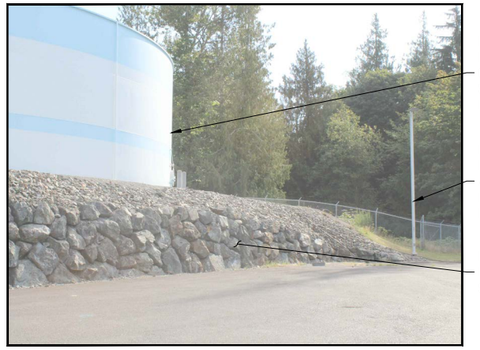
EXISTING UTILITY POLE TO BE RELOCATED. CONTRACTOR SHALL COORDINATE WITH PSE FOR RELOCATION. REFER TO DIVISION 1 OF THE SPECIFICATIONS REGARDING INFORMATION RELATED TO SHUT DOWN.

EXISTING PUMP STATION BUILDING AND APPURTENANCES TO BE PROTECTED IN PLACE

EXISTING CHAIN LINK FENCE TO BE RELOCATED PER DWG NO. C05

EXISTING ASPHALT TO BE REMOVED PER DWG NO. C02

01 **SITE PHOTO**



EXISTING RESERVOIR TO BE PROTECTED IN PLACE. CONTRACTOR SHALL USE SHORING AS NECESSARY DURING CONSTRUCTION.

EXISTING SITE LIGHT, POLE, FOUNDATION AND ASSOCIATED CONDUITS TO BE REMOVED AS SHOWN ON DWG NO. C02

EXISTING ROCKERY TO BE REMOVED TO LIMITS SHOWN ON DWG NO. C02

02 **SITE PHOTO**

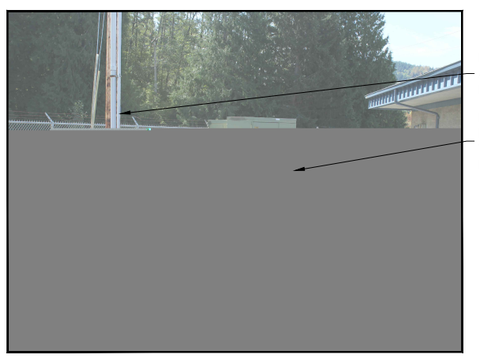
EXISTING SITE LIGHT, POLE, FOUNDATION AND ASSOCIATED CONDUITS TO BE REMOVED AS SHOWN ON THE DEMOLITION PLAN.

PROTECT EXISTING CATCH BASIN IN PLACE

EXISTING STRUCTURE TO BE REMOVED AS SHOWN ON DWG NO. C02

EXISTING WATER MAIN, VALVE AND STANDPIPE TO BE REMOVED AS SHOWN ON DWG NO. C02

03 **SITE PHOTO**



EXISTING UTILITY POLE TO AND GUY WIRE/ANCHOR TO BE RELOCATED.

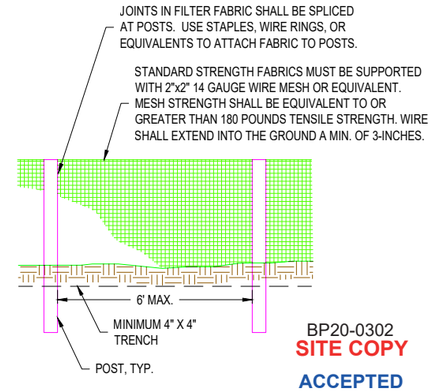
EXISTING TRANSFORMER AND VAULT. PROTECT VAULT IN PLACE. TRANSFORMER TO BE REPLACED BY PUGET SOUND ENERGY.

04 **SITE PHOTO**

SILT FENCE NOTES:

1. FILTER FABRIC MATERIAL SHALL CONTAIN ULTRAVIOLET RAY INHIBITORS AND STABILIZERS TO PROVIDE A MINIMUM OF 6 MONTHS OF EXPECTED USABLE CONSTRUCTION LIFE AT A TEMPERATURE RANGE OF 0°F TO 120°F.
2. FILTER FABRIC FENCES SHALL BE INSTALLED AS SHOWN PER PLAN. ADJUST AS NECESSARY TO FOLLOW CONTOUR WHENEVER POSSIBLE. THE ENDS OF THE FENCE SHALL BE TURNED UP INTO THE CONTOUR.
3. FILTER FABRIC SHALL BE SEWN TOGETHER AT THE POINT OF MANUFACTURE TO FORM FILTER FABRIC LENGTHS AS REQUIRED. ALTERNATIVELY TWO SECTIONS OF FENCE CAN BE OVERLAPPED, PROVIDE THAT THE CONTRACTOR CAN DEMONSTRATE, TO THE SATISFACTION OF THE ENGINEER, THAT THE OVERLAP IS LONG ENOUGH AND THAT THE ADJACENT FENCE SECTIONS ARE CLOSE ENOUGH TOGETHER TO PREVENT SILT LADEN WATER FROM ESCAPING THE FENCE OVERLAP.

FILTER FABRIC	
POLYMERIC MESH AOS (ASTM D4751)	0.60 MM MAXIMUM FOR FILM WOVENS (US #30 SIEVE). 0.30 MM MAXIMUM FOR ALL OTHER GEOTEXTILE TYPES (US #50 SIEVE). 0.15 MM MINIMUM FOR ALL FABRIC TYPES (US #100 SIEVE).
WATER PERMITTIVITY (ASTM D4491)	0.02 SEC^{-1} MINIMUM
GRAB TENSILE STRENGTH (ASTM D4632)	180 LBS. MINIMUM FOR EXTRA STRENGTH FABRIC. 100 LBS. MINIMUM FOR STANDARD STRENGTH FABRIC.
GRAB TENSILE ELONGATION (ASTM D4632)	30% MAXIMUM.
ULTRAVIOLET RESISTANCE (ASTM D4355)	70% MINIMUM.



BP20-0302
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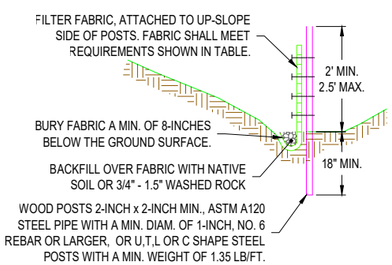


100 C02 **SILT FENCE**
NOT TO SCALE

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-CIV02.DWG
SAVE DATE: Apr 9, 2020
PLOT DATE: Apr 9, 2020
ENGINEER: CMP
REVIEWED: DWB

REVISIONS

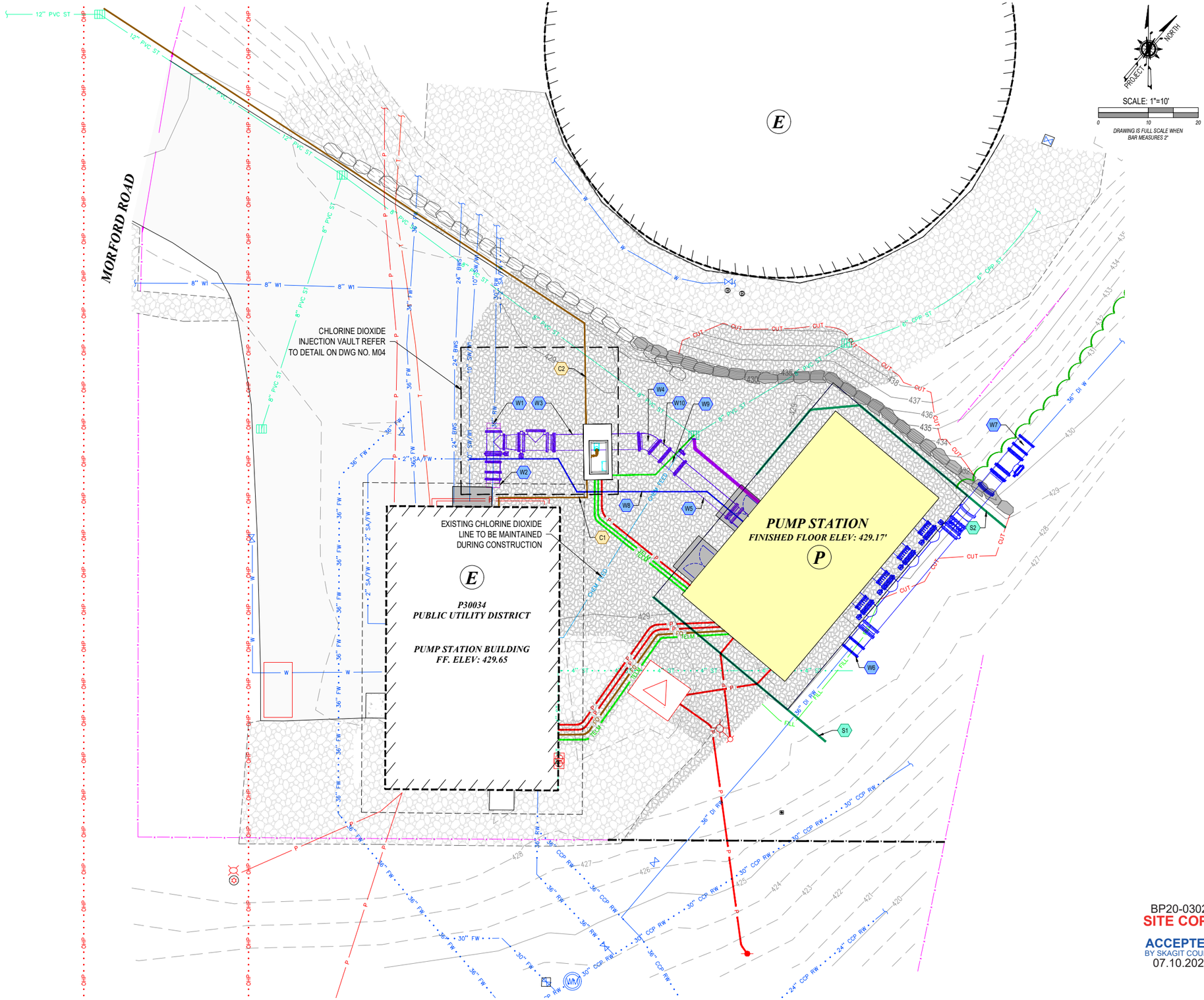
NO.	DESCRIPTION	DATE	BY	REVIEW

SCALE: SHOWN
2" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

P.N. 3766
C.O. 5040

DWG NO.: C03
SHEET NO.: 4
37

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020



PROPOSED SITE UTILITY PLAN

SITE UTILITY NOTES

WATER

- W1 N:539342.55, E:1311033.39, PROVIDE: (1) - CONNECTION TO EXISTING
- W2 N:539330.16, E:1311033.28, PROVIDE: (1) - CONNECTION TO EXISTING
- W3 PROVIDE APPROX 20 LF of 36" DI PIPE (TRJ)
- W4 N:539339.00, E:1311064.31, PROVIDE: (1) - 36" DI 45° BEND (TRJxTRJ)
- W5 PROVIDE APPROX 16 LF of 36" DI PIPE (TRJ)
- W6 N:539296.78, E:1311104.70, PROVIDE: (1) - CONNECTION TO EXISTING WITH 36" DI SLEEVE (TRJxTRJ)
- W7 N:539338.19, E:1311139.50, PROVIDE: (1) - CONNECTION TO EXISTING WITH 36" DI SLEEVE (TRJxTRJ)
- W8 CONNECT WATER SERVICE TO 10" DI SW/W1 PIPE WITH CORPSTOP. PROVIDE APPROX 37 LF OF 1" REHAU PEX PIPING AND FITTINGS AS NECESSARY TO CONNECT TO NEW PUMP STATION BUILDING. REFER TO DWG NO. M03 FOR CONTINUATION.
- W9 N:539334.86 E:1311069.24, PROVIDE: (1) - 36" x 6" DI TEE (TRJxFL) (1) - 6" GATE VALVE (FLxTRJ) (1) - 6" DI NIPPLE, LENGTH TO FIT. FITTINGS AND PIPE SHALL BE FULLY RESTRAINED
- W10 PROVIDE APPROX 16 LF of 36" DI PIPE (TRJ)

STORMWATER

- S1 PROVIDE APPROX 45 LF TRENCH DRAIN PER DETAIL ON DWG NO C06.
- S2 PROVIDE APPROX 65 LF TRENCH DRAIN PER DETAIL ON DWG NO C06.

MINOR UTILITIES

- C1 PROVIDE APPROX 20 LF of 2" SCH. 80 PVC PIPE. PROVIDE FITTINGS AS NECESSARY PROVIDE FULLY FUNCTIONAL CHLORINE DIOXIDE INJECTION SYSTEM AND TO CONNECT TO EXISTING. ROUTE PIPE THROUGH EXISTING BUILDING PIPE GALLEY. COORDINATE CONNECTION WITH DISTRICT REPRESENTATIVE.
- C2 PROVIDE APPROX 135 LF of 2" SCH. 80 PVC PIPE. PROVIDE FITTINGS AS NECESSARY PROVIDE FULLY FUNCTIONAL CHLORINE DIOXIDE INJECTION SYSTEM AND TO CONNECT TO EXISTING. COORDINATE CONNECTION WITH DISTRICT REPRESENTATIVE.

SITE UTILITY LEGEND

- 1170 MAJOR CONTOUR
- 1171 MINOR CONTOUR
- CUT CUT LIMITS
- FILL FILL LIMITS
- P ELECTRICAL CONDUIT
- FO FIBER OPTIC CONDUIT
- TELM TELEMETRY CONDUIT
- TRENCH DRAIN
- BUILDING DRAIN LINE
- CHLORINE INJECTION LINE
- ROCKERY
- BUILDING ROOF OUTLINE
- BUILDING
- CONCRETE
- CRUSHED SURFACING

GENERAL UTILITY NOTES

- PROVIDE JOINT BONDING FOR DISCHARGE PIPING PER DETAIL ON DWG NO. M06.
- DISCHARGE PIPING SHALL BE POLYWRAPPED IN ACCORDANCE WITH DIVISION 13 OF THE SPECIFICATIONS.

BP20-0302
SITE COPY
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BY SKAGIT COUNTY
07.10.2020

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 32675 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

DANIEL W. BURWELL — STATE OF WASHINGTON — 38306 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT
SITE UTILITY PLAN

Skagit PUD — PUBLIC UTILITY DISTRICT

ENGINEER: OMP	DRAWN: SPUD	JOB NO.: 117.025
REVIEWED: DWB	PLOT DATE: Apr 9, 2020	FILENAME: RWPS-D-CIV03.DWG
	DATE: Apr 9, 2020	CLIENT: SPUD

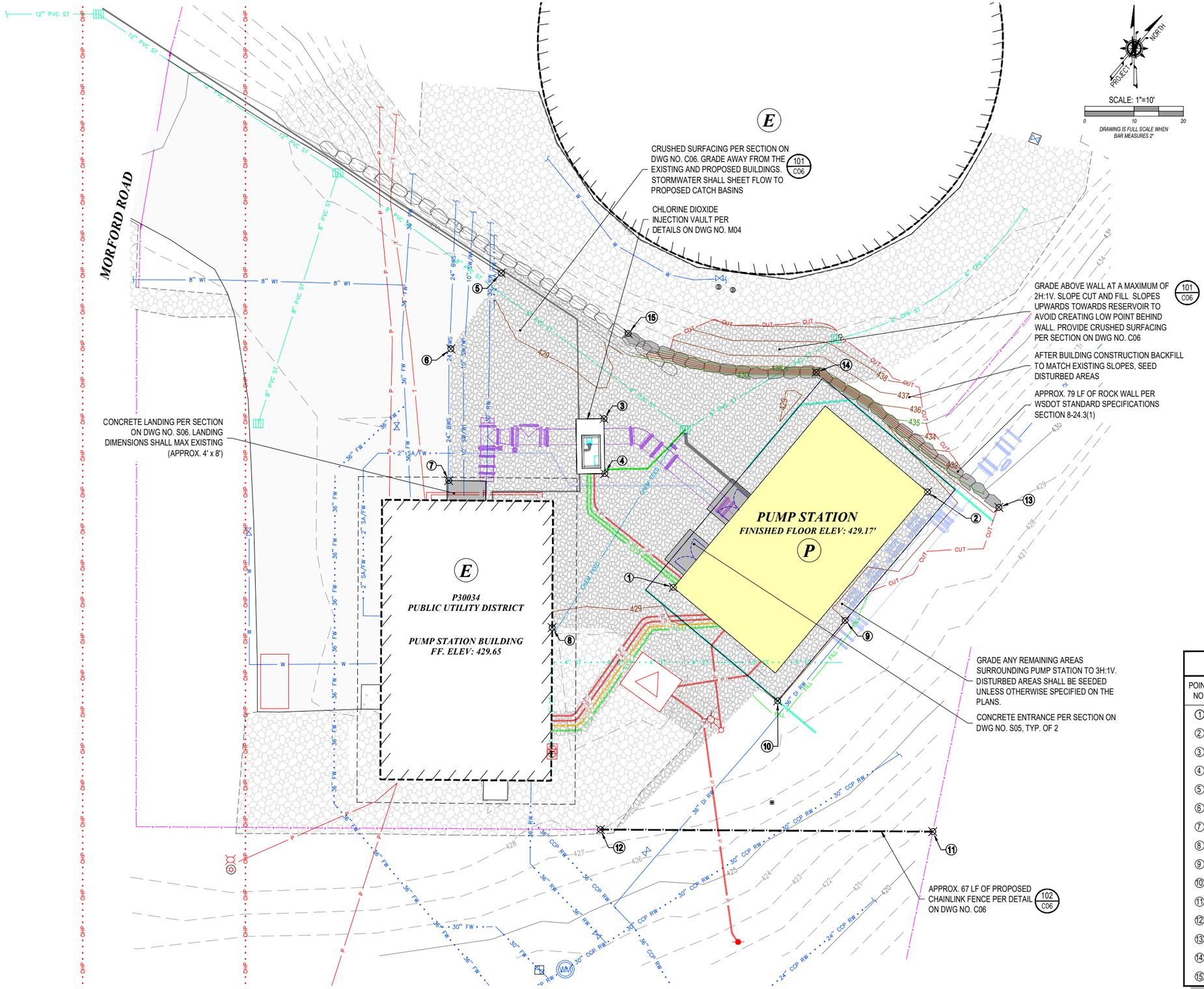
REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW
1				

P.N. 3766
C.O. 5040

DWG NO.: C04
SHEET NO.: 5 / 37

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020



PROPOSED SITE GRADING PLAN

BP20-0302
SITE COPY
ACCEPTED
BY SKAGIT COUNTY
07.10.2020

RH2

RICHARD L. BALLARD
STATE OF WASHINGTON
17878
REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

DANIEL W. BURNHAM
STATE OF WASHINGTON
38306
REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

ROCKERY NOTES

ROCKERY SHALL BE CONSTRUCTED PER STANDARD SPECIFICATIONS 8.24.3(1). BASE ROCK - 3 MAN. ROCK ABOVE BASE ROCK - 2 MAN. BACKFILL SHALL BE CSBC COMPACTED TO FIRM AND UNYIELDING CONDITION. NO GEOTEXTILE REQUIRED. SUBGRADE SHALL BE REVIEWED AND APPROVED JUST PRIOR TO BASE ROCK PLACEMENT BY OWNER REPRESENTATIVE. PROTECT SUBGRADE FROM WEATHER DEGRADATION.

SITE GRADING LEGEND

- 1170 — MAJOR CONTOUR
- 1171 — MINOR CONTOUR
- CUT — CUT LIMITS
- FILL — FILL LIMITS
- P — ELECTRICAL CONDUIT
- FO — FIBER OPTIC CONDUIT
- TELM — TELEMETRY CONDUIT
- TRENCH DRAIN
- BUILDING DRAIN LINE
- CHLORINE INJECTION LINE
- ROCKERY
- BUILDING ROOF OUTLINE
- BUILDING
- CONCRETE
- CRUSHED SURFACING
- CHAINLINK FENCE

POINT TABLE

POINT NO.	ELEV.	NORTHING	EASTING	DESC.
①	SEE DWG NO. A01	539308.20	1311071.05	BUILDING CORNER
②	SEE DWG NO. A01	539327.55	1311122.62	BUILDING CORNER
③	SEE DWG NO. M04	539342.42	1311057.01	VAULT CORNER
④	SEE DWG NO. M04	539331.26	1311057.17	VAULT CORNER
⑤	MATCH EXISTING	539371.91	1311036.17	EDGE OF GRAVEL
⑥	MATCH EXISTING	539356.56	1311025.97	EDGE OF GRAVEL
⑦	MATCH EXISTING	539329.85	1311025.53	EDGE OF GRAVEL
⑧	MATCH EXISTING	539300.04	1311046.51	EDGE OF GRAVEL
⑨	429.05	539301.46	1311105.93	EDGE OF GRAVEL
⑩	429.04	539285.17	1311092.24	EDGE OF GRAVEL
⑪		539258.65	1311123.70	FENCE CORNER
⑫		539259.07	1311056.30	FENCE CORNER
⑬		539324.42	1311137.10	END OF ROCKERY
⑭		539351.81	1311100.05	ROCKERY DEFLECTION
⑮		539359.70	1311061.95	END OF ROCKERY

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT
Skagit PUD — PUBLIC UTILITY DISTRICT

SITE GRADING PLAN

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-CIV04.DWG
DATE: Apr 9, 2020
PLOT DATE: Apr 9, 2020
ENGINEER: CMP
REVIEWED: DWB

REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW

P.N. 3766
C.O. 5040

DWG NO.: C05
SHEET NO.: 6 / 37

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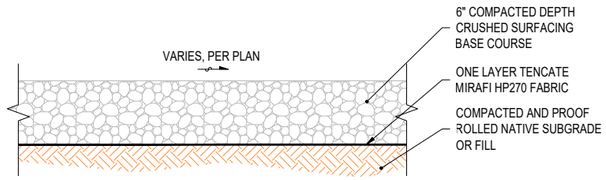
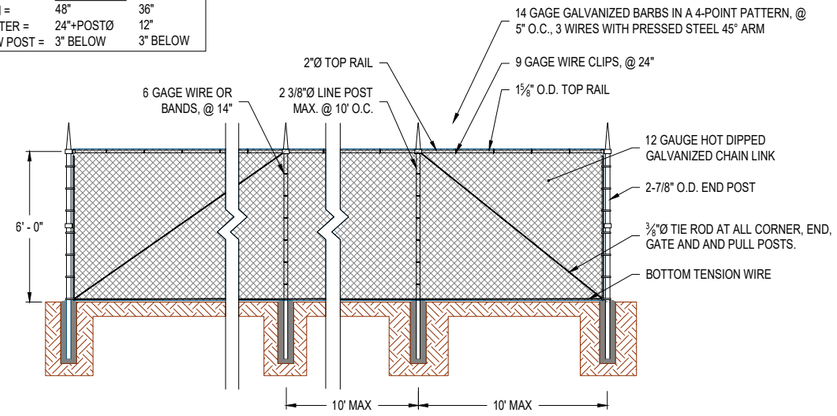
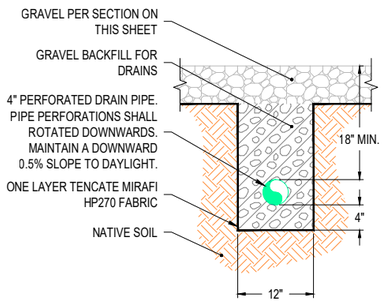


GRAVEL SECTION (101 / C05)
NOT TO SCALE

POST HOLE CONCRETE:	GATE POSTS & END POSTS	LINE POSTS
MINIMUM DEPTH =	48"	36"
MINIMUM DIAMETER =	24"+POSTØ	12"
MINIMUM BELOW POST =	3" BELOW	3" BELOW



CHAINLINK FENCE DETAIL (102 / C05)
NOT TO SCALE



TRENCH DRAIN DETAIL (103 / C05)
NOT TO SCALE

BP20-0302
SITE COPY

ACCEPTED
BY SKAGIT COUNTY
07.10.2020

P.N. 3766
C.O. 5040

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 37878 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

DANIEL W. BUDWEIL — STATE OF WASHINGTON — 38306 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT
Skagit PUD — PUBLIC UTILITY DISTRICT

SITE DETAILS

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-DET.DWG
SAVE DATE: Apr 9, 2020
PLOT DATE: Apr 9, 2020
ENGINEER: CMP
REVIEWED: DWB

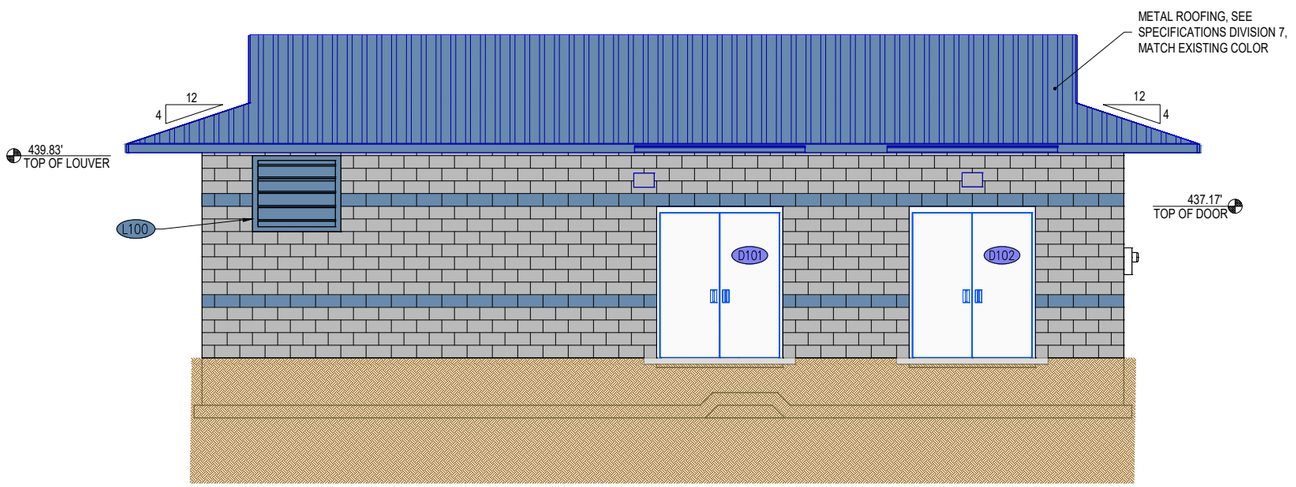
REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW

SCALE: SHOWN
2" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

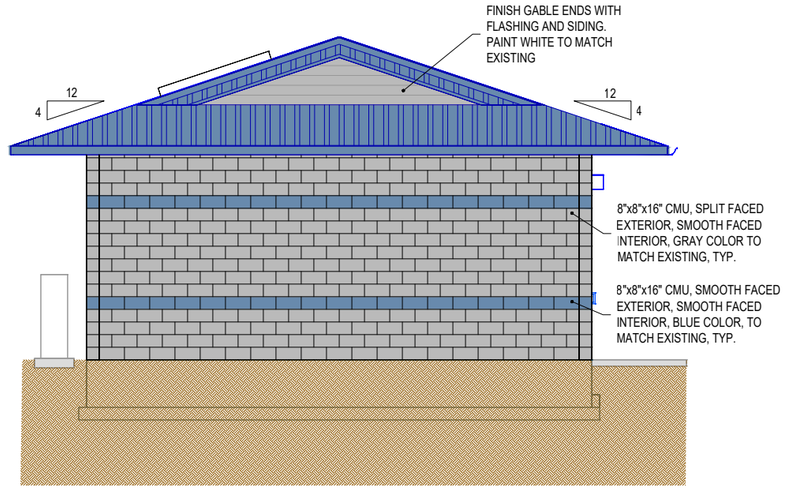
DWG NO.: C06
SHEET NO.: 7 of 37

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020



WEST ELEVATION

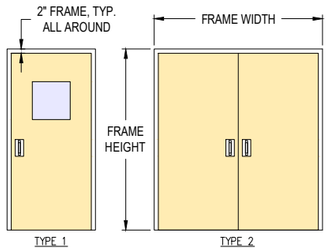
¼" = 1'-0"



NORTH ELEVATION

¼" = 1'-0"

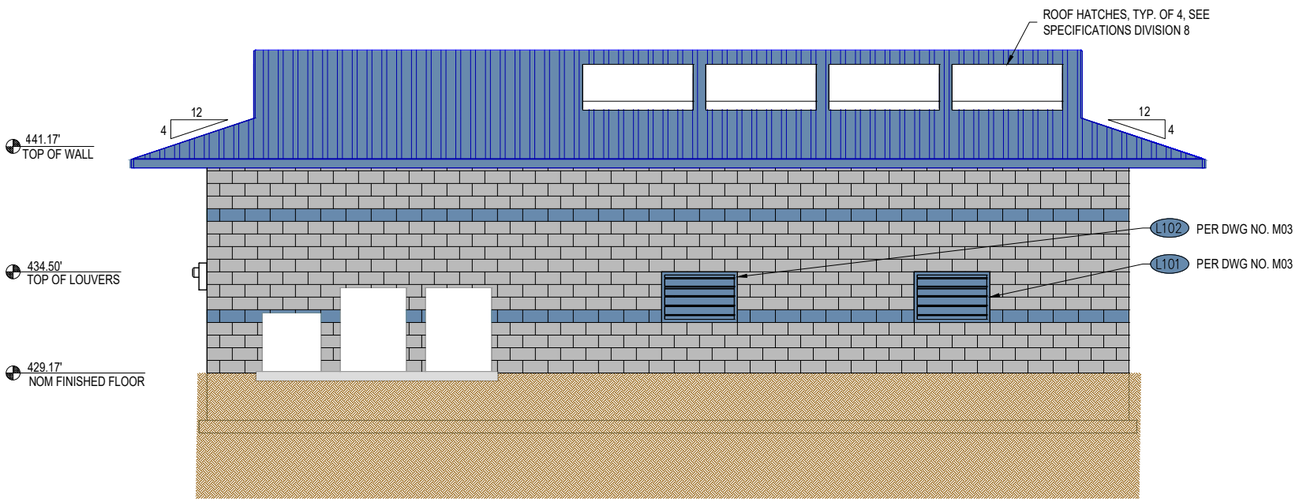
DOOR TYPES:



DOOR SCHEDULE

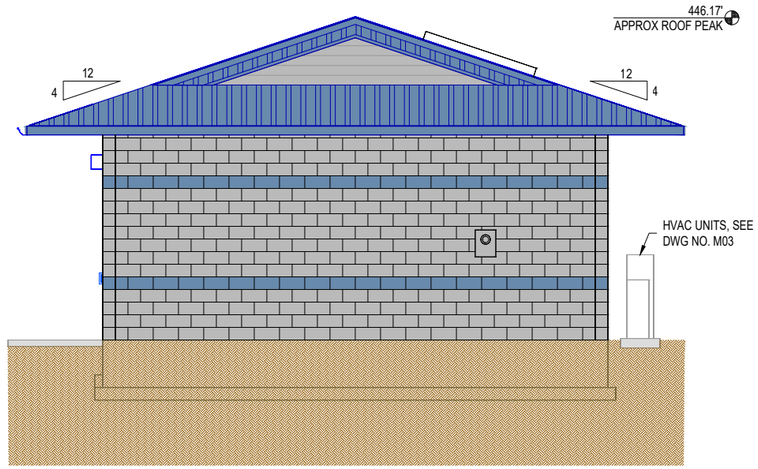
No.	LOCATION	DOOR TYPE	DOOR SIZE WIDTH	DOOR SIZE HEIGHT	DOOR MATERIAL	FRAME SIZE WIDTH	FRAME SIZE HEIGHT	FRAME MATERIAL	NOTES
D100	MECHANICAL ROOM	2	6'-4"	7'-10"	STEEL	6'-8"	8'-0"	STEEL	1
D101	ELECTRICAL ROOM	2	6'-4"	7'-10"	STEEL	6'-8"	8'-0"	STEEL	1
D102	ELECTRICAL ROOM	1	3'-0"	7'-10"	STEEL	3'-4"	8'-0"	STEEL	1

1. PROVIDE HARDWARE TO DOORS AS SPECIFIED IN DIVISION 8. PANIC BARS SHALL BE PROVIDED FOR EACH ACTIVE SIDE DOUBLE EXTERIOR DOOR
2. COAT DOOR PER SPECIFICATIONS DIVISION 9, MATCH COLOR OF EXISTING



EAST ELEVATION

¼" = 1'-0"



SOUTH ELEVATION

¼" = 1'-0"

BP20-0302
SITE COPY

ACCEPTED
BY SKAGIT COUNTY
07.10.2020

P.N. 3766
C.O. 5040

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 17575 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

RON MARSHALL CONNELL — STATE OF WASHINGTON — 44672 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT

Skagit PUD — PUBLIC UTILITY DISTRICT

EXTERIOR ELEVATIONS

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-ARCH01.DWG
SAVE DATE: Apr 3, 2020
PLOT DATE: Apr 10, 2020
ENGINEER: DND
REVIEWED: JMC

REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW

SCALE: SHOWN
2" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: A01
SHEET NO.: 8 / 37

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020

SIDING ON NEW BUILDING SHALL MATCH EXISTING BUILDING

GUTTER ON EXISTING BUILDING SHALL NOT BE INCLUDED IN THE NEW BUILDING

EAVE ON EXISTING BUILDING SHALL NOT BE INCLUDED IN THE NEW BUILDING, SEE DWG NO. S03 FOR DETAILS

FLASHING ON NEW BUILDING SHALL MATCH EXISTING BUILDING

SOFFIT COLOR FOR NEW BUILDING SHALL MATCH EXISTING AND METAL SOFFITS TO BE INCLUDED IN NEW BUILDING

EXISTING PUMP STATION EXTERIOR

NEW ROOF MATERIAL AND COLOR SHALL MATCH EXISTING, INCLUDING BUT NOT LIMITED TO RIB HEIGHT AND SPACING.

EXISTING PUMP STATION EXTERIOR

NOTE:
-ANY ARCHITECTURAL ITEMS NOT SPECIFICALLY IDENTIFIED IN THESE PLANS SHALL BE CONSTRUCTED TO MATCH THE EXISTING PUMP STATION

-BIDDERS WILL BE ALLOWED TO ACCESS THE SITE TO VERIFY EXISTING BUILDING MATERIALS TO ASSIST IN BID PREPARATION.

NEW BUILDING CMU COLOR TO MATCH EXISTING

EXISTING PUMP STATION EXTERIOR

FLASHING TYPE AND COLOR AROUND NEW ROOF HATCHES SHALL MATCH THE EXISTING BUILDING

TRIM AND FLASHING ON GABLE ENDS OF BUILDING SHALL MATCH EXISTING

FLASHING FOR BUILDING RIDGES SHALL MATCH EXISTING

EXISTING PUMP STATION EXTERIOR

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 12878 — REGISTERED PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

JON MARSHALL CONRAD — STATE OF WASHINGTON — 24672 — REGISTERED PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

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SITE COPY
ACCEPTED
BY SKAGIT COUNTY
07.10.2020

P.N. 3766
C.O. 5040

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT

Skagit PUD — PUBLIC UTILITY DISTRICT

EXISTING PUMP STATION GRAPHICS

ENGINEER: DWD
REVIEWED: JMC
DRAWN: SPUD
CHECKED: JMC
SAVE DATE: Apr 3, 2020
PLOT DATE: Apr 10, 2020
FILENAME: RWPS-D-ARCH01.DWG
JOB NO.: 117.025

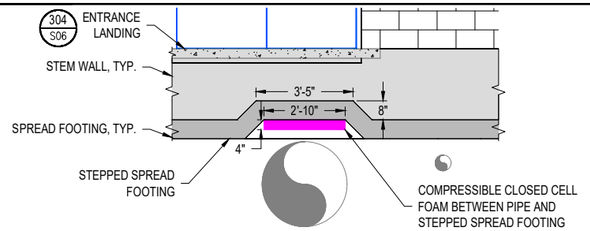
REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW

SCALE: SHOWN
2" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

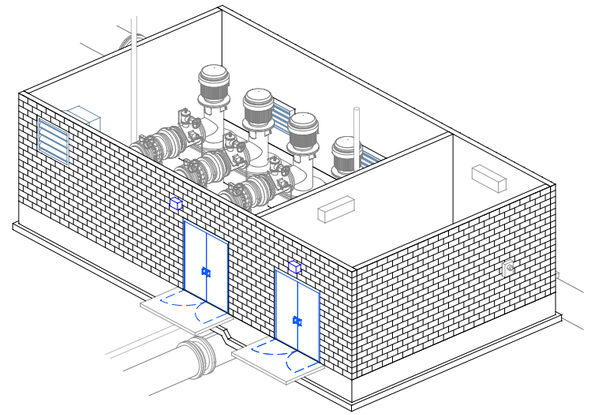
DWG NO.: A02
SHEET NO.: 9 37

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020



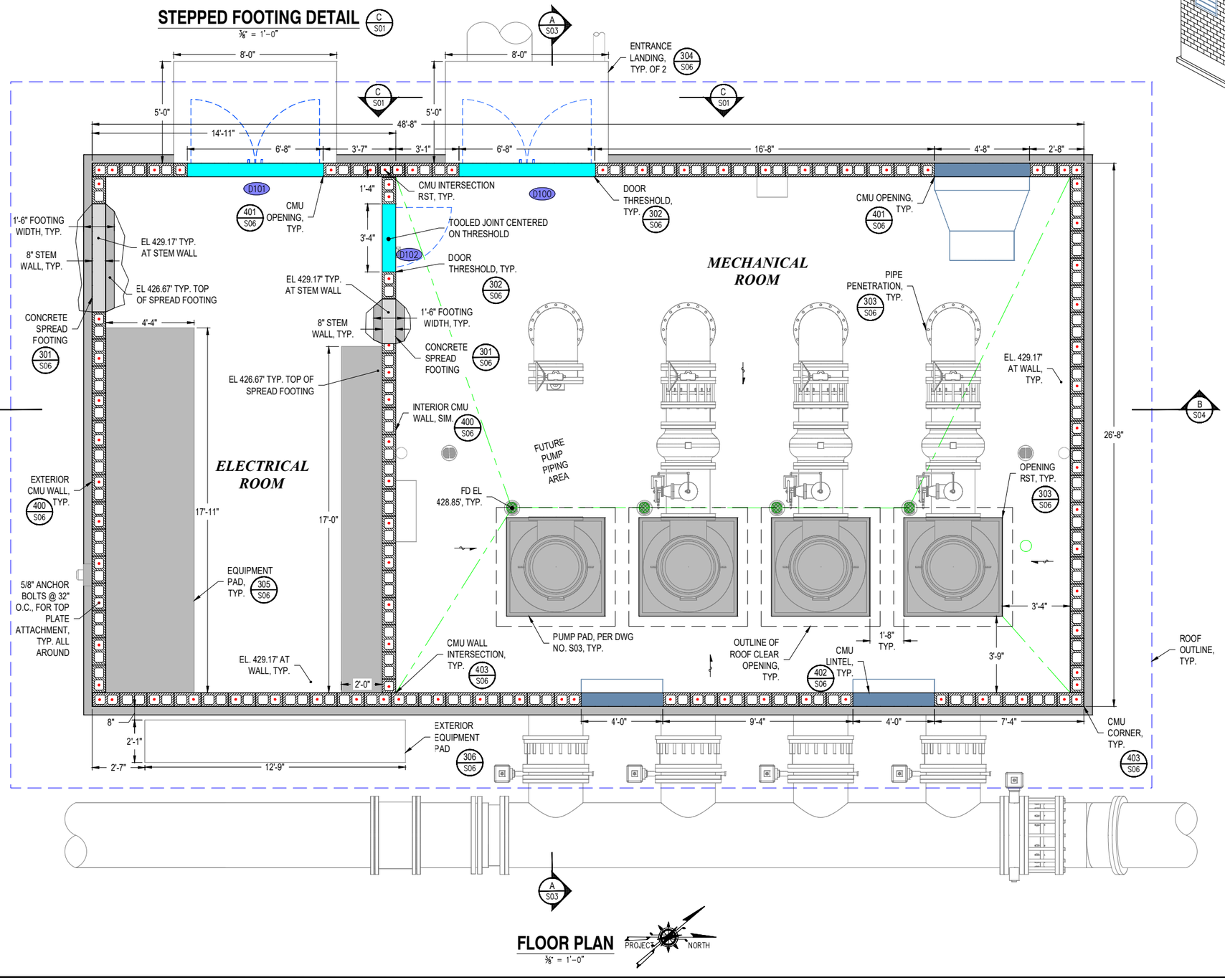
STEPPED FOOTING DETAIL C S01

3/8" = 1'-0"



OBLIQUE

NOT TO SCALE



FLOOR PLAN

3/8" = 1'-0"

PROJECT NORTH

NOTES:

1) SEE MECHANICAL, PLUMBING, AND ELECTRICAL PLANS FOR ADDITIONAL UNDER/IN SLAB PIPING AND CONDUIT.

2) SEE DWG NO. A01 FOR DOOR SCHEDULE.

3) SEE 300 S05 FOR GENERAL STRUCTURAL NOTES.

4) SEE MECHANICAL DRAWINGS FOR PIPE AND PENETRATION LOCATIONS.

COLOR LEGEND

- SPREAD FOOTING
- STEM WALL
- EQUIPMENT PAD
- LOUVER
- DOOR
- HATCH OPENING OUTLINE
- ROOF OUTLINE
- FLOOR RIDGE/VALLEY
- CMU BLOCK

BP20-0302
SITE COPY
ACCEPTED
BY SKAGIT COUNTY
07.10.2020

P.N. 3766
C.O. 5040

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 22875 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

JON MARSHALL CONRAD — STATE OF WASHINGTON — 44672 — STRUCTURAL ENGINEER — PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT
FACILITY FLOOR PLAN

Skagit PUD — PUBLIC UTILITY DISTRICT

ENGINEER: DND	JOB NO.: 117.025
REVIEWED: JMC	CLIENT: SPUD
DATE: Apr 10, 2020	FILENAME: RWPS-D-STR01.DWG
PLOT DATE: Apr 10, 2020	

REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW

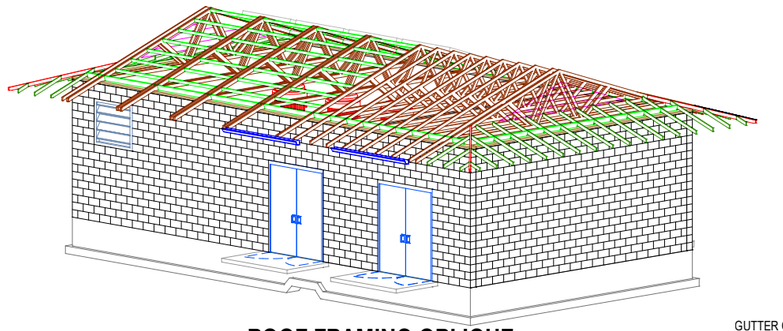
SCALE: SHOWN

3" 1' 2"

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: S01
SHEET NO.: 10 37

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020



ROOF FRAMING OBLIQUE

NOT TO SCALE

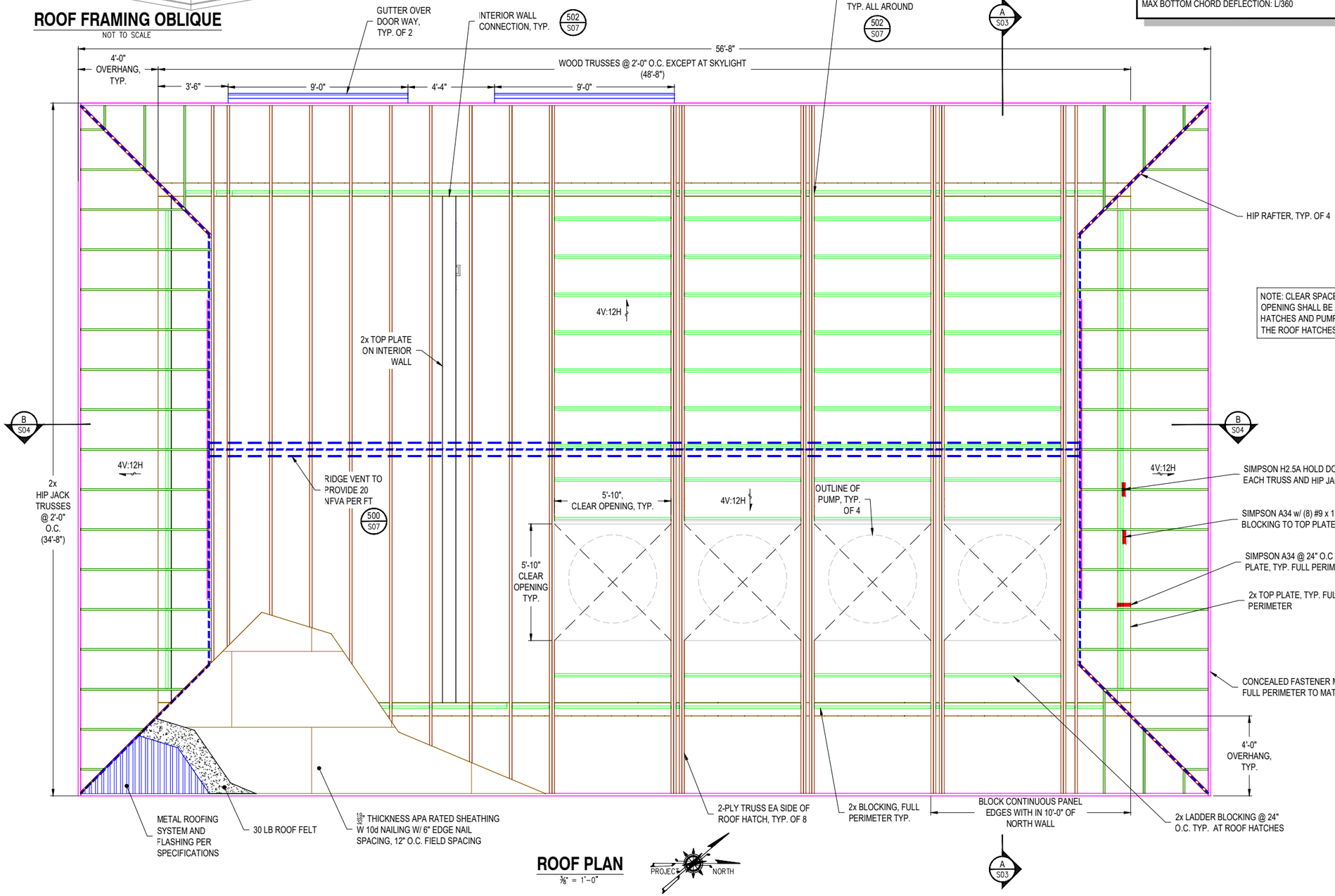
NOTE:

- ALL-FASTENERS INTO PRESSURE TREATED WOOD SHALL BE HOT-DIP GALVANIZED.
- ALL CONNECTORS IN CONTACT WITH PRESSURE TREATED WOOD SHALL BE HOT-DIP GALVANIZED.

TRUSS NOTES

PREFABRICATED CONNECTOR PLATE WOOD ROOF TRUSSES AND OTHER FRAMING SHALL BE DESIGNED BY THE MANUFACTURER IN ACCORDANCE WITH ANSI/TPI 1-1995 FOR THE SPANS AND CONDITIONS SHOWN ON THE DRAWINGS.

LOADING SHALL BE AS FOLLOWS:
ROOF DEAD LOAD:
TOTAL DEAD LOAD = 12 PSF, INCLUDES:
ROOFING: 1.5 PSF
SHEATHING: 2.0 PSF
TRUSSES: 2.0 PSF ASSUMED
INSULATION: 0.5 PSF
(1) LAYER OF 5/8 INCH GYPSUM WALLBOARD: 3.0 PSF
MISCELLANEOUS MECHANICAL: 3.0 PSF.
SNOW LOADS = 25 PSF
MAX BOTTOM CHORD DEFLECTION: L/360



NOTE: CLEAR SPACE FOR ROOF HATCH OPENING SHALL BE 5'-8" MINIMUM FOR HATCHES AND PUMP RETRIEVAL THROUGH THE ROOF HATCHES AND CEILING WALLS.

ROOF PLAN

3/8" = 1'-0"

PROJECT NORTH

BP20-0302
SITE COPY
ACCEPTED
BY SKAGIT COUNTY
07.10.2020

P.N. 3766
C.O. 5040

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 27875 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

JON MARSHALL CONRADI — STATE OF WASHINGTON — 44672 — REGISTERED STRUCTURAL ENGINEER — PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT

FACILITY ROOF PLAN

Skagit PUD — PUBLIC UTILITY DISTRICT

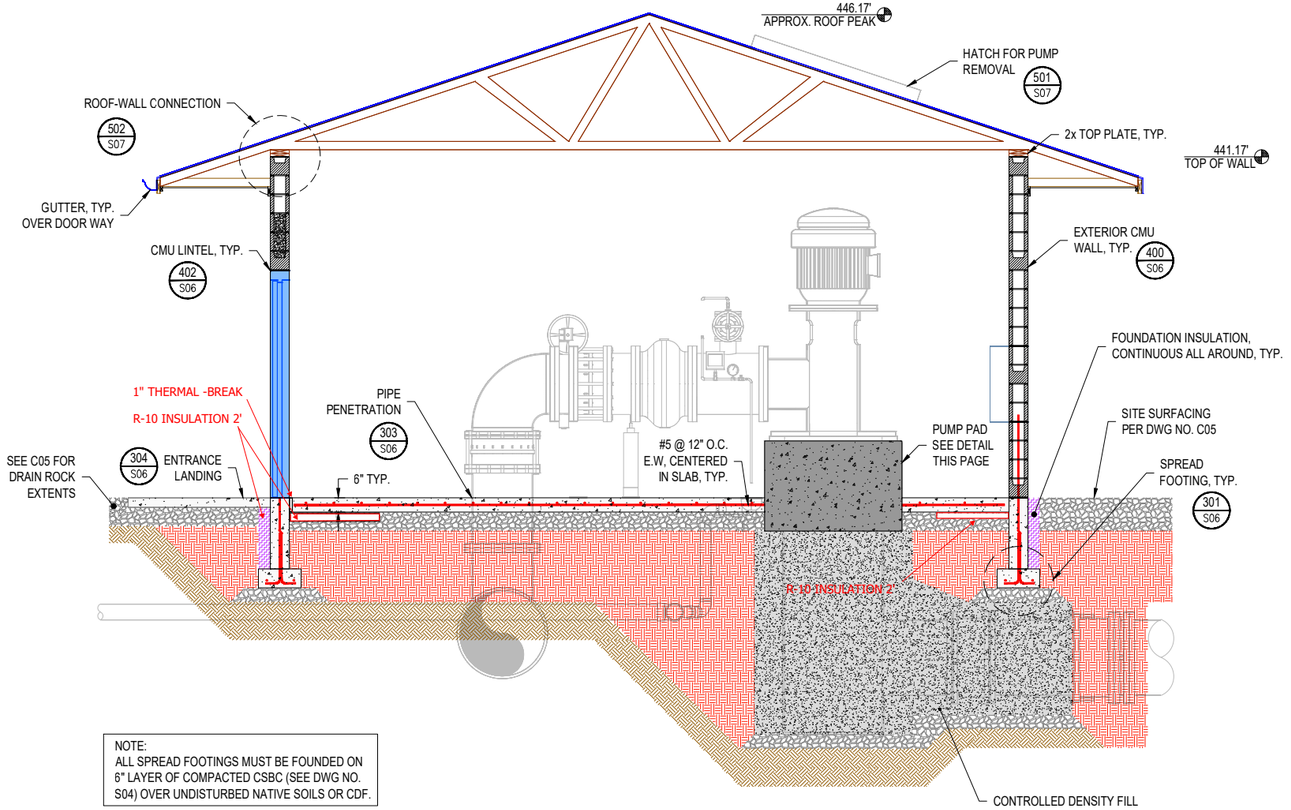
REVISIONS			
NO.	DESCRIPTION	DATE	BY
			REVIEW

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-STR02.DWG
SAVE DATE: Apr 10, 2020
PLOT DATE: Apr 10, 2020
ENGINEER: DMD
REVIEWED: JMC

SCALE: SHOWN
3" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

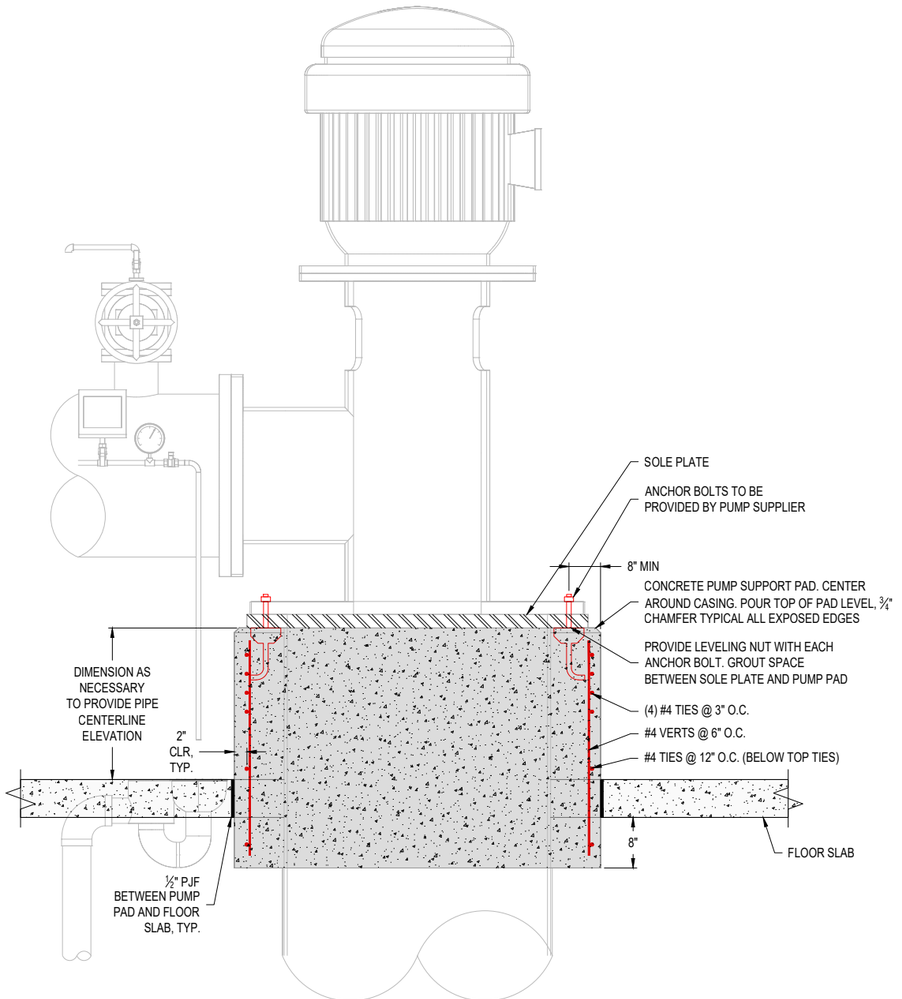
DWG NO.: S02
SHEET NO.: 11 / 37

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020



NOTE:
ALL SPREAD FOOTINGS MUST BE FOUNDED ON 6" LAYER OF COMPACTED CSBC (SEE DWG NO. S04) OVER UNDISTURBED NATIVE SOILS OR CDF.

SECTION
A / S01
⅜" = 1'-0"



PUMP PAD DETAIL SECTION
1" = 1'-0"

BP20-0302
SITE COPY
ACCEPTED
BY SKAGIT COUNTY
07.10.2020

P.N. 3766
C.O. 5040

RH2

RICHARD L. BALLARD
STATE OF WASHINGTON
22878
REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

JON MARSHALL CONNELL
STATE OF WASHINGTON
44672
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION
REPLACEMENT

STRUCTURAL SECTION I

Skagit PUD
PUBLIC UTILITY DISTRICT

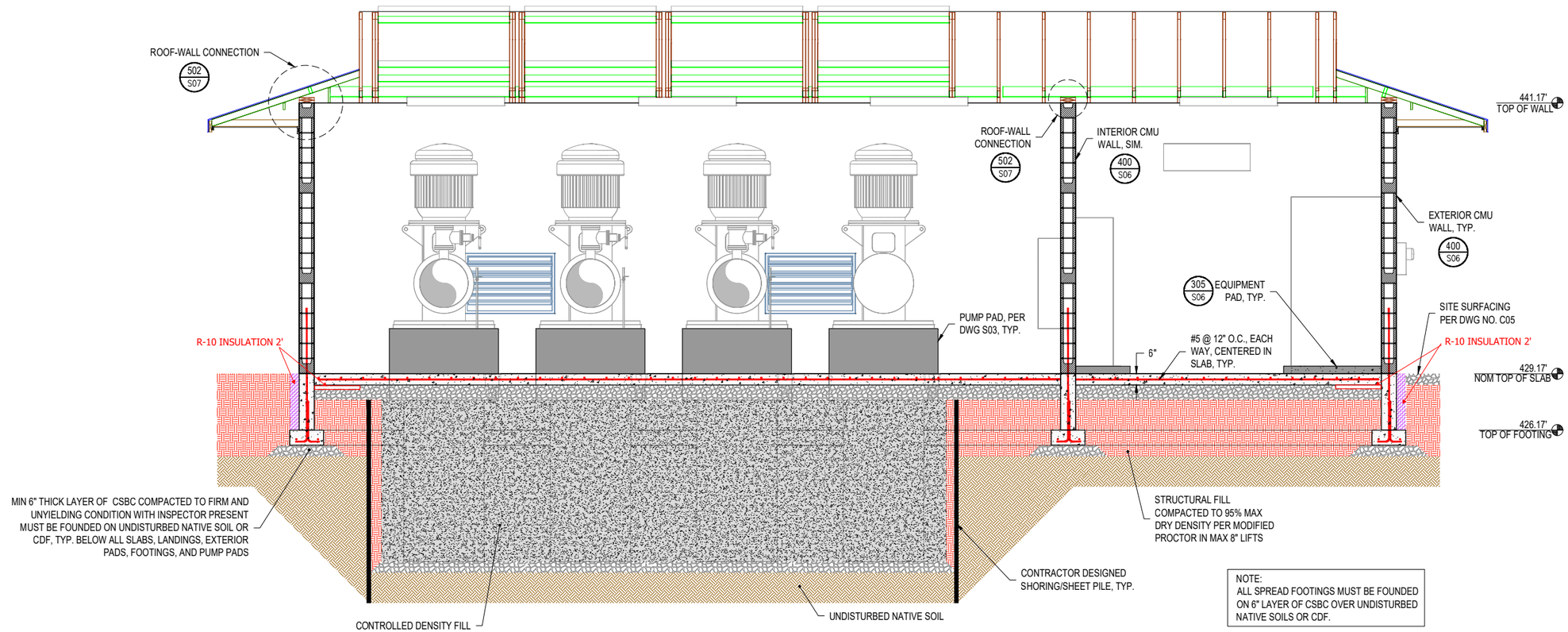
REVISIONS			
NO.	DATE	DESCRIPTION	BY
			REVIEW

CLIENT: SPUD
FILENAME: RWPS-D-STR03.DWG
JOB NO.: 117.025
SAVE DATE: Apr 10, 2020
PLOT DATE: Apr 10, 2020
ENGINEER: DMD
REVIEWED: JMC

SCALE: SHOWN
0" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: S03
SHEET NO.: 12 / 37

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020



NOTE:
ALL SPREAD FOOTINGS MUST BE FOUNDED ON 6" LAYER OF CSBC OVER UNDISTURBED NATIVE SOILS OR CDF.

SECTION B / S01
3/8" = 1'-0"

RICHARD L. BALLARD — STATE OF WASHINGTON — 27875 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

JON MARSHALL CONRAD — STATE OF WASHINGTON — 44672 — STRUCTURAL ENGINEER — PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

RH2

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION
REPLACEMENT

Skagit PUD — PUBLIC UTILITY DISTRICT

STRUCTURAL SECTION II

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-STR04.DWG
SAVE DATE: Feb 20, 2020
PLOT DATE: Apr 10, 2020
ENGINEER: DND
REVIEWED: JMC

REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW

SCALE: SHOWN
2" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: S04
SHEET NO.: 13 / 37

BP20-0302
SITE COPY

ACCEPTED
BY SKAGIT COUNTY
07.10.2020

P.N. 3766
C.O. 5040

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020

GENERAL STRUCTURAL NOTES (300)

GEOTECHNICAL PARAMETERS:

MINIMUM FROST DEPTH	12"
MAXIMUM NET BEARING	1,500 PSF STATIC
SITE SOIL CLASSIFICATION	D
GROUND WATER TABLE	AT GRADE
SOILS REPORT REFERENCE	SKAGIT COUNTY

SEISMIC DESIGN DATA:

SITE LOCATION	LAT 48.470329, LONG 122.190514,
SEISMIC DESIGN CATEGORY	D
RISK CATEGORY	IV ESSENTIAL FACILITY
SPECTRAL RESPONSE ACCELERATIONS	S_{DS} = 0.8g, S_{D1}= 0.464g, S1= 0.357g, Ss= 1.0g
SEISMIC IMPORTANCE FACTOR	Ie = 1.5
SITE CLASS:	D
RESPONSE MODIFICATION FACTORS	IMPULSIVE = 3, CONVECTIVE = 1.5
SEISMIC RESPONSE COEFFICIENT	0.2
RESPONSE MODIFICATION FACTOR	5
SEISMIC-FORCE RESTRAINING SYSTEM	SPECIAL REINFORCED CMU WALL
FOUNDATION TYPE	CONCRETE SPREAD FOOTING
ROOF TYPE	WOOD SHEATHING WITH METAL ROOFING
DESIGN BASE SHEAR	35,283 LBS
ANALYSIS PROCEDURE USED:	EQUIVALENT LATERAL FORCE

WIND DESIGN DATA:

BASIC WIND SPEED	110 MPH
EXPOSURE	C, ENCLOSED
RISK CATEGORY	IV
INTERNAL PRESSURE COEFFICIENT:	+/- 0.18
COMPONENTS AND CLADDING PRESSURE:	ZONE 2: 54.95 PSF ZONE 3: 74.89 PSF
WIND IMPORTANCE FACTOR	Iw = 1.00
ANALYSIS PROCEDURE USED	ENVELOPE

SNOW DESIGN DATA:

ROOF SNOW LOAD	25 PSF
SNOW EXPOSURE FACTOR Ce:	0.9
IMPORTANCE FACTOR, Is:	1.20
THERMAL FACTOR, Ct:	1.0
DRIFT SURCHARGE, Pd:	N/A
WIDTH OF DRIFTS, W:	N/A
UNIFORM UNBALANCED SNOW LOAD:	30 LBS

OTHER DESIGN VALUES USED:

OCCUPANCY CATEGORY	UTILITY
IBC CONSTRUCTION TYPE	V-B
BUILDING AREA	1965 SF
CONCRETE	4,000 PSI WITH 60,000 PSI REINFORCING
CMU	1,500 PSI WITH 60,000 PSI REINFORCING
STEEL	A36 FOR PLATES, A992 FOR OTHER
TIMBER	HEM FIR STUD GRADE OR BETTER AND PER TRUSS MANUFACTURER

LIVE LOADS:

ROOF	20 PSF

CRITERIA:

1. ALL MATERIALS, WORKMANSHIP, DESIGN, AND CONSTRUCTION SHALL CONFORM TO THE DRAWINGS, SPECIFICATIONS, ASCE 7-16, AND IBC 2015.
2. ALL SHOP DRAWINGS AND STRUCTURAL CALCULATIONS SHALL BE STAMPED BY A PROFESSIONAL ENGINEERING LICENSED IN WASHINGTON STATE.

GENERAL:

LINES SHOWN ON DRAWINGS MAY BE ASSOCIATED WITH CAD MODELING AND MAY NOT REPRESENT REQUIRED OR ALLOWED JOINTS. SEE DETAILS FOR CLARIFICATION ON REQUIRED AND ALLOWED JOINTS.
ALL FASTENERS INSTALLED IN TREATED LUMBER SHALL BE HOT-DIPPED GALVANIZED.

SPECIAL INSPECTIONS, TESTS, AND OBSERVATIONS:

PROVIDE VERIFICATION OF APPROVED SHOP IF AN APPROVED SHOP IS USED.
SPECIAL INSPECTIONS AND TESTS SHALL INCLUDE THE FOLLOWING. REFER TO IBC SECTION 1704, 1705, 1707, 1708, AND 1709 FOR DETAILS.

1. SPECIAL INSPECTIONS BY THE GEOTECHNICAL ENGINEER INCLUDING:
   1.1. SITE EXCAVATION AND GRADING: PERIODIC
   1.2. PLACEMENT OF STRUCTURAL FILL AND SOIL COMPACTION: PERIODIC
   1.3. VERIFICATION OF SOIL-BEARING CAPACITY: PERIODIC
2. CONCRETE PLACEMENT AT CONCRETE CONSTRUCTION: CONTINUOUS, SEE ALSO SECTION 1705.3
3. REINFORCEMENT AT CONCRETE CONSTRUCTION: PERIODIC, SEE ALSO SECTION 1705.3.
4. MASONRY CONSTRUCTION, INCLUDING PLACEMENT OF MASONRY UNITS, MORTAR REINFORCEMENT AND STRUCTURAL CONNECTIONS: PERIODIC, SEE ALSO SECTION 1705.4.
5. GROUT PLACEMENT AT MASONRY CONSTRUCTION: CONTINUOUS, SEE ALSO SECTION 1704.5.3.
6. WOOD-FRAMED LATERAL-FORCE RESISTING SYSTEM: PERIODIC, SEE ALSO SECTION 1705.5
7. TESTING OF CONCRETE FOR SPECIFIED COMPRESSIVE STRENGTH (FC), AIR CONTENT AND SLUMP. SEE ALSO TABLE/SECTION 1704.4.
8. VERIFICATION OF SPECIFIED COMPRESSIVE STRENGTH (FM) OF MASONRY PRIOR TO CONSTRUCTION AND EVERY 5,000 SQUARE FEET DURING CONSTRUCTION. SEE ALSO TABLE 1708.1.4.
9. STRUCTURAL OBSERVATION BY A REGISTERED DESIGN PROFESSIONAL IN ACCORDANCE WITH SECTION 1709 AND 1704 SHALL BE PROVIDED.
10. SPECIAL INSPECTION OF EPOXY GROUTING / ANCHORAGE REQUIRED.
11. SPECIAL INSPECTION OF WELDING / BOLTING REQUIRED UNLESS PERFORMED AT AN APPROVED SHOP.

REINFORCED CONCRETE:

1. REINFORCING STEEL SHALL BE DETAILED (INCLUDING HOOKS AND BENDS) IN ACCORDANCE WITH ACI 315-99 AND 318-14. LAP ALL REINFORCEMENTS IN ACCORDANCE WITH THE "REINFORCING SPLICE AND DEVELOPMENT LENGTH SCHEDULE" - SEE THIS SHEET. LAP ADJACENT MATS OF WELDED WIRE FABRIC A MINIMUM OF 8" AT SIDES AND ENDS.
2. NO BARS PARTIALLY EMBEDDED IN HARDENED CONCRETE SHALL BE FIELD BENT UNLESS SPECIFICALLY DETAILED OR APPROVED BY THE STRUCTURAL ENGINEER.
3. CONCRETE PROTECTION FOR REINFORCING STEEL SHALL BE AS FOLLOWS, UNLESS OTHERWISE NOTED:
   3.1. FOOTINGS AND OTHER UNIFORMED SURFACES CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH . . . . . 3"
   3.2. FORMED SURFACES EXPOSED TO EARTH (WALLS BELOW GRADE), WATER OR WEATHER (#6 BARS OR LARGER) . . . . . 2"
   3.3. SLABS AND INTERIOR FACES . . . . . 2"

DEFERRED SUBMITTALS:

THE FOLLOWING ITEMS HAVE BEEN DEFERRED FOR SUBMITTAL TO THE CITY UNTIL AFTER ISSUANCE OF THE BUILDING PERMIT:

- MECHANICAL PIPING SUPPORTS AND LATERAL BRACING
- ANCHORAGE OF ELECTRICAL EQUIPMENT
-TRUSSES

ABBREVIATIONS:

AL - ALUMINUM
CHK - CHECKERED
CL - CENTERLINE
CLR - CLEAR
CSBC - CRUSHED SURFACING BASE COURSE
EA - EACH
EF - EACH FACE
FB - FLAT BAR
HORZ - HORIZONTAL
LLV - LONG LEG VERT
O.C. - ON CENTER
PL - PLATE
PJF - PREMOLDED JOINT FILLER
RB - ROUND BAR
RST - REINF. STEEL
SST - STAINLESS STEEL
T&B - TOP & BOTTOM
VERT - VERTICAL
UNO - UNLESS NOTED OTHERWISE
WWM - WELDED WIRE MESH

REINFORCEMENT SPLICE AND DEVELOPMENT SCHEDULE

	Ld, MINIMUM STRAIGHT DEVELOPMENT LENGTHS			MINIMUM LAP SPLICE LENGTHS	
BAR	MINIMUM	TOP BARS	OTHERWISE	CLASS A	CLASS B
#3	19"	25"	29"	Ld	1.3xLd
#4	24"	32"	36"	Ld	1.3xLd
#5	29"	38"	43"	Ld	1.3xLd
#6	42"	55"	63"	Ld	1.3xLd

"MINIMUM" IF:
MIN COVER OF ONE BAR Ø AND MIN SPACING OF TWO BAR DIAMETERS
MIN COVER ONE Ø, MIN SPACING OF ONE BAR Ø, AND TIES OR STIRRUPS
LESS THAN 12" OF FRESH CONCRETE BELOW HORIZONTAL BARS
"TOP BARS" IF:
MEETS CRITERIA FOR MIN EXCEPT 12" OR MORE FRESH CONC BELOW
"OTHERWISE" IF:
DOES NOT MEET REQUIREMENTS FOR MIN DEVELOPMENT LENGTH
"CLASS A" IF:
ONLY HALF OF BARS LAPPED AT ONE LOCATION AND
TWICE THE REINFORCING FOR TENSION IS PROVIDED
"CLASS B" IF:
LAP SPLICES DO NOT MEET CLASS A REQUIREMENTS

CMU ANCHORS FOR THE USE IN BOTH GROUTED AND UNGROUTED CMU CELLS SHALL BE EITHER HILTI HIT-HY 70 INJECTABLE MORTAR, SIMPSON STRONG-TIE SET-XP ANCHORING ADHESIVE, OR POWERS AC100+ GOLD ADHESIVE ANCHORS.

WHERE SIZE IS CALLED OUT ON THE DRAWINGS, PROVIDE MINIMUM EMBEDMENT DEPTHS AS SHOWN ON THE FOLLOWING TABLES. PROVIDE MINIMUM EDGE DISTANCES AND SPACING AS SHOWN ON THE FOLLOWING TABLES UNLESS SPECIFICALLY DETAILED OTHERWISE.

INSTALL ANCHORS IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

NOTIFY OWNER 48 HOURS IN ADVANCE OF INSTALLATION OF ALL ANCHORS.

WHERE SIZE IS NOT CALLED OUT, ANCHOR SHALL BE SELECTED BASED ON DESIGN LOADS. IF THE MINIMUM EDGE DISTANCE AND/OR MINIMUM SPACING CAN NOT BE ACHIEVED, REFER TO PRODUCT INFORMATION FOR REDUCTION IN ALLOWABLE LOADS.

FORCES ARE DETERMINED BY THE FOLLOWING FORMULA: (Ps / Pt) + (Vs / Vt) = 1

WHERE: Ps = APPLIED SERVICE TENSION LOAD
Pt = ALLOWABLE SERVICE TENSION LOAD
Vs = APPLIED SERVICE SHEAR LOAD
Vt = ALLOWABLE SERVICE SHEAR LOAD

THE ABOVE FORMULA IS FOR THE ALLOWABLE LOADS FOR ANCHORS SUBJECTED TO COMBINED TENSION AND SHEAR.

GROUTED CMU ANCHORS
HILTI HIT-HY 70, SIMPSON STRONG-TIE SET-XP & POWERS AC100+ GOLD

DIA. OF ROD (INCHES) OR REBAR SIZE NO.	MIN. EDGE DISTANCE (INCHES)	MIN. EMBEDMENT (INCHES)	MIN. ANCHOR SPACING (INCHES)	ALLOWABLE LOAD BASED ON BOND STRENGTH (POUNDS)	
				TENSION	SHEAR
3/8	12	3-3/8	(1) PER CELL	1,000	845
1/2	12	4-1/2	(1) PER CELL	1,000	1,470
5/8	12	5-5/8	(1) PER CELL	1,140	1,595
3/4	12	6-3/4	(1) PER CELL	1,200	1,625
#3	12	3-3/8	(1) PER CELL	1,000	850
#4	12	4-1/2	(1) PER CELL	1,000	1,355
#5	12	5-5/8	(1) PER CELL	1,140	1,355

UNGROUTED CMU ANCHORS
HILTI HIT-HY 70, SIMPSON STRONG-TIE SET-XP & POWERS AC100+ GOLD

DIA. OF ROD (INCHES) OR REBAR SIZE NO.	MIN. EDGE DISTANCE (INCHES)	MIN. EMBEDMENT (INCHES)	MIN. ANCHOR SPACING (INCHES)	ALLOWABLE LOAD BASED ON BOND STRENGTH (POUNDS)	
				TENSION	SHEAR
3/8	12	3	(1) PER CELL	280	265
1/2	12	3	(1) PER CELL	280	265
5/8	12	3	(1) PER CELL	280	265
3/4	12	3	(1) PER CELL	280	265
#3	12	3	(1) PER CELL	280	265
#4	12	3	**(1) PER CELL**	280	265
#5	12	3	(1) PER CELL	280	265

CMU ANCHOR (301)

CONCRETE ANCHORS SHALL BE EITHER HILTI HIT-RE 500-V3 INJECTABLE MORTAR, SIMPSON STRONG-TIE SET-XP ANCHORING ADHESIVE, OR POWERS PE1000+ ADHESIVE ANCHORS AS SPECIFIED. WHERE SIZE IS CALLED OUT ON THE DRAWINGS, PROVIDE MINIMUM EMBEDMENT DEPTHS AS SHOWN ON THE FOLLOWING TABLES. PROVIDE MINIMUM EDGE DISTANCES AND SPACING AS SHOWN ON THE FOLLOWING TABLES UNLESS SPECIFICALLY DETAILED OTHERWISE. SPECIAL INSPECTION REQUIRED.

INSTALL ANCHORS IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

NOTIFY OWNER 48 HOURS IN ADVANCE OF INSTALLATION OF ALL ANCHORS.

WHERE SIZE IS NOT CALLED OUT, ANCHOR SHALL BE SELECTED BASED ON DESIGN LOADS.IF THE MINIMUM EDGE DISTANCE AND/OR MINIMUM SPACING CAN NOT BE ACHIEVED, REFER TO PRODUCT INFORMATION FOR REDUCTION IN ALLOWABLE LOADS.

CONCRETE ANCHORS
HILTI HIT-RE 500-V3, SIMPSON STRONG-TIE SET-XP & POWERS PE1000+

DIA. OF ROD (INCHES) OR REBAR SIZE NO.	MIN. EDGE DISTANCE (INCHES)	MIN. EMBEDMENT (INCHES)	MIN. ANCHOR SPACING (INCHES)	ALLOWABLE LOAD BASED ON BOND STRENGTH (POUNDS)	
				TENSION	SHEAR
1/2	2-1/2	2-3/4	2-1/2	1,027	2,210
5/8	3-1/8	3-1/8	3-1/8	1,312	2,827
3/4	3-3/4	3-1/2	3-3/4	1,556	3,351
7/8	4-3/8	3-1/2	4-3/8	1,556	3,351
#4	2-1/2	4-1/2	2-1/2	1,520	3,618
#5	3-1/8	5-5/8	3-1/8	1,775	5,494
#6	3-3/4	6-3/4	3-3/4	2,225	7,570
#7	4-3/8	7-7/8	4-3/8	2,440	9,428
#8	5	9	5	4,520	11,507

CONCRETE ANCHOR (302)

STATEMENT OF SPECIAL INSPECTION

SPECIAL INSPECTIONS IN ACCORDANCE WITH IBC 1704 SHALL BE PROVIDED BY THE OWNER FOR THE FOLLOWING ITEMS:

REQUIRED SPECIAL INSPECTIONS

SYSTEM OR MATERIAL	INSPECTION			
	IBC CODE REFERENCE	CODE OR STANDARD REFERENCE	FREQUENCY	
			CONTINUOUS	PERIODIC
SOILS				
VERIFY FOOTING BEARING CAPACITY AND SUBGRADE PREPARATION FOR FILLS	1705.3 1705.6	COUNTY STANDARDS		X(a)
FILL MATERIAL VERIFICATION			X(a)	
FILL PLACEMENT AND COMPACTION			X(a)	
LIFT THICKNESS			X(a)	
CONCRETE				
REINFORCING STEEL	1704.4 1907.5	ACI 318 1.3.2.C ACI 318 7.5		X
ANCHORAGE TO CONCRETE	1704.4 1911.1 1912.1	ACI 318 1.3.2.C	X	
VERIFYING USE OF REQUIRED MIX DESIGN	1704.4 1904 1905	ACI 318 1.3.2.A ACI 318 Ch 4 ACI 318 5.2–5.4		X
CONCRETE PLACEMENT	1704.4 1905.9–10	ACI 318 1.3.2.D ACI 318 5.9–5.10	X	
CONCRETE CURING	1704.4 1905.11	ACI 318 1.3.2.D ACI 318 5.11–5.13		X(a)
VERIFICATION OF CONCRETE STRENGTH	1704.4	ACI 318 18.13.4.3		X(a)
VERIFICATION OF FORMWORK	1704.4 1906.1	ACI 318 6.1.1		X(a)
WOOD				
VERIFY DIAPHRAGM – SHEATHING MATERIAL GRADE	1705.5			X
CMU				
GROUT PLACEMENT	1705.4.1			X
REINFORCING STEEL	1705.4.1			X
CMU PLACEMENT	1705.4.1			X

(a) PERIODIC INSPECTION AS REQUIRED BY CODE OR THE PROJECT SPECIFICATIONS

TESTING:

MATERIALS TESTING IN ACCORDANCE WITH IBC 1704 SHALL BE PROVIDED FOR THE FOLLOWING ITEMS:

REQUIRED TESTING FOR SPECIAL INSPECTIONS

SYSTEM OR MATERIAL	INSPECTION			
	IBC CODE REFERENCE	CODE OR STANDARD REFERENCE	FREQUENCY	
			CONTINUOUS	PERIODIC
SOILS				
FILL IN PLACE DENSITY OR PREPARED SUBGRADE DENSITY	1704.7	GEOTECHNICAL REPORT; IBC APX J107.5	X(a)	
MATERIAL VERIFICATION				X(a)
CONCRETE				
CONCRETE STRENGTH	1704.4 1905.6	ASTM C39	EACH 50 CY OF WALL PLACED EACH DAY	
CONCRETE SLUMP		ASTM C143		
CONCRETE AIR CONTENT		ASTM C231		
CONCRETE TEMPERATURE		ASTM C1064		

(a) PERIODIC TESTING AS REQUIRED BY CODE OR THE PROJECT SPECIFICATIONS

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RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 22875 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

JON MARSHALL CONRADI — STATE OF WASHINGTON — 44672 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT
Skagit PUD — PUBLIC UTILITY DISTRICT

STANDARD STRUCTURAL DETAILS I

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-STR05.DWG
DATE: Apr 10, 2020
PLOT DATE: Apr 10, 2020
DESIGNED: DND
REVIEWED: JMC

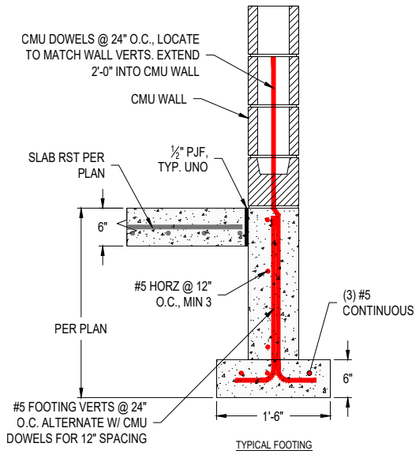
REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW

SCALE: SHOWN
2" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: S05
SHEET NO.: 14 / 37

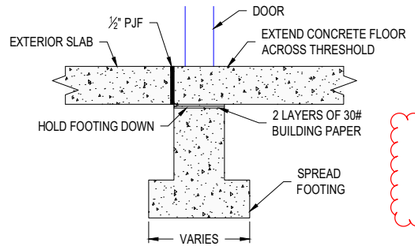
THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020



SPREAD FOOTING
NOT TO SCALE
301 TYP

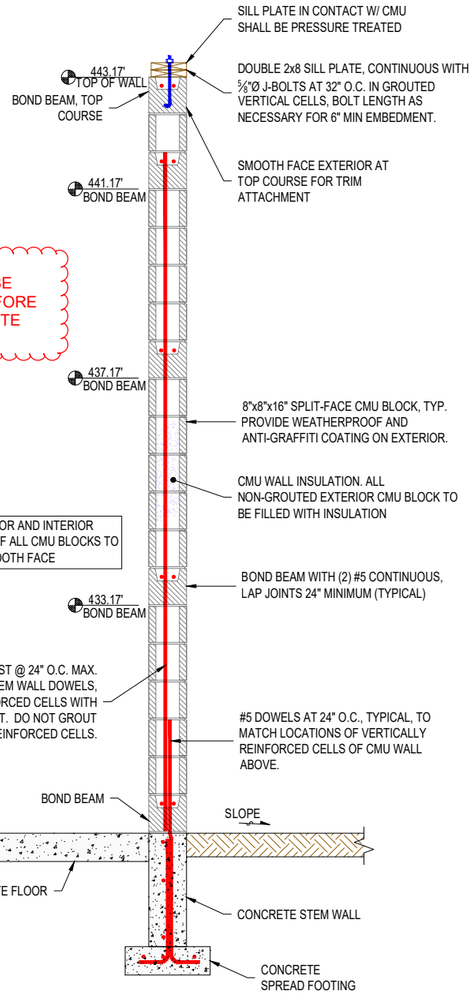
Vertical Hook-rebar steel to be tied in place at time of footing inspection

Foundation anchorage in Seismic Zone D
403.1.6.1
1. Post to footings shall be positively connected
2. Interior brace walls shall have anchor bolts space no more than 6 ' O.C and 12" from ends.
3. Buildings over 2 stories anchor bolts spacing 4'

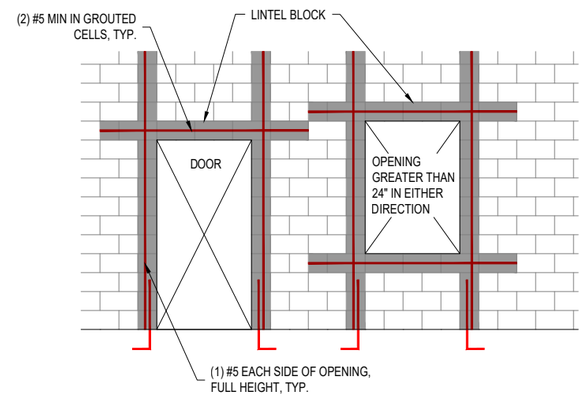


DOOR THRESHOLD
1" = 1'-0"
302 TYP

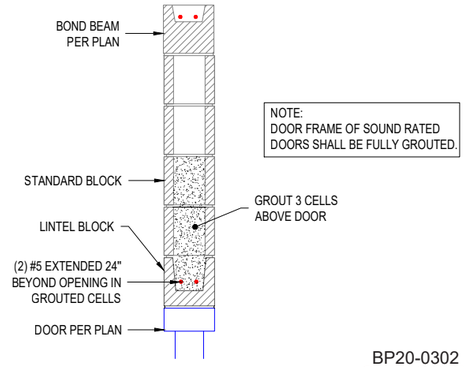
BOND BEAM TO BE INSPECTECTED BEFORE CASTING CONCRETE



EXTERIOR CMU WALL
NOT TO SCALE
400 TYP.



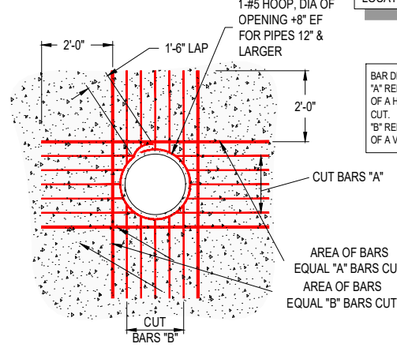
TYPICAL CMU OPENING
NOT TO SCALE
401 TYP.



CMU LINTEL
1" = 1'-0"
402 TYP.

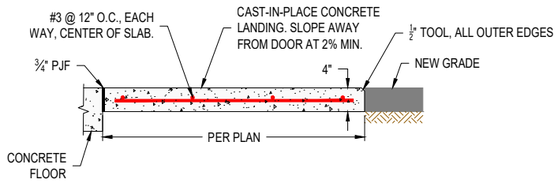
NOTE: NOT ALL PENETRATIONS ARE SHOWN ON STRUCTURAL PLANS.

NOTE: THIS DETAIL USED FOR SINGLE PENETRATIONS 4" IN DIAMETER AND LARGER, AND IN EQUIVALENT GROUPS OF SMALLER DIAMETER PENETRATIONS. REFER TO MECHANICAL PLANS FOR SIZE AND LOCATION OF PIPE PENETRATIONS.



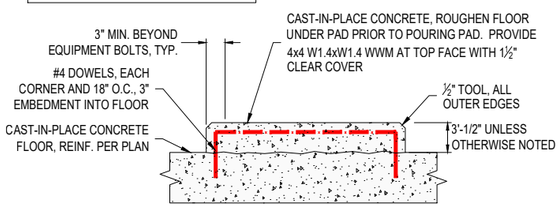
BAR DESIGNATION NOTES:
"A" REFERS TO CROSS-SECTIONAL AREA OF A HORIZONTAL BAR THAT HAS BEEN CUT.
"B" REFERS TO CROSS-SECTIONAL AREA OF A VERTICAL BAR THAT HAS BEEN CUT.

PENETRATION AND OPENING REINFORCEMENT
NOT TO SCALE
303 TYP

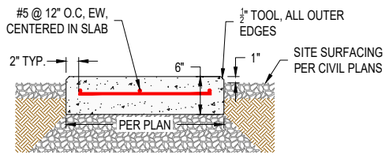


TYPICAL ENTRANCE LANDING DETAIL
NOT TO SCALE
304 TYP

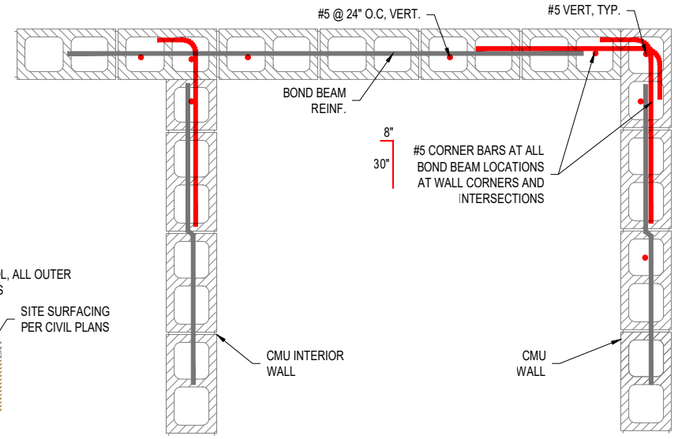
NOTE: SEE MECHANICAL DRAWINGS FOR EQUIPMENT LOCATION AND DIMENSIONS.



EQUIPMENT PAD
1" = 1'-0"
305 TYP



EXTERIOR EQUIPMENT PAD
1" = 1'-0"
306 TYP



CMU WALL INTERSECTION / CORNER
1" = 1'-0"
403 TYP.

BP20-0302
SITE COPY
ACCEPTED
BY SKAGIT COUNTY
07.10.2020

RH2

RICHARD L. BALLARD
STATE OF WASHINGTON
22878
REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

RON MARSHALL CONNELL
STATE OF WASHINGTON
44672
REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT

STANDARD STRUCTURAL DETAILS II

Skagit PUD — PUBLIC UTILITY DISTRICT

JOB NO.:	117.025
CLIENT:	SPUD
FILENAME:	RWPS-D-STR06.DWG
ISSUE DATE:	Apr 10, 2020
PLOT DATE:	Apr 10, 2020
ENGINEER:	DND
REVIEWED:	JMC

REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW

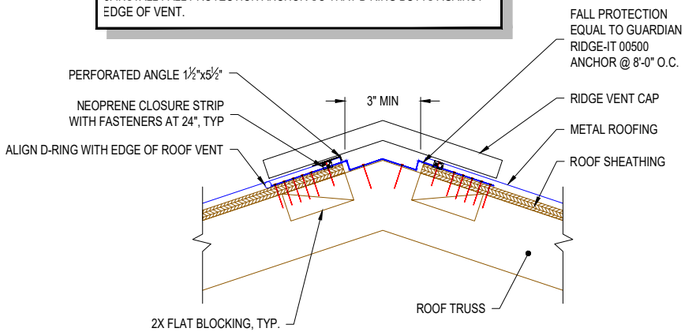
SCALE: SHOWN
2" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

P.N. 3766
C.O. 5040

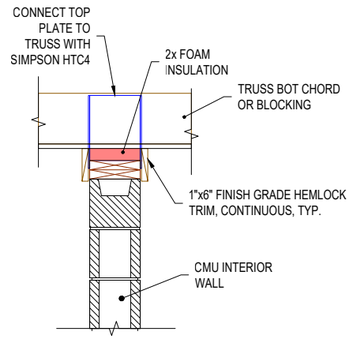
DWG NO.: S06
SHEET NO.: 15 / 37

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020

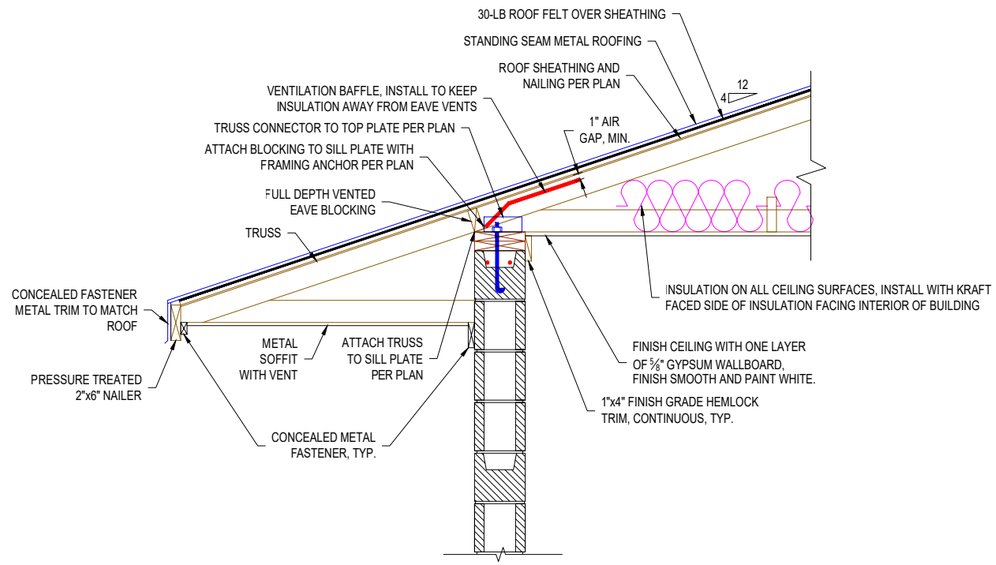
RIDGE VENT NOTES:
1. INSTALL FALL PROTECTION AT ROOF PEAK OVER METAL ROOFING AND FASTEN TO TRUSS WITH 16d NAILS PER MFR RECOMMENDATIONS PRIOR TO INSTALLATION OF RIDGE VENT.
2. PROVIDE END CAPS FOR RIDGE VENT PER MANUFACTURER'S SPECIFICATIONS.
3. INSTALL FALL PROTECTION ANCHOR SO THAT D RING BUTTS AGAINST EDGE OF VENT.



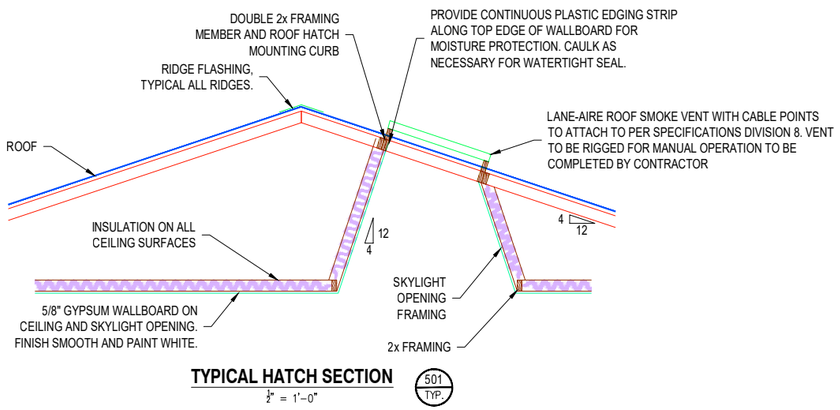
RIDGE VENT DETAIL
NOT TO SCALE — 500 TYP.



(INTERIOR WALL)



(EXTERIOR WALL)



TYPICAL HATCH SECTION
½" = 1'–0" — 501 TYP.

CMU WALL/TRUSS CONNECTIONS
1" = 1'–0" — 502 TYP.

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 12878 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

JON MARSHALL CONRAD — STATE OF WASHINGTON — 44672 — STRUCTURAL ENGINEER — PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT

Skagit PUD — PUBLIC UTILITY DISTRICT

STANDARD STRUCTURAL DETAILS III

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-STR06.DWG
SAVE DATE: Apr 10, 2020
PLOT DATE: Apr 10, 2020
ENGINEER: DMD
REVIEWED: JMC

REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW

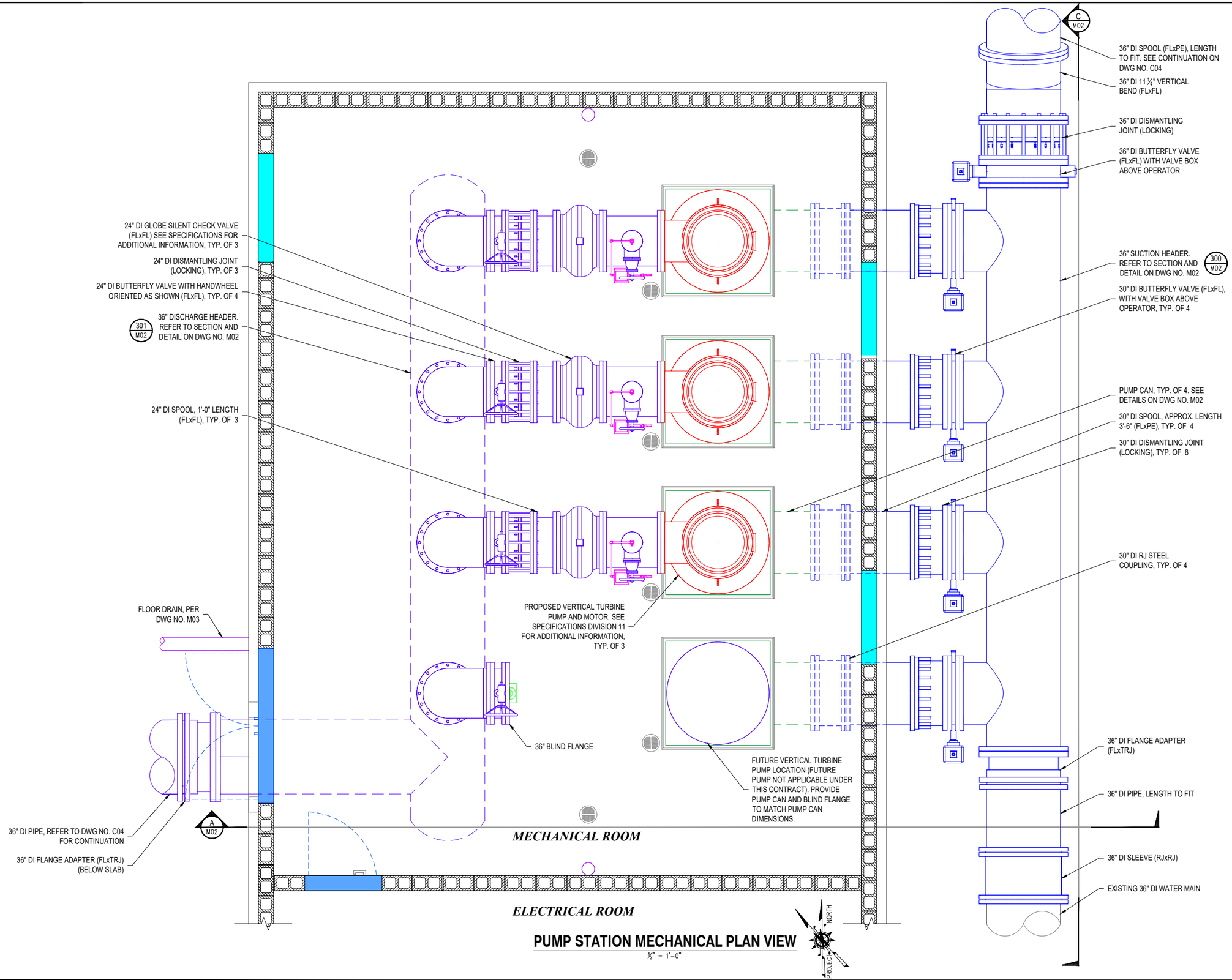
SCALE: SHOWN
½" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: S07
SHEET NO.: 16 / 37

BP20-0302
SITE COPY
ACCEPTED
BY SKAGIT COUNTY
07.10.2020

P.N. 3766
C.O. 5040

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020



PUMP STATION MECHANICAL PLAN VIEW

½" = 1'-0"

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 12878 — REGISTERED PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

DANIEL W. BURNETT — STATE OF WASHINGTON — 38306 — REGISTERED PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY

JUDY RAW WATER PUMP STATION REPLACEMENT

Skagit PUD — PUBLIC UTILITY DISTRICT

MAJOR MECHANICAL PLAN

REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-MEC01.DWG
SAVE DATE: Apr 9, 2020
PLOT DATE: Apr 9, 2020
ENGINEER: OMP
REVIEWED: DWB

SCALE: SHOWN

2" 1" 2"

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

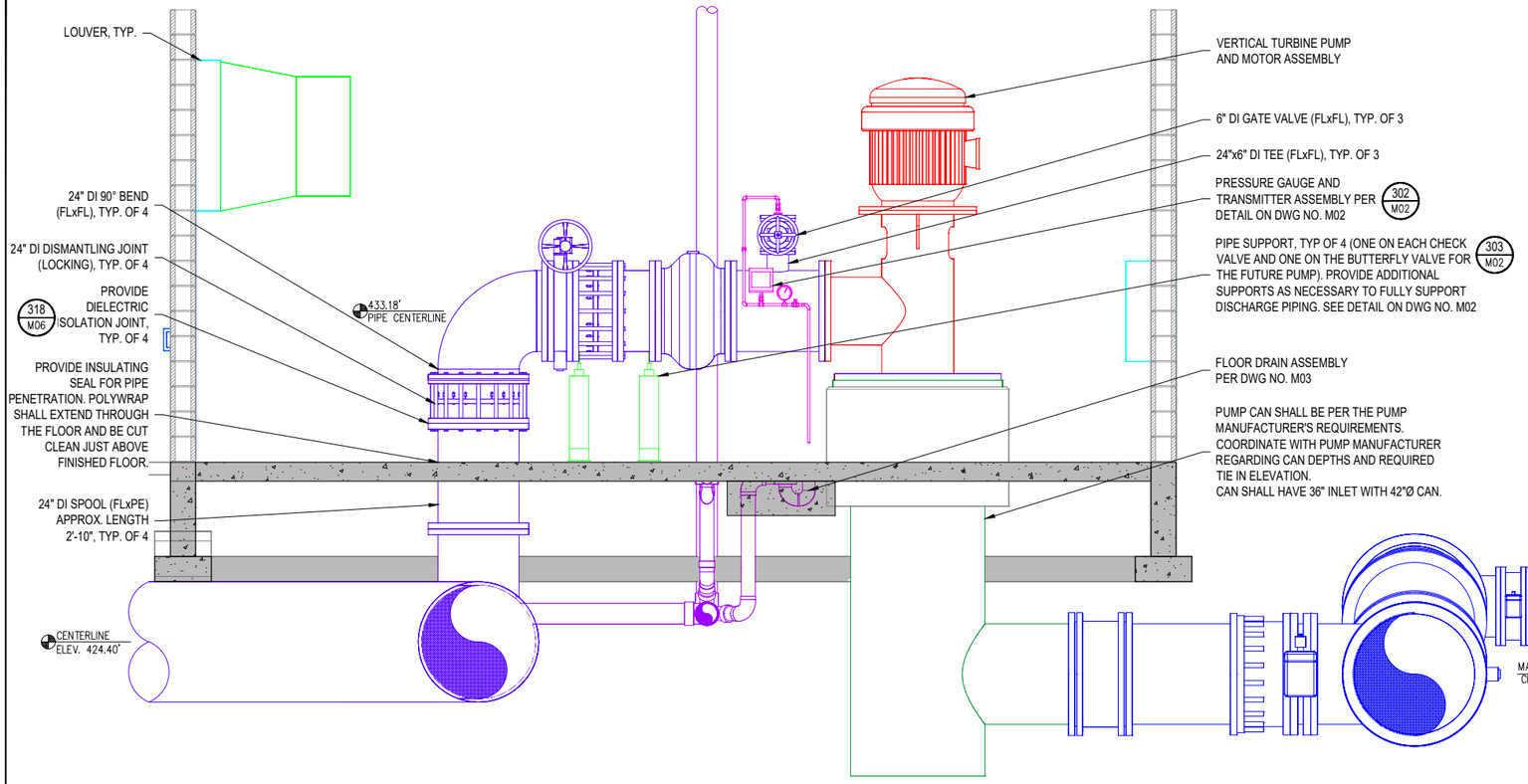
DWG NO.: M01
SHEET NO.: 17 / 37

BP20-0302
SITE COPY

ACCEPTED
BY SKAGIT COUNTY
07.10.2020

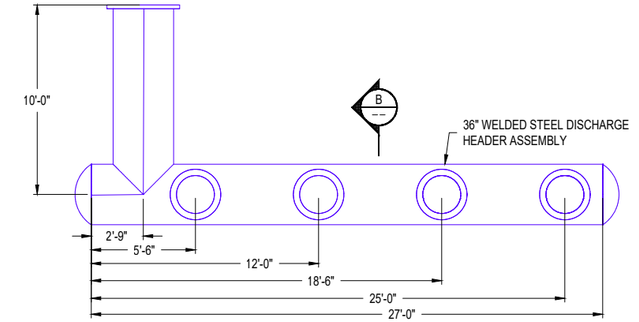
P.N. 3766
C.O. 5040

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020



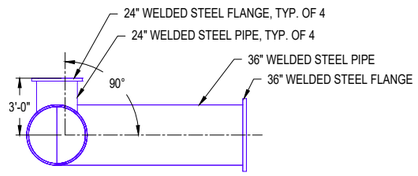
A M01 **MAJOR MECHANICAL SECTION**

½" = 1'–0"



PLAN VIEW

SUCTION AND DISCHARGE HEADER NOTES:
- BOLT PATTERNS FOR ALL STEEL FLANGES SHALL MATCH ADJACENT FITTINGS.
- REFER TO DIVISION 9 OF THE SPECIFICATIONS FOR COATING REQUIREMENTS.

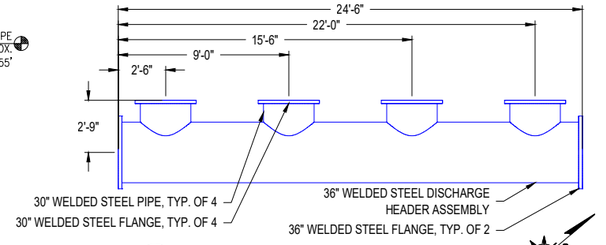


B *SECTION VIEW*

301 M01 **DISCHARGE HEADER DETAIL**

¼" = 1'–0"

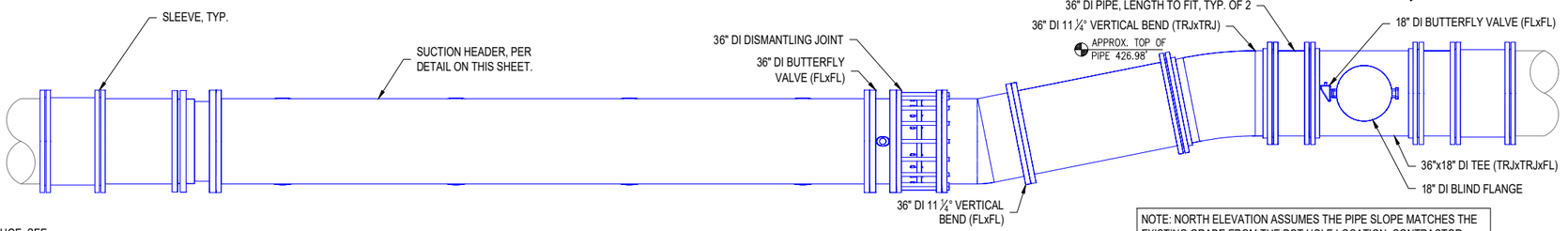
PROJECT NORTH



300 M01 **SUCTION HEADER DETAIL**

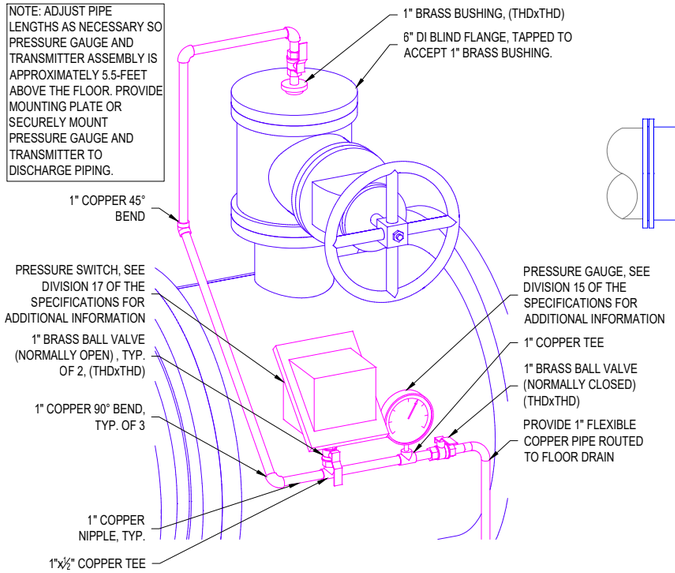
¼" = 1'–0"

PROJECT NORTH



NOTE: NORTH ELEVATION ASSUMES THE PIPE SLOPE MATCHES THE EXISTING GRADE FROM THE POT HOLE LOCATION. CONTRACTOR SHALL FIELD VERIFY PRIOR TO NOTIFYING DISTRICT OF CONNECTION.

NOTE: ADJUST PIPE LENGTHS AS NECESSARY SO PRESSURE GAUGE AND TRANSMITTER ASSEMBLY IS APPROXIMATELY 5.5-FEET ABOVE THE FLOOR. PROVIDE MOUNTING PLATE OR SECURELY MOUNT PRESSURE GAUGE AND TRANSMITTER TO DISCHARGE PIPING.



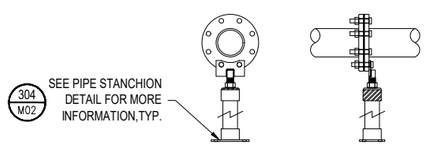
302 M02 **PRESSURE GAUGE AND TRANSMITTER ASSEMBLY**

NOT TO SCALE

C M01 **SUCTION HEADER PROFILE**

⅜" = 1'–0"

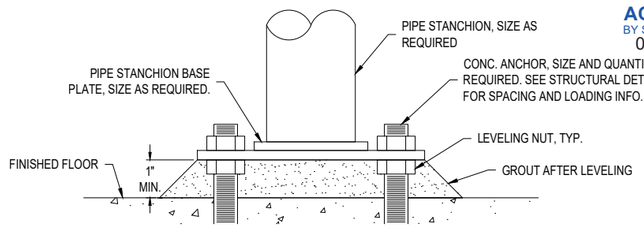
NOTES:
- CONTRACTOR SHALL PROVIDE SUPPORTS AS NEEDED TO SECURE PIPING SYSTEM IN NORMAL AND TEST OPERATING CONDITIONS.
- SADDLE AND SADDLE CLAMP SUPPORTS SHALL BE "STANDON" BRAND AS MANUFACTURED BY MATERIAL RESOURCES OR EQUAL.



TYPE A - FLANGE SUPPORT

303 M02 **STANDON PIPE SUPPORT**

NOT TO SCALE



304 M02 **PIPE STANCHION DETAIL**

NOT TO SCALE

BP20-0302
SITE COPY
ACCEPTED
BY SKAGIT COUNTY
07.10.2020

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 22875 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

DANIEL W. DUNWIDDIE — STATE OF WASHINGTON — 38306 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT
Skagit PUD PUBLIC UTILITY DISTRICT

MECHANICAL SECTIONS & DETAILS

JOB NO.: 117.025
CLERK: SPUD
FILENAME: RWPS-D-MEC02.DWG
DATE: Apr 9, 2020
PLOT DATE: Apr 9, 2020
ENGINEER: OMP
REVIEWED: DWB

REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW

SCALE: SHOWN
3" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

P.N. 3766
C.O. 5040

DWG NO.: M02
SHEET NO.: 18 / 37

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020

HEAT PUMP AND AIR CONDITIONER SCHEDULE

NO.	ROOM	INDOOR UNIT MODEL	OUTDOOR UNIT MODEL	RATED COOLING CAPACITY (BTUH)	RATED HEATING CAPACITY (BTUH)	SEER	VOLTAGE/ PHASE	MANUFACTURER
HP-1	ELECTRICAL ROOM	PKA-A36KA7	PUZ-A36NKA7	36,000	22,400	18.8	230V/1	MITSUBISHI
HP-2	ELECTRICAL ROOM	PKA-A36KA7	PUZ-A36NKA7	36,000	22,400	18.8	230V/1	MITSUBISHI
HP-3	ELECTRICAL ROOM	PKA-A24KA7	PUZ-A24NHA7	24,000	15,700	21.4	230V/1	MITSUBISHI

HEAT PUMP AND AIR CONDITIONER NOTES:
1. ROUTE CONDENSATE TO OUTSIDE. CONTRACTOR SHALL PROVIDE CONDENSATE PUMP IF REQUIRED. TERMINATE CONDENSATE PIPE 6" ABOVE FINISHED GRADE IN A MANNER THAT ALLOWS THE WATER TO FLOW AWAY FROM THE BUILDING.
2. MOUNT INSIDE UNITS PER MANUFACTURER RECOMMENDATIONS.
3. RATED HEATING CAPACITY IS AT AN OUTSIDE TEMPERATURE OF 17°F.
4. PLACE OUTDOOR UNITS ON 12" HIGH OUTDOOR UNIT STAND, MOUNTED TO CONCRETE EQUIPMENT PAD.
5. REFER TO INSTALLATION MANUAL FOR MAXIMUM REFRIGERANT PIPE LENGTHS, NUMBER OF ALLOWED BENDS, AND REQUIRED REFRIGERANT CHARGE.
6. FIELD ROUTE REFRIGERANT PIPING BETWEEN INDOOR AND OUTDOOR UNITS. KEEP PIPING STRAIGHT AND PARALLEL WITH SURFACES. DO NOT ROUTE REFRIGERANT PIPING ABOVE ANY ELECTRICAL PANELS.
7. MOUNT BOTTOM OF INDOOR UNITS 9'-0" ABOVE FINISHED FLOOR.
8. OR EQUAL UNITS ALLOWED. UNIT EFFICIENCIES MUST BE 15% GREATER THAN THE MINIMUM EFFICIENCY LISTED IN THE 2015 WSEC.
9. PROVIDE MITSUBISHI ELECTRIC - MIFH1 WIRELESS RECEIVER FOR EACH UNIT. SEE ELECTRICAL SCHEDULE FOR ADDITIONAL INFORMATION.
10. STAGE THE UNITS BY THERMOSTAT SETTING. UNIT HP-1 TO BEGIN COOLING AT 80° F, UNIT HP-2 AND HP-3 TO BEGIN COOLING AT 85° F. ALL SETTINGS SHALL BE ADJUSTABLE.

PLUMBING NOTES:
1. THE WASTE AND WATER PIPING SYSTEM AS SHOWN ON THIS DRAWING IS DIAGRAMMATIC AND DOES NOT SHOW ALL DETAIL OR OFFSETS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CORRECTLY LOCATE AND INSTALL THIS PLUMBING SYSTEM.
2. ALL PIPING SHALL BE INSTALLED IN ACCORDANCE WITH THE UNIFORM PLUMBING CODE, LATEST EDITION, AND ALL OTHER APPLICABLE CODES AND STANDARDS.
3. ALL WASTE PIPING TO BE SLOPED AT 1/4"/FT MIN. UNLESS OTHERWISE NOTED. ALL ELEVATIONS AND SLOPES TO BE FIELD VERIFIED BEFORE INSTALLATION.
4. ALL WASTE, DRAIN, AND VENT PIPING SHALL BE SCH. 80 PVC UNLESS OTHERWISE NOTED.
5. CLEARLY LABEL EVERY PIPE INSIDE ROOMS
6. PROVIDE PIPE SUPPORTS AND STRAPS AS NECESSARY TO SECURE PIPE TO NEAREST WALL / BEAM / CEILING.
7. PLUMBING PIPES SHALL BE ROUTED BELOW TRUSSES. NO TRUSS PENETRATION IS ALLOWED.

PROPOSED LEGEND/NOTES:
- PVC SEWER PIPE, UNLESS OTHERWISE NOTED
- (1) 4" FLOOR DRAIN. ZURN Z730 FLOOR DRAIN WITH BACKWATER VALVE OR APPROVED EQUAL.
- (2) CLEANOUT WITH ADJUSTABLE TOP. WADE MODEL W-8130 SERIES OR EQUAL.

POTABLE WATER PLUMBING NOTES:
1. ALL PLUMBING PIPES SHALL BE LABELED WITH FUNCTION AND FLOW DIRECTION.
2. ALL WATER PLUMBING SHALL BE PEX. CONTRACTOR SHALL PROVIDE ALL NECESSARY FITTINGS AND SUPPORTS. SPECIFICATIONS DIVISION 11 FOR DETAILS.

PROPOSED LEGEND/NOTES:
- COLD WATER (C.W.) PIPE
- (1) ½" INTERIOR HOSE BIB
- (2) ½" EXTERIOR HOSE BIB
- (3) HOSE RACK AND HOSE
- (4) WATTS 1" LF009 LEAD FREE REDUCED PRESSURE BACKFLOW PREVENTION DEVICE OR APPROVED EQUAL.
- (5) BADGER 1" RECORDALL METER OR APPROVED EQUAL.

SEAL SAFE SYSTEM NOTES:
1. ALL PIPING SHALL BE PEX UNLESS OTHERWISE NOTED.
2. PROVIDE PIPE SUPPORTS AND STRAPS AS NECESSARY TO SECURE PIPE TO NEAREST WALL / BEAM / CEILING.
3. PIPING SHALL BE ROUTED BELOW TRUSSES. NO TRUSS PENETRATION IS ALLOWED.

PROPOSED LEGEND/NOTES:
- PEX SEAL SAFE LINE
- (1) PRESSURE REDUCING VALVE SET TO 15 PSI
- (2) PRESSURE FLOW MONITORING UNIT PER DETAIL 306/M05

VENTILATOR SCHEDULE

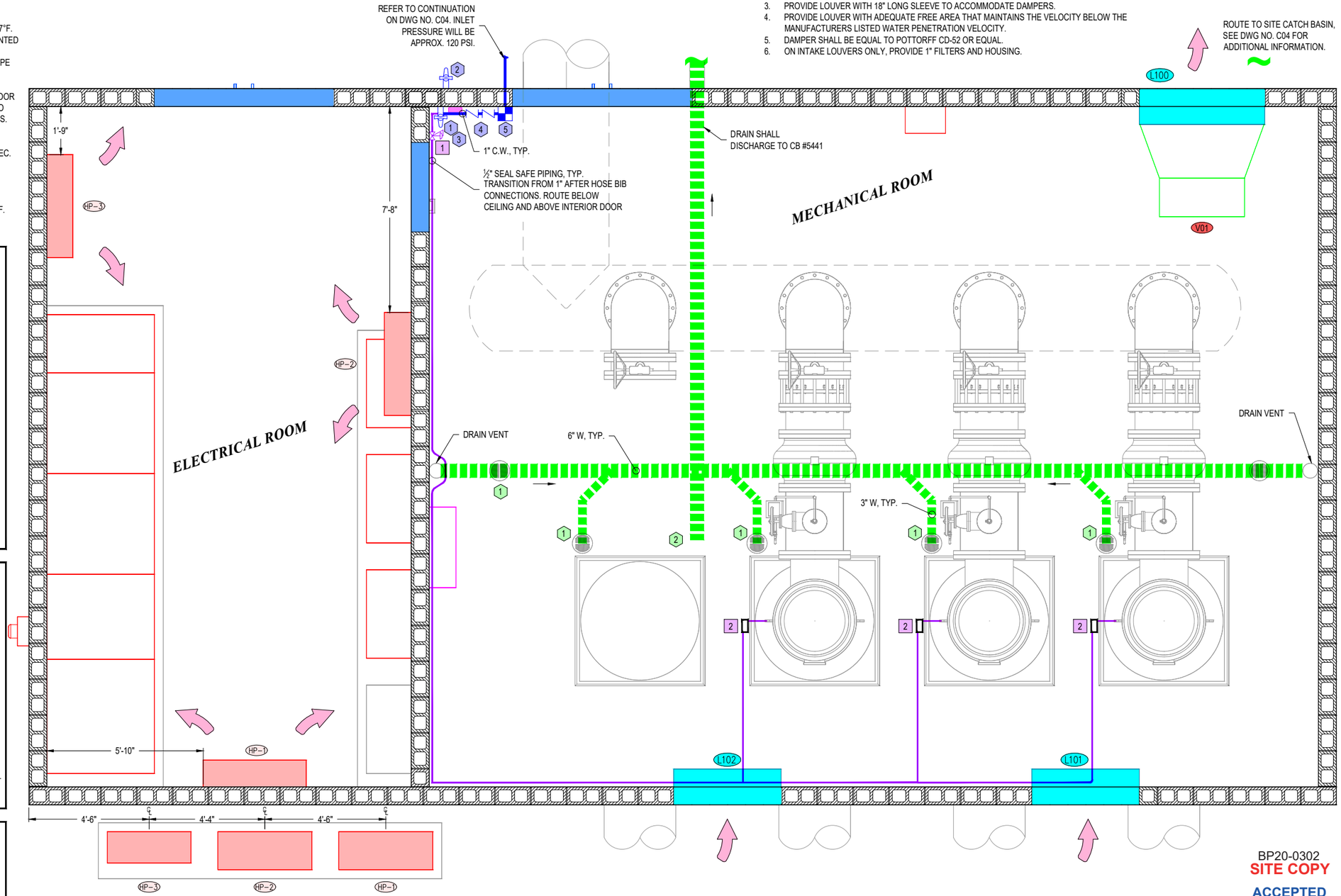
NO.	ROOM	FLOW	MANUFACTURER	MODEL	FLOW RATE	MOTOR HP	VOLTAGE/ PHASE
V01	MECHANICAL ROOM	EXHAUST	GREENHECK	SBE-3H30	7,500 CFM	1 1/2	460V/3

VENTILATOR NOTES:
1. PROVIDE MOTOR SIDE GUARD.
2. MOTOR SHALL BE ECM OR HAVE A RATED EFFICIENCY OF AT LEAST 70% PER WSEC-2015.
3. CONTRACTOR SHALL SECURE FAN TO CEILING AS RECOMMENDED BY THE MANUFACTURER.
4. VENTILATOR TO BE CONTROLLED BY WALL THERMOSTAT.
5. PROVIDE SHEET METAL SHROUD AS REQUIRED.

LOUVER SCHEDULE

NO.	ROOM	FLOW	MANUFACTURER	MODEL	FLOW RATE	SIZE	DAMPER
L100	MECHANICAL ROOM	EXHAUST	POTTORFF	EFD-445	7,500 CFM	56"x48"	MOTORIZED
L101	MECHANICAL ROOM	INTAKE	POTTORFF	EFD-445	3,750 CFM	48"x32"	MOTORIZED
L102	MECHANICAL ROOM	INTAKE	POTTORFF	EFD-445	3,750 CFM	48"x32"	MOTORIZED

LOUVER NOTES:
1. CHANNEL FRAME SHALL BE FLUOROPOLYMER COATED EXTRUDED ALUMINUM WITH FACE MOUNTED STAINLESS STEEL INSECT SCREEN ON THE INTERIOR OF THE LOUVER.
2. CONTRACTOR TO PROVIDE PROPER TRANSITION FROM FAN TO LOUVER AS SHOWN ON PLANS.
3. PROVIDE LOUVER WITH 18" LONG SLEEVE TO ACCOMMODATE DAMPERS.
4. PROVIDE LOUVER WITH ADEQUATE FREE AREA THAT MAINTAINS THE VELOCITY BELOW THE MANUFACTURERS LISTED WATER PENETRATION VELOCITY.
5. DAMPER SHALL BE EQUAL TO POTTORFF CD-52 OR EQUAL.
6. ON INTAKE LOUVERS ONLY, PROVIDE 1" FILTERS AND HOUSING.



HVAC AND MINOR MECHANICAL PLAN

½" = 1'-0"

PROJECT NORTH

BP20-0302
SITE COPY
ACCEPTED
BY SKAGIT COUNTY
07.10.2020

P.N. 3766
C.O. 5040

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 37875 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

DANIEL W. BROWNING — STATE OF WASHINGTON — 38306 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT
Skagit PUD — PUBLIC UTILITY DISTRICT

HVAC AND MINOR MECHANICAL PLAN

REVISIONS

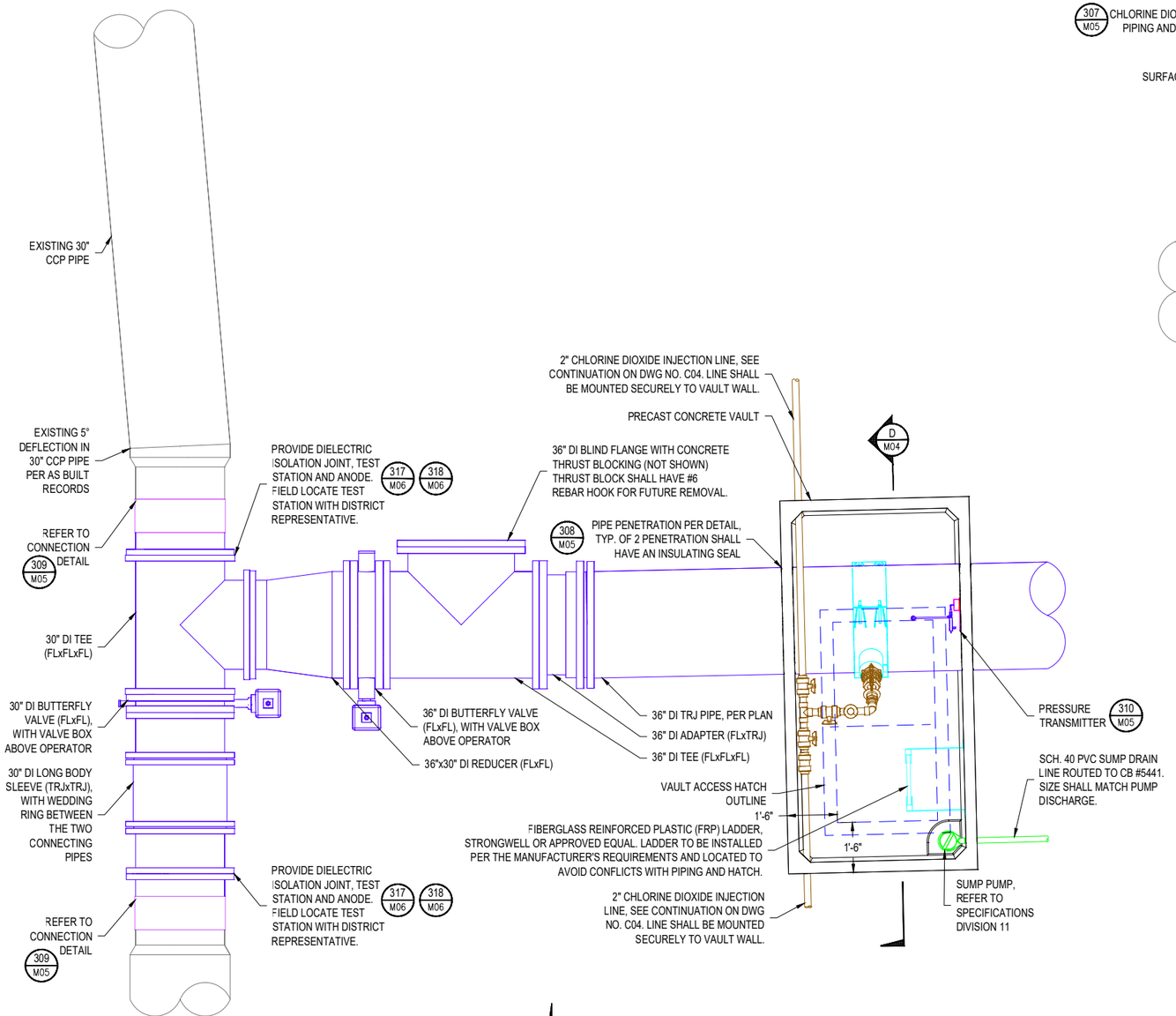
NO.	DESCRIPTION	DATE	BY	REVIEW

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-MEC03.DWG
SAVE DATE: Apr 9, 2020
PLOT DATE: Apr 9, 2020
ENGINEER: CMP
REVIEWED: DWB

SCALE: SHOWN
2" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

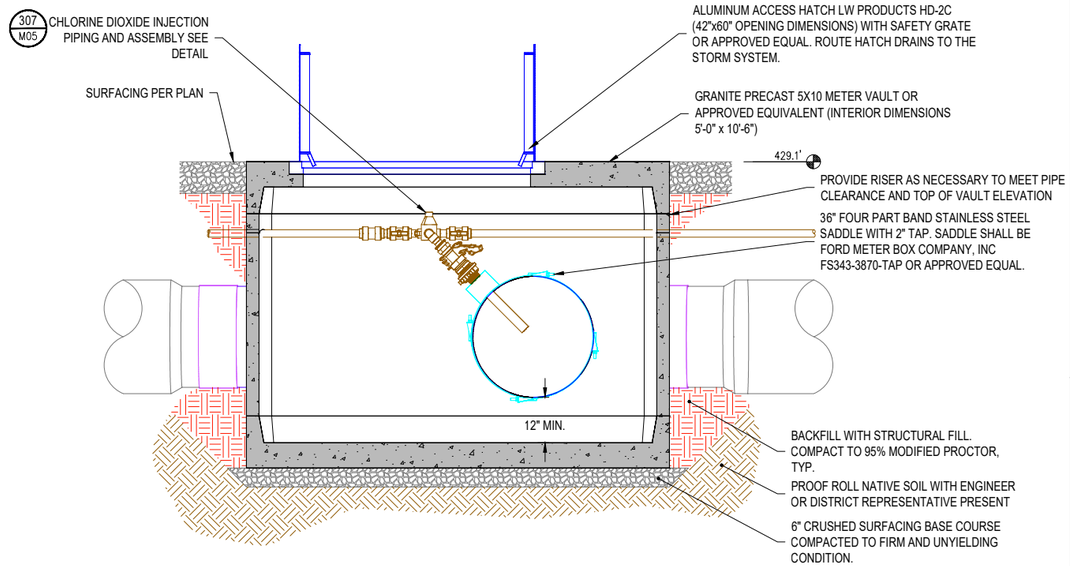
DWG NO.: M03
SHEET NO.: 19 / 37

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020



CHEMICAL DIOXIDE INJECTION VAULT AND YARD PIPING PLAN VIEW

½" = 1–0'



D M04 CHEMICAL DIOXIDE INJECTION VAULT SECTION VIEW

½" = 1–0'

RICHARD L. BALLARD — STATE OF WASHINGTON — 32878 — REGISTERED PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

DANIEL W. BUSENBARK — STATE OF WASHINGTON — 38306 — REGISTERED PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

RH2

PUD NO. 1 OF SKAGIT COUNTY

JUDY RAW WATER PUMP STATION REPLACEMENT

CHLORINE DIOXIDE INJECTION VAULT PLAN & PROFILE

Skagit PUD — PUBLIC UTILITY DISTRICT

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-DMEC04.DWG
DATE: Apr 9, 2020
PLOT DATE: Apr 9, 2020
ENGINEER: CMP
REVIEWED: DWB

REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW

SCALE: SHOWN

2" 1" 2"

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: M04

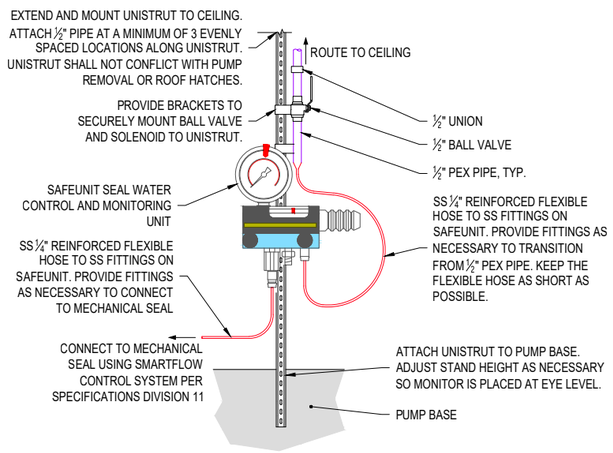
SHEET NO.: 20 37

BP20-0302
SITE COPY

ACCEPTED
BY SKAGIT COUNTY
07.10.2020

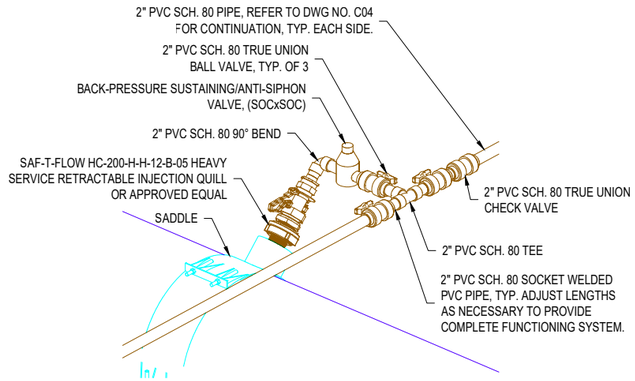
P.N. 3766
C.O. 5040

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020



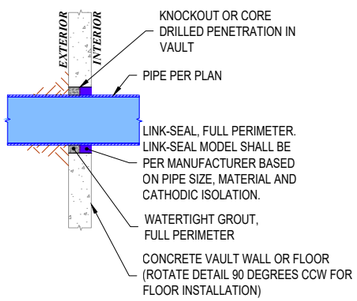
306 M03 **PRESSURE FLOW MONITORING DETAIL**

NOT TO SCALE



307 M04 **CHLORINE DIOXIDE INJECTION PIPING OBLIQUE**

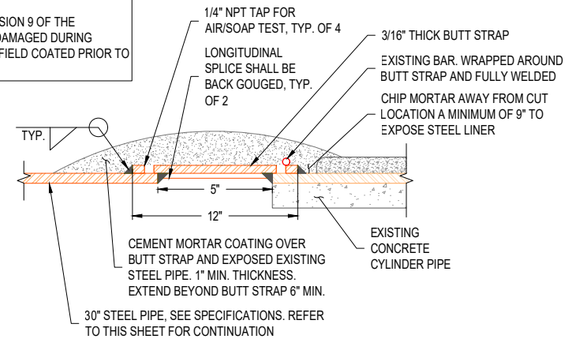
NOT TO SCALE



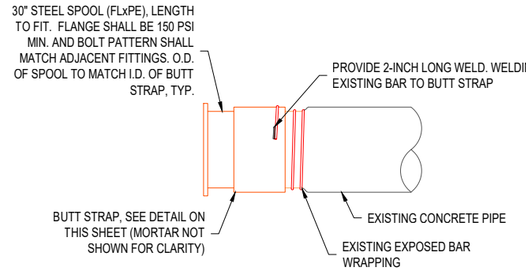
308 M04 **PIPE PENETRATION DETAIL**

NOT TO SCALE

NOTES:
1. FOR FIELD WELDING OF INDIVIDUAL BUTT STRAPS PIECES TO EACH OTHER, SEE BUTT STRAP SPLICE.
2. UNLESS OTHERWISE NOTED, BUTT STRAP WIDTH SHALL CONFORM TO THE LIMITATIONS SHOWN FOR PIPE END SEPARATION AND STEEL OVERLAP REQUIREMENTS.
3. BUTT STRAP LENGTH SHALL MATCH EXPOSED STEEL PIPE CIRCUMFERENCE
4. STEEL PIPE SHALL BE COATED PER DIVISION 9 OF THE SPECIFICATIONS. ANY COATED AREAS DAMAGED DURING INSTALLATION AND WELDING SHALL BE FIELD COATED PRIOR TO BACKFILL.



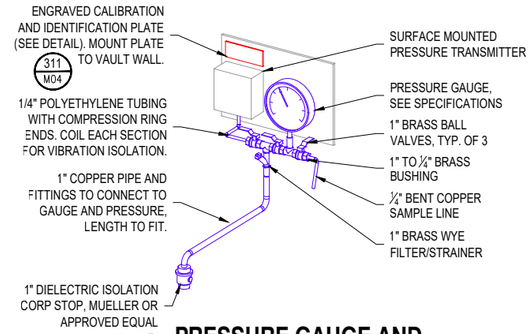
BUTT STRAP INSTALLATION DETAIL



309 M04 ***FLANGED CONNECTION***

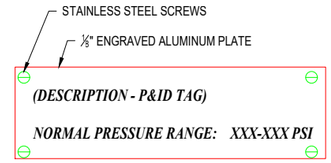
BUTT STRAP PIPE CONNECTION TO CONCRETE CYLINDER PIPE

NOT TO SCALE



310 M04 **PRESSURE GAUGE AND TRANSMITTER DETAIL**

NOT TO SCALE



NOTE: SEE SPECIFICATIONS FOR DESCRIPTION, P&ID TAG, AND PRESSURE RANGE INFO.

311 M04 **IDENTIFICATION AND CALIBRATION PLATE DETAIL**

NOT TO SCALE

BP20-0302
SITE COPY
ACCEPTED
BY SKAGIT COUNTY
07.10.2020

P.N. 3766
C.O. 5040

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 32675 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

DANIEL W. BUSWELL — STATE OF WASHINGTON — 38306 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT
Skagit PUD PUBLIC UTILITY DISTRICT
MECHANICAL DETAILS

ENGINEER: CMP
REVIEWED: DWB
SAVE DATE: Apr 9, 2020
PLOT DATE: Apr 9, 2020
CLIENT: SPUD
FILENAME: RWPS-D-MEC03.DWG
JOB NO.: 117.025

REVISIONS

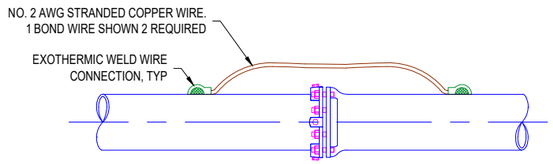
NO.	DESCRIPTION	DATE	BY	REVIEW

SCALE: SHOWN
0" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: M05
SHEET NO.: 21 / 37

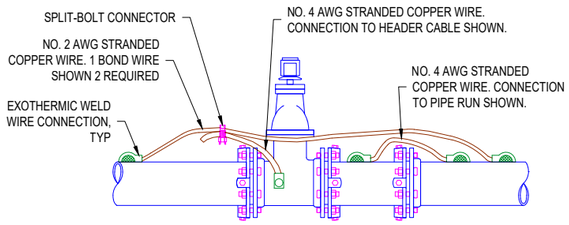
THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020

NOTE:
1. MECHANICAL JOINT STYLE SHOWN, OTHER JOINTS SIMILAR.
2. A SPLIT-BOLT CONNECTOR MAY BE INCORPORATED INTO THE JOINT BOND.



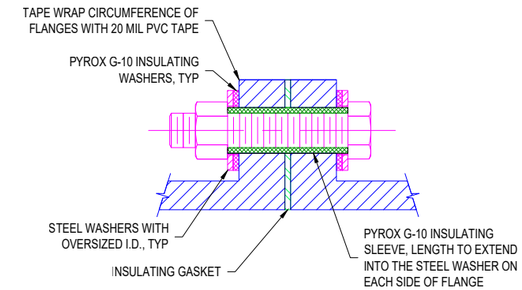
312 JOINT BOND UNCOATED & DIELECTRIC COATED PIPE
NOT TO SCALE

NOTES:
1. MECHANICAL JOINT STYLE SHOWN, OTHER JOINTS SIMILAR.
2. CONNECT FITTINGS AND VALVES TO HEADER CABLE OR PIPE RUN WITH (1) NO. 4 AWG STRANDED WIRE.
3. DO NOT BURN SEALS OR SEALING SURFACE.



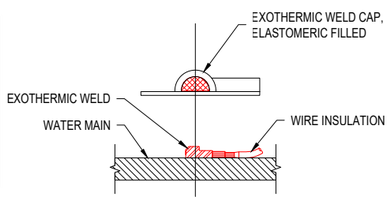
313 JOINT BOND FITTINGS & VALVES
NOT TO SCALE

NOTE:
1. HIGH STRENGTH BOLTS REQUIRE (2) ADDITIONAL HIGH STRENGTH WASHERS.



314 TYP. DIELECTRIC ISOLATION FLANGE JOINT DETAIL
NOT TO SCALE

NOTES:
1. APPLY WELD CAP DIRECTLY TO PIPE, NOT TO PIPE WRAP. USE PRIMER AS REQUIRED BY THE MANUFACTURER.
2. COMPLETELY ENCLOSE WIRE WITHIN WELD CAP.
3. REPAIR ANY DAMAGED COATING NOT COVERED BY WELD CAP.

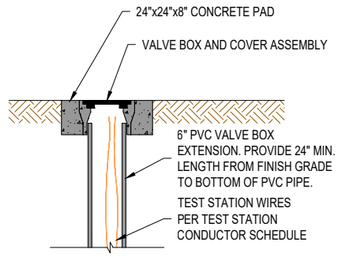


315 C06 EXOTHERMIC WELD DI & STEEL PIPE
NOT TO SCALE

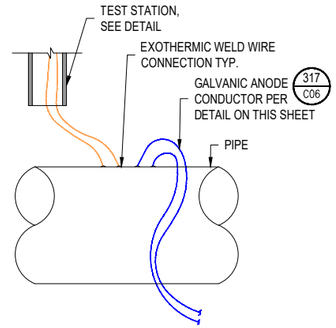
TEST STATION CONDUCTOR SCHEDULE

ITEM	WIRE COLOR	WIRE
DISCHARGE PIPE	ORANGE	8 AWG, STRANDED COPPER WIRE, USE-TYPE INSULATION

NOTES:
1. WIRE SHALL HAVE ENOUGH SLACK TO EXTEND A MIN. OF 2 FT ABOVE FINISHED GRADE AFTER FINAL SURFACING.
2. FOR AN ISOLATION JOINT RUN OF NEW WATER PIPE, WIRE ON THE UP STATION SIDE OF THE ISOLATION JOINT SHALL BE WHITE AND WIRE ON THE DOWN STATION SIDE OF THE ISOLATION JOINT SHALL BE BLACK.
3. COLOR CODE WIRES BY INSULATION COLOR, OR BY COLORED TAPE OR PAINT ON LAST 4 FT OF WIRE.



TEST STATION INSTALLATION



TEST STATION (TS/C)

TEST STATION DETAIL 316 TYP.
NOT TO SCALE

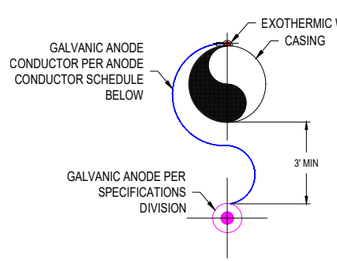
ANODE SCHEDULE

PIPE DIAMETER	NUMBER OF ANODES
GREATER THAN OR EQUAL TO 18"	4 (2 AT EACH END)

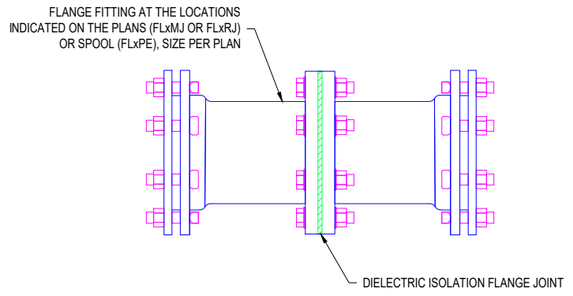
ANODE CONDUCTOR SCHEDULE

ITEM	WIRE COLOR	WIRE
GALVANIC ANODES	BLUE	12 AWG, SOLID COPPER WIRE, TW OR THHN INSULATION

NOTES:
1. LOCATE ANODES A MAX OF 3 FEET HORIZONTALLY FROM CENTERLINE OF PIPE.
2. PLACE GALVANIC ANODE IN CLEAN NATIVE BACKFILL AND COMPACT TO 12" ABOVE ANODE.
3. ANODES MAY BE PLACED UPRIGHT OR HORIZONTALLY, HORIZONTAL ORIENTATION SHOWN.
4. ANODE WIRE SHALL BE EXOTHERMIC WELDED DIRECTLY TO PIPE OR INCORPORATED INTO THE JOINT BOND WITH A SPLIT-BOLT CONNECTION.
5. RUNS OF PIPE SHALL HAVE AN ANODE INSTALLED AT EACH END.
6. ANODES TO BE SPACED A MINIMUM OF 5-FEET APART.
7. ANODES ALONG A RUN OF PIPE SHALL BE EVENLY DISTRIBUTED AND LOCATED ADJACENT TO A PIPE JOINT.
8. PLACE ANODES MINIMUM 5-FEET DISTANCE FROM ANY FOREIGN STRUCTURE.
9. A PIPE RUN IS FROM ISOLATION JOINT TO ISOLATION JOINT.



317 C06 GALVANIC ANODE INSTALLATION DETAILS
NOT TO SCALE



318 DIELECTRIC ISOLATION JOINT ASSEMBLY
NOT TO SCALE

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 12878 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

DANIEL W. BUSENBARK — STATE OF WASHINGTON — 38306 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT

CATHODIC PROTECTION DETAILS

Skagit PUD — PUBLIC UTILITY DISTRICT

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-DET.DWG
SAVE DATE: Apr 9, 2020
PLOT DATE: Apr 9, 2020
ENGINEER: OMP
REVIEWED: DWB

REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW

BP20-0302
SITE COPY
ACCEPTED
BY SKAGIT COUNTY
07.10.2020

SCALE: SHOWN
2" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

P.N. 3766
C.O. 5040
DWG NO.: M06
SHEET NO.: 22 37

THIS PLAN SET IS TO BE KEPT OF SITE . IT HAS BEEN REVIEW BY RSJ AS PART OF BP20-0320 07.10.2020

ONE-LINE DIAGRAM SYMBOLS

- CIRCUIT BREAKER
  XXX/YY – CB SIZE & NO. OF POLES
  ET – ELECTRONIC TRIP
  TM – THERMAL MAGNETIC BREAKER
  MCP – MOTOR CIRCUIT PROTECTOR
  SE – SERVICE ENTRANCE
  GFI – GROUND FAULT INTERRUPTER
- FUSE
- FUSED DISCONNECT SWITCH
- PLUG–IN CONNECTION
- RTM — RUN TIME METER
- OC — MOTOR OPERATION COUNTER
- SSRVS — SSRVS – SOLID STATE REDUCED VOLTAGE STARTER
- VARIABLE FREQUENCY DRIVE
- MOTOR STARTER
- MOTOR STARTER W/ OPERATOR DEVICES
  A – HAND–OFF–AUTO
  B – OPERATIONAL COUNTER
  C – RUN TIME METER
  D – RUN LIGHT
  E – FAIL LIGHT
  F – EMERGENCY STOP
- K — KIRK KEY INTERLOCK
- POWER TRANSFORMER
- CONTROL POWER TRANSFORMER
- TRANSFORMER
- CURRENT TRANSFORMER
- VOLTAGE TRANSFORMER
- CONTACTOR
- CAPACITOR
- ENGINE GENERATOR
- GENERATOR CONNECTION RECEPTACLE
- S/N — SOLID NEUTRAL
- TB — TERMINAL BLOCK
- SURGE PROTECTION DEVICE
- SPD — SURGE PROTECTION DEVICE (ALTERNATIVE)

GROUNDING SYSTEM SYMBOLS

- GROUND
- METAL PIPE GROUND
- CONNECTION POINT, EXOTHERMIC WELD. CADWELD OR APPROVED EQUAL.
- GROUND ROD SIZED PER N.E.C. USE EXOTHERMIC WELD CONNECTION AT THE GROUND ROD.
- PIGTAIL, BARE COPPER, LENGTH AS REQUIRED, 8' MINIMUM.
- CONNECTION POINT, MECHANICAL, COMPRESSION TYPE.

ELECTRICAL SITE PLAN SYMBOLS

- UTILITY POLE AND GUY WIRE
- HH — MANHOLE OR HANDHOLE
- P — BURIED POWER VAULT OR MANHOLE
- T — TELEPHONE VAULT OR PEDESTAL
- F — FIBER OPTICS VAULT OR PEDESTAL
- LUMINAIRE
- PAD–MOUNT TRANSFORMER

PANELBOARDS, SWITCHES, AND EQUIPMENT

- SERVICE ENTRANCE, SWITCHGEAR, MOTOR CONTROL CENTER, OR PANELBOARD
- SURFACE MOUNTED PANELBOARD
- FLUSHED MOUNTED PANELBOARD
- NXX — FIELD CONTROL STATION WITH NEMA REQUIREMENTS.
  N1 – NEMA 1
  N3R – NEMA 3R
  N4 – NEMA 4
  N4SS – NEMA 4 STAINLESS STEEL
  N4F – NEMA 4 FIBERGLASS
  N6 – NEMA 6
  N12 – NEMA 12 GASKETED
- EQUIPMENT MOUNTING STAND
- T — HEATER, WATTAGE NOTED
- EQUIPMENT CONNECTION
- M — SINGLE PHASE MOTOR. HORSEPOWER AS NOTED
- HP — THREE PHASE MOTOR. HORSEPOWER AS NOTED
- HP — SINGLE PHASE MOTOR. HORSEPOWER AS NOTED
- ELECTRICAL PLUG
- DISCONNECT SWITCH
- F — FUSED DISCONNECT SWITCH
- COMBINATION MOTOR STARTER AND DISCONNECT SWITCH

RECEPTACLES AND JUNCTION BOX SYMBOLS

- J — CEILING JUNCTION BOX
- J — WALL JUNCTION BOX
- J — FLOOR JUNCTION BOX
- DUPLEX WALL RECEPTACLE , 120V
  WP = WEATHERPROOF
  G = GROUNDED
  IG = ISOLATED GROUND
  GFI = GROUND FAULT INTERRUPTER
- DOUBLE DUPLEX
- SINGLE RECEPTACLE, 120V
- SINGLE RECEPTACLE, 208V
- DUPLEX FLOOR RECEPTACLE, 120V
- SPECIAL PURPOSE WALL RECEPTACLE, RATING AS NOTED
- CLOCK
- TV — TELEVISION
- TELEPHONE
- TELEPHONE/DATA WITH CABLE
- TELEPHONE/DATA WITHOUT CABLE

SWITCH OUTLETS

- S — STANDARD SWITCH, 120VAC, 20 AMP
- S_3 3WAY — 3–WAY SWITCH, 120VAC, 20 AMP
- S HOA HOA — 3–POSITION SWITCH, 120VAC, 20 AMP, LABEL SWITCH POSITION HAND–OFF–MOTION OR PHOTO

- S_{DEE} SINGLE–POLE
- S_2 DOUBLE–POLE
- S_3 THREE WAY
- S_4 FOUR WAY
- S_D DIMMER
- S_{OS} OCCUPANCY SENSOR
- S_P PILOT–LIGHTED
- S_K KEY–OPERATED
- S_{LV} LOW VOLTAGE
- S_M MASTER
- PUSHBUTTON

LIGHTING FIXTURES/DEVICES

- FLUORESCENT FIXTURE
- WALL/CEILING MOUNTED FIXTURE
- EMERGENCY LIGHT WITH SELF CONTAINED BATTERY
- SURFACE OR PENDANT MOUNTED FIXTURE
- RECESSED FIXTURE
- MD — MOTION DETECTOR
- PC — PHOTO CONTROL CELL

FIRE SYSTEM SYMBOLS

- H — HEAT DETECTOR
- S — SMOKE DETECTOR
- D — FIRE ALARM DISPATCH STROBE ALARM
- A — FIRE ALARM AUDIBLE/VISUAL ALARM
- F — FIRE ALARM MANUAL PULL STATION

ADDITIONAL SYMBOLS

- S — SOUND SYSTEM SPEAKER
- V — SOUND SYSTEM VOLUME CONTROL
- B — DOORBELL

VALVE SYMBOLS

- PILOT VALVE SOLENOID
- VALVE
- CHECK VALVE
- CONTROL VALVE

ABBREVIATIONS

SPDT – SINGLE POLE, DOUBLE THROW
SPST – SINGLE POLE, SINGLE THROW
DPST – DOUBLE POLE, SINGLE THROW
WP – WEATHER–PROOF
GFI – GROUND FAULT INTERRUPT
P – POWER
C – CONTROL
J – INSTRUMENTATION
PC – POWER & CONTROL
CJ – CONTROL & INSTRUMENTATION
CKT. – CIRCUIT
C.O. – CONDUIT ONLY
N.L. – NIGHT LIGHT
AL. – ALUMINUM
CU. – COPPER

HOA	HAND–OFF–AUTO SWITCH
RTM	RUN TIME METER
OC	OPERATION COUNTER
MRIL	MOTOR RUN INDICATION LIGHT
SFIL	SEAL FAIL INDICATION LIGHT
SFTR	SEAL FAIL TRIP RESET
OTIL	OVER TEMPERATURE INDICATION LIGHT
MOIL	MOTOR OVERLOAD INDICATION LIGHT

INDICATE TYPE BY LETTER

- V — VOLTMETER
- AH — AMPERE–HOUR

INSTRUMENT METER

A – AMMETER
AH – AMPERE–HOUR
PF – POWER FACTOR
V – VOLTMETER
VA – VOLT AMMETER
VAR – VARMETER
VARH – VARHOUR METER
W – WATTMETER
WH – WATTHOUR METER

RACEWAY LEGEND

SITE PLAN LEGEND

- P — PROPOSED POWER
- TEL — PROPOSED TELEPHONE
- TELM — PROPOSED INSTRUMENTATION
- FO — PROPOSED FIBER OPTICS

BUILDING OR FACILITY PLAN LEGEND

- 480 VOLT EXPOSED RACEWAY
- 480 VOLT WIRING CONCEALED, UNDERGROUND, EMBEDDED, OR CONCRETE ENCASED RACEWAY
- 120/208/240 VOLT EXPOSED RACEWAY
- 120/208/240V WIRING CONCEALED, UNDERGROUND, EMBEDDED, OR CONCRETE ENCASED RACEWAY
- CONTROL OR INSTRUMENTATION EXPOSED RACEWAY
- CONTROL OR INSTRUMENTATION, UNDERGROUND, EMBEDDED, OR CONCRETE ENCASED RACEWAY
- HOME RUN TO PANELBOARD OR AS INDICATED
- CONDUIT RUN, BROKEN AND CONTINUED SAME SHEET OR AS NOTED
- FLEXIBLE CONDUIT
- CONDUIT RUN. HATCH MARKS INDICATE NUMBER OF CONDUCTORS
- ½" GRC, 2–#12 — CALLOUT INDICATING CONDUIT SIZE, NUMBER AND SIZE OF WIRE.
- XXX — CALLOUT INDICATING CONDUIT PER SCHEDULE
- CONDUIT BENT UP OR TOWARD
- CONDUIT BENT DOWN OR AWAY
- CAPPED CONDUIT

ONE-LINE DIAGRAM INFORMATION

- EXISTING EQUIPMENT AND CONDUIT
- PROPOSED EQUIPMENT AND CONDUIT
- GROUNDING EQUIPMENT AND CONDUCTORS
- CONDUIT, WIRING OR EQUIPMENT TO BE REMOVED

LADDER LOGIC SYMBOL LEGEND

- INDICATOR LIGHT — INDICATOR LIGHT
  A – AMBER G – GREEN
  B – BLUE R – RED
  C – CLEAR W – WHITE
- RELAY (XYZ 123) — RELAY
  TR – TIMED RELAY
  CR – CONTROL RELAY
- LIMIT SWITCH — LIMIT SWITCH, NORMALLY OPEN
- FLOAT SWITCH — FLOAT SWITCH, NORMALLY OPEN
- LIMIT SWITCH — LIMIT SWITCH, NORMALLY CLOSED
- FLOAT SWITCH — FLOAT SWITCH, NORMALLY CLOSED
- TIME DELAY CONTACT — TIME DELAY CONTACT, NORMALLY OPEN, TIME TO CLOSE
- PUSHBUTTON — PUSHBUTTON, NORMALLY CLOSED
- TIME DELAY CONTACT — TIME DELAY CONTACT, NORMALLY CLOSED, TIME TO OPEN
- PUSHBUTTON — PUSHBUTTON, NORMALLY OPEN
- TIME DELAY CONTACT — TIME DELAY CONTACT, NORMALLY OPEN, TIME TO OPEN
- THERMOSTAT — THERMO SWITCH, NORMALLY OPEN
- TIME DELAY CONTACT — TIME DELAY CONTACT, NORMALLY CLOSED, TIME TO CLOSE
- THERMOSTAT — THERMO SWITCH, NORMALLY CLOSED
- RELAY CONTACT, NC / RELAY CONTACT, NO — RELAY CONTACT, INSTANTANEOUS CHANGE
- FLOWSWITCH — FLOWSWITCH, NORMALLY OPEN
- PRESSURE SWITCH — PRESSURE SWITCH, NORMALLY OPEN
- FLOWSWITCH — FLOWSWITCH, NORMALLY CLOSED
- PRESSURE SWITCH — PRESSURE SWITCH, NORMALLY CLOSED
- 2 POLE SWITCH

LADDER LOGIC LINETYPES

- COMPONENT INSTALLED INSIDE ENCLOSURE
- COMPONENT INSTALLED ON FRONT OF ENCLOSURE
- FIELD CONNECTED COMPONENT

- 3 POLE SWITCH

P&ID BUBBLE IDENTIFICATION CHART

EXISTING	FUNCTION
	INSTRUMENT IDENTIFICATION BUBBLE
	FIELD MOUNTED DEVICE OR INSTRUMENT
	FRONT PANEL MOUNTED INSTRUMENT OR DEVICE (LOCAL PANEL)
	BACK PANEL MOUNTED INSTRUMENT OR DEVICE (LOCAL PANEL)
	FRONT PANEL MOUNTED INSTRUMENT OR DEVICE (LAB ROOM PANEL)
	OPERATOR INTERFACE DISPLAY (LOCAL PANEL)
	OPERATOR INTERFACE DISPLAY (LAB ROOM PANEL)

GENERAL NOTES

1. THIS IS A STANDARD LEGEND. NOT ALL OF THE INFORMATION SHOWN ON THIS PAGE WILL APPEAR IN THIS SET OF PLANS.

2. THESE DRAWINGS ARE DIAGRAMMATIC ONLY; EXACT LOCATIONS OF ELECTRICAL EQUIPMENT SHALL BE DETERMINED IN THE FIELD BY THE CONTRACTOR. THE INSTALLATION OF ALL EQUIPMENT SHOWN ON THESE DRAWINGS OR DESCRIBED IN THE SPECIFICATIONS SHALL CONFORM TO THE REQUIREMENTS SET FORTH IN THE LATEST EDITIONS OF ALL APPLICABLE CODES AND UTILITY COMPANY STANDARDS. CONTACT THE UTILITY COMPANY REPRESENTATIVES AND VERIFY THEIR REQUIREMENTS.

3. NOTIFY THE ENGINEER IMMEDIATELY IF CONFLICTS IN EQUIPMENT LOCATIONS ARE DISCOVERED OR IF PROBLEMS ARISE DUE TO FIELD CONDITIONS, LACK OF INFORMATION OR ANY OTHER REASON. NO PAYMENT WILL BE MADE FOR CHANGES WHICH HAVE NOT BEEN REVIEWED BY THE ENGINEER.

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 52875 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

MARK R. BRAASCH — STATE OF WASHINGTON — 51635 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION
REPLACEMENT

ELECTRICAL LEGEND

Skagit PUD — PUBLIC UTILITY DISTRICT

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-ELE001.DWG
DATE: Apr 7.2020
PLOT DATE: Apr 10, 2020
ENGINEER: KES
REVIEWED: MWB

REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW

SCALE: SHOWN
0" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: E01
SHEET NO.: 23 37

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P.N. 3766
C.O. 5040

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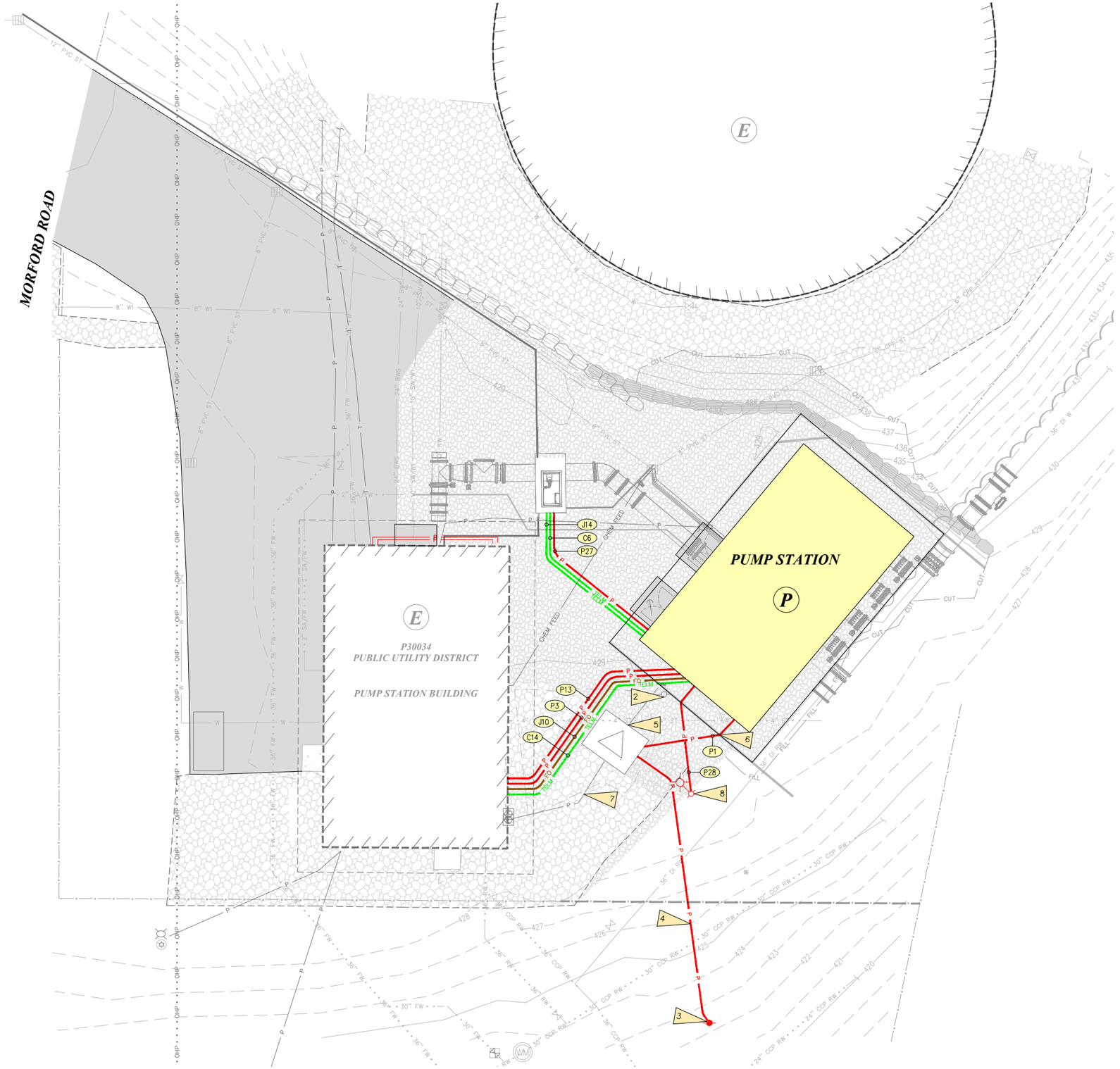

PROPOSED ELECTRICAL SITE PLAN

1" = 10'

ELECTRICAL NOTES

XX	1. SEE DWG NO. E11 FOR CONDUIT AND CONDUCTOR SCHEDULES.
2	2. EXISTING UTILITY POLE TO BE REMOVED BY PUGET SOUND ENERGY AT ONSET OF CONSTRUCTION.
3	3. PROPOSED UTILITY POLE BY PUGET SOUND ENERGY.
4	4. CONTRACTOR SHALL PROVIDE TRENCHING, BACKFILL AND RESTORATION PER PUGET SOUND ENERGY REQUIREMENTS. PUGET SOUND ENERGY SHALL PROVIDE PRIMARY RACEWAY AND CONDUCTORS.
5	5. EXISTING TRANSFORMER TO BE REMOVED AND REPLACED BY PUGET SOUND ENERGY. PUGET SOUND ENERGY TO REVISE EXISTING VAULT.
6	6. SECONDARY POWER SERVICE BY CONTRACTOR. PUGET SOUND ENERGY SHALL TERMINATE CONDUCTORS AT TRANSFORMER.
7	7. EXISTING UNDERGROUND POWER CONDUCTORS TO EXISTING PUMP STATION TO BE REMOVED BY CONTRACTOR ONCE SERVICE TO PROPOSED BUILDING IS ENERGIZED. EXISTING CONDUIT TO BE ABANDONED.
8	8. CONTRACTOR SHALL EXCAVATE AND RELOCATE THE EXISTING SITE LIGHT. CONTRACTOR SHALL PROVIDE A NEW CONCRETE FOOTING FOR THE LIGHT AND ATTACH THE LIGHT POLE AS REQUIRED TO ACCOMMODATE THE RELOCATION.

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 32875 — REGISTERED PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

MARK R. BRAASCH — STATE OF WASHINGTON — 51635 — REGISTERED PROFESSIONAL ENGINEER

SIGNED: 04/09/2020

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PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION
REPLACEMENT

Skagit PUD — PUBLIC UTILITY DISTRICT

ELECTRICAL SITE PLAN

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-ELE03.DWG
DATE: Feb 20, 2020
PLOT DATE: Apr 10, 2020
ENGINEER: KES
REVIEWED: MWB

REVISIONS

NO.	DESCRIPTION	DATE	BY	REVIEW

SCALE: SHOWN

2" 1" 2"

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: E03

SHEET NO.: 25 / 37

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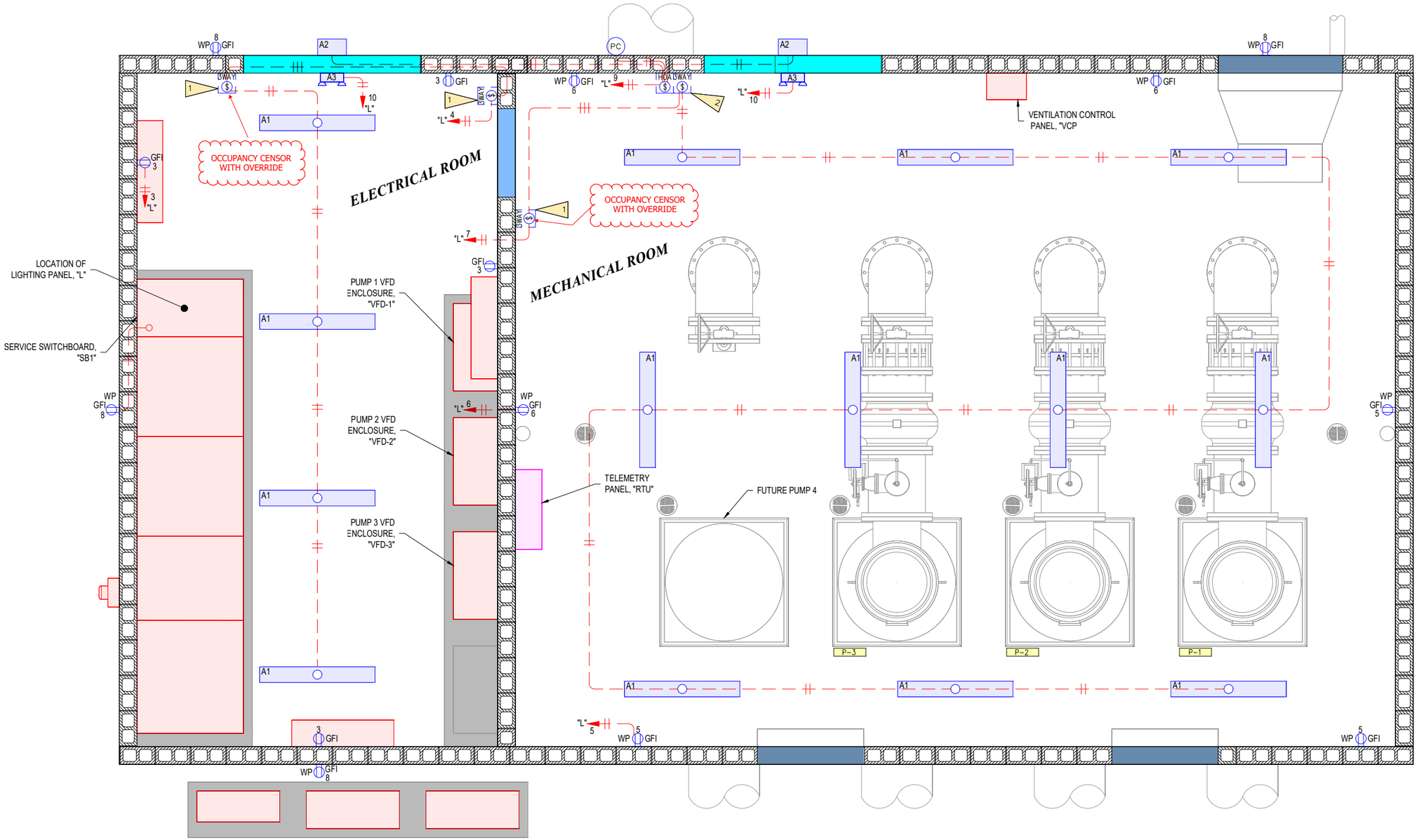

PROPOSED PS - LIGHTING AND RECEPTACLE PLAN

½" = 1'-0"

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ELECTRICAL NOTES

1. SINGLE GANG BOX AND SWITCH RECESSED IN WALL.
2. DOUBLE GANG BOX AND SWITCHES RECESSED IN WALL.
3. SEE DWG NO. E11 FOR LIGHTING FIXTURE SCHEDULE.
4. SEE DWG NO. E11 FOR ELECTRICAL EQUIPMENT SCHEDULE.
5. PROVIDE AND INSTALL LABELS FOR ALL LIGHT SWITCHES. LABELS SHALL INDICATE THE DEVICE CONTROLLED BY THE SWITCH.
6. LOCATE ALL LIGHT FIXTURES, SWITCHES, AND DEVICES IN LOCATION SHOWN ON THE PLANS USING ENGINEERING SCALE. ADJUST LOCATION AS NECESSARY TO AVOID INTERFERENCE WITH OTHER EQUIPMENT.

P.N. 3766
C.O. 5040

RH2

RICHARD L. BALLARD — STATE OF WASHINGTON — 12875 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

MARK R. BRAASCH — STATE OF WASHINGTON — 51635 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 04/09/2020

PUD NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT

Skagit PUD — PUBLIC UTILITY DISTRICT

PROPOSED PS - LIGHTING AND RECEPTACLE PLAN

REVISIONS			
NO.	DATE	DESCRIPTION	BY
			REVIEW

JOB NO.: 117.025
CLIENT: SPUD
FILENAME: RWPS-D-ELEC05.DWG
SAVE DATE: Feb 20, 2020
PLOT DATE: Apr 10, 2020
ENGINEER: KES
REVIEWED: MWB

SCALE: SHOWN
3" 1" 2"
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: E06
SHEET NO.: 28 37

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PUBLIC UTILITY DISTRICT NO. 1 OF SKAGIT COUNTY
JUDY RAW WATER PUMP STATION REPLACEMENT
STRUCTURAL CALCULATIONS

By Danielle Dorr, EIT
Reviewed by Shannon Emerick, PE and Jon Conner, PE, SE
RH2 Engineering, Inc.
April 10, 2020

Index to Calculations

Description	Subcategory	Page
General	Design Criteria	i
	ATC Hazards	ii-iii
	Gravity load Distribution and Roof Design	1
CMU Wall Design	Minimum Wall Reinforcing	2
Gravity Analysis	CMU Lintel	3
	Soil Bearing	3-4
Lateral Analysis	Wind	5-6
	Seismic	7-9
	Roof Diaphragm	8-9
	Load Transfer to Walls	9
	Shear Walls	10
	Out-of-Plane Wall Loads	10
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Other	Special Reinforced Masonry Check	11
Catalogs	Simpson H2.5T	12
	Simpson A34	13

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Public Utility District No. 1 of Skagit County
Judy Raw Water Pump Station Replacement
Structural Calculations
By Danielle Dorr, EIT
Reviewed by Shannon Emerick, PE and Jon Conner, PE, SE

Design Criteria:

Geotechnical parameters per typical conditions in the construction area:

Minimum frost depth: 12-inches below adjacent final grade
Assumed Maximum Net Bearing: 1,500 psf static (per Skagit County)
Add 1/3 for seismic or wind
Site Class: D Stiff Soil

Other loading parameters:

Wind Load: 110 MPH, Exposure C (nearby wooded area)
Snow Load: 25 psf (per Skagit County)
Earthquake Load: Lat: 48.470329 N, Long: -122.190514 W
Sds = 0.8g, Sd1 = 0.357g, S1: 0.357, Ss: 1

Other design values used:

Occupancy Category: IV (water pump station for fire suppression)
Concrete: 4000psi with 60,000psi reinforcing
Timber: Hem Fir, stud grade or better
CMU: 8”x8”x16”, 1500 psi with 60,000 psi reinforcing

Dead Loads:

Concrete: 150 pcf.
CMU: 58 psf (Amrhein Table B-3a)
Roof dead load: Total applied dead load = 12 psf. Includes: Roofing & Sheathing: 3.5 psf; Trusses: 2 psf; Insulation: 0.5psf; Gypsum: 3 psf; Miscellaneous mechanical: 3 psf.

Live Loads:

Roof: 20 psf

Design Codes and References:

2015 IBC for load calculations and general design criteria
ASCE 7-16 for load calculations and general design criteria
Concrete: ACI 318 – 14
Timber: ANSI / AF&PA NDS-2005 for Wood Construction
CMU: Reinforced Masonry Engineering Handbook, Amrhein, 5th Edition; ACI 530-13/ASCE 5-13/TMS 402-13

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Hazards by Location

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Search Information

Address: 48.470329, -122.190514

Coordinates: 48.470329 , -122.190514

Elevation: 424 ft

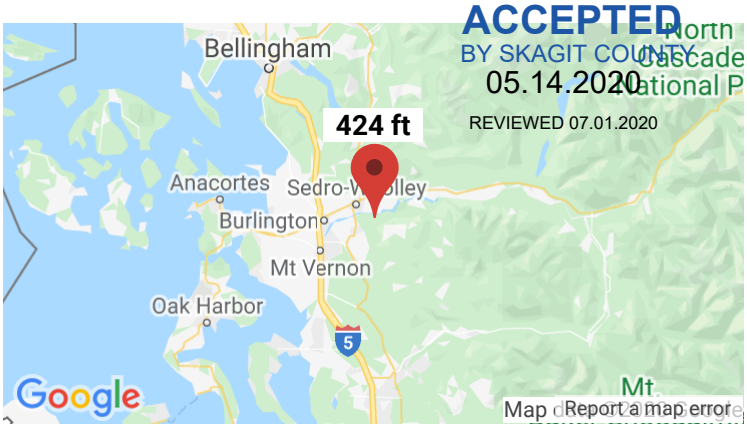
Timestamp: 2020-02-13T14:16:18.271Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: IV

Site Class: D-default



Basic Parameters

Name	Value	Description
S_S	1	MCE_R ground motion (period=0.2s)
S_1	0.357	MCE_R ground motion (period=1.0s)
S_{MS}	1.2	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	0.8	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.906	Coefficient of risk (0.2s)
CR_1	0.893	Coefficient of risk (1.0s)
PGA	0.428	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.514	Site modified peak ground acceleration

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T_L	16	Long-period transition period (s)
SsRT	1	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.104	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.357	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.399	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.5	Factored deterministic acceleration value (PGA)

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* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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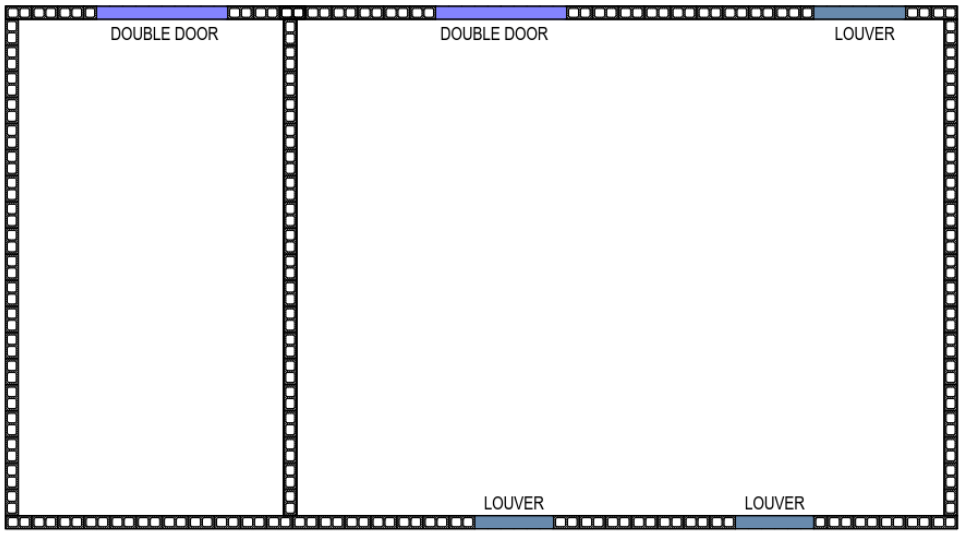
Pump Station Design
- CMU buildings with wood framed roof trusses
- Method: ASD working stress design

Gravity Load Distribution
- Wood trusses at 24" o.c. support a gable roof with 4:12 pitch and 4 ft overhang

$l := 48.67$	Length of building (ft)
$w := 26.67$	Width of building (ft)
$h_w := 12$	Wall height (ft)
$p := 4$	Roof pitch (p:12)
$s := 2$	On center spacing (ft)
$S := 25$	Roof snow load (psf) (Skagit County)
$OH := 4$	Overhang (ft)
$I_s := 1.20$	Snow Importance factor (ASCE 7-16, Table 1.5-2)
$LL := 20$	Construction Live Load (psf)
$DL := 12$	Roof Dead Load (psf)
$CMU := 58$	CMU Dead Load (psf)
$Conc := 150$	Concrete Dead Load (psf)
$w_{roof} := (S + DL) \cdot \left(\frac{w}{2} + OH\right) = 641.4$	Maximum unfactored gravity load to exterior walls (plf)

$l = 48.7 \ ft$

Raw Water Pump Station



$w = 26.7 \ ft$

Trusses span the width

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CMU Minimum Wall Reinforcement - ACI 530-13, 7.3.2.3.1

$RST_{hv} := 0.002 \cdot (12 \cdot 7.625) = 0.183$ Total horz & vert RST required (in^2/ft) (ACI 7.3.2.6)

$RST_{min} := 0.0007 \cdot (12 \cdot 7.625) = 0.064$ Minimum required reinforcement (in^2/ft) (ACI 7.3.2.6)

$S_{max} := 48$ Maximum horz spacing of RST (in) (ACI 7.3.2.6)

$RST_{stdv} := 0.307$ Standard vertical RST #5 (in^2)

$Check := \text{if } \frac{12 \cdot RST_{stdv}}{24} > RST_{min}$ "OK" else "NG" $Check = \text{"OK"}$ Standard vertical RST check with #5 @ 24" O.C. (in^2/ft)

$RST_{stdh} := 0.305$ Standard horizontal RST #5 (in^2)

$Check := \text{if } \frac{12 \cdot RST_{stdh}}{48} > RST_{min}$ "OK" else "NG" $Check = \text{"OK"}$ Standard horizontal RST check with #5 @ 48" O.C. (in^2/ft)

$RST_{total} := \frac{12 \cdot RST_{stdv}}{24} + \frac{12 \cdot RST_{stdh}}{48} = 0.2$ Standard horizontal and vertical total RST #5 (in^2)

$Check := \text{if } RST_{total} > RST_{hv}$ "OK" else "NG" $Check = \text{"OK"}$ Standard vertical and horizontal RST check (in^2/ft)

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CMU Lintel Design - Amrhein 11-4

- Max span over double doors at north wall

$span := 6.67$	Lintel span (ft)
$h := 4$	Height of CMU above opening (ft)
$h_l := 2$	Height of lintel (ft)
$w_{roof} = 641$	Load from roof (plf)
$b_{CMU} := 7.625$	Width of 8" CMU (in)
$d := (h_l \cdot 12) - 3 = 21$	Distance to RST (in)
$L_d := h \cdot CMU = 232$	CMU dead load (plf)
$L_T := L_d + w_{roof} = 873.4$	Total load to lintel (plf)
$M := \frac{L_T \cdot span^2}{8} = 4857$	Moment on lintel (ft-lbs)
$K := \frac{M \cdot 12}{b_{CMU} \cdot d^2} = 17.3$	Flexural coefficient
$\rho := 0.000732$	Steel ratio (Amrhein Table E-1B)
$A_s := \rho \cdot b_{CMU} \cdot d = 0.1172$	RST required in lintel (in^2)

Standard #5 trim bars (As = 0.307 in^2) OK for lintel RST. Solid grout 3 courses above doors and louvers.

Check Exterior CMU Walls - Bearing under largest opening

$h_w = 12$	Wall height (ft)
$B_a := 1500$	Assumed maximum bearing pressure for Skagit County (psf)
$f_w := 1.5$	Tributary spread footing width (ft)
$f_t := 6$	Footing thickness (in)
$s_d := 3$	Stem wall depth (ft)
$s_t := 8$	Stem wall thickness (in)
$W_f := \left(\left(f_w \cdot \frac{f_t}{12}\right) + \left(s_d \cdot \frac{s_t}{12}\right)\right) \cdot Conc = 413$	Footing weight (plf)
$W_w := h_w \cdot CMU = 696$	Weight of wall (plf)
$w_{roof} = 641.4$	Load to wall from roof (plf)

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$open_w := 6.67$ Width of critical opening (ft) (Double door, west wall)

$open_h := 7.33$ Height of opening (ft)

$W_{oi} := open_w \cdot (h_w - open_h) \cdot \frac{CMU}{2} + w_{roof} \cdot \frac{open_w}{2} = 3042$ Additional load to each side of opening (lbs)

$d_{wall} := open_h \cdot \tan\left(30 \cdot \frac{\pi}{180}\right) = 4.2$ Distance from edge of opening to outside edge of cmu wall (ft) (Assumes load spreads from top of door at 30 degree angle)

$A := f_w \cdot d_{wall} = 6.3$ Cross sectional area under load (sq ft)

$W_o := \frac{W_{oi}}{A} = 479.3$ Distributed load on each side of opening (psf)

$Bearing := \frac{w_{roof} + W_w + W_f + W_o}{f_w} = 1486$ Max bearing pressure next to door opening (psf)

$B_{typ} := \frac{w_{roof} + W_w + W_f}{f_w} = 1167$ Typical bearing pressure (psf)

$Check :=$ if $Bearing \le B_a$ "OK" else "NG" $Check =$ "OK"

Typical 18" footing width OK.

Roof Sheathing Design - IBC Table 2304.8(3)

$D := DL + S = 37$ Dead loads acting on sheathing (psf)

$LL = 20$ Live load acting on sheathing (psf)

$Check :=$ if $D \le 40$ "OK" else "NG" $Check =$ "OK"

$Check :=$ if $LL \le 30$ "OK" else "NG" $Check =$ "OK"

19/32" sheathing assumed for shear strength.
Span strength is OK for 30 psf live load and 40 psf total load (capacities based on IBC Table 2304.8(3)).

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Lateral Analysis - Wind - ASCE 7-16, Chapter 28 MWFRS (Envelope Procedure)

$I_w := 1.0$ Importance factor - ASCE 7-16, Table 1.5-2

$p = 4$ Roof pitch (p:12)

$V_b := 110$ Basic wind speed (mph) for OC IV, Exposure C

$w = 26.7$ Building width without roof overhang (ft)

$l = 48.7$ Building length without roof overhang (ft)

$OH = 4$ Roof overhang (ft), typ

$h_w = 12$ Average wall height (ft)

$h_p := h_w + \left(\frac{w}{2}\right) \cdot \left(\frac{p}{12}\right) + 1 = 17.4$ Total above-grade building height (ft) at roof peak

$h_r := \frac{(h_w + 1) + h_p}{2} = 15.2$ Mean roof height (ft)

$\lambda := 1.26$ Adjustment for bldg height/exposure - ASCE Fig 28.5-1

$P_{s30} := [26.6 \quad -7.0 \quad 17.7 \quad -3.9 \quad -23.1 \quad -16 \quad -16 \quad -12.2 \quad -32.3 \quad -25.3]$

Simplified design wind pressure for structure zones A thru Goh - ASCE Fig. 28.5-1, 110mph, 18.4 deg. roof angle (negative implies uplift)

$P_s := \lambda \cdot I_w \cdot P_{s30}$

$A \quad B \quad C \quad D \quad E \quad F \quad G \quad H \quad E_{OH} \quad G_{OH}$

$P_s = [33.5 \quad -8.8 \quad 22.3 \quad -4.9 \quad -29.1 \quad -20.2 \quad -20.2 \quad -15.4 \quad -40.7 \quad -31.9]$

Adjusted design wind pressures for zones A thru Goh

$a_1 := 0.10 \cdot w \qquad a_2 := 0.4 \cdot h_r \qquad a_3 := 0.04 \cdot w$

$a :=$ if $a_3 < a_2 \wedge a_3 < a_1$ a_3; if $a_2 < a_3 \wedge a_2 < a_1$ a_2; if $a_1 < a_2 \wedge a_1 < a_3$ a_1; if $a_1 < 3 \vee a_2 < 3 \vee a_3 < 3$ 3

$a = 3$ Width of Zones A and B (ft)

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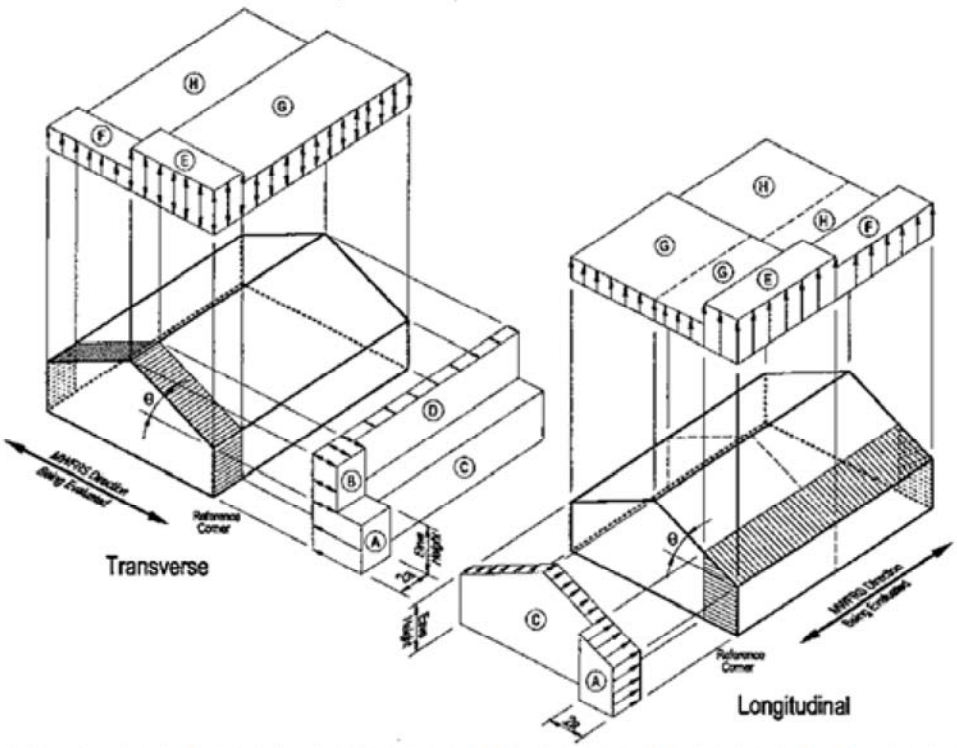

$W_{min} := 16 \cdot (l \cdot h_p)$ $W_{min} = 13585$ Minimum 16 psf Design Wind Load (lbs)

Transverse loading, wind:
Wind loads from top HALF of wall must be considered for roof diaphragm loads.

$$W_T := P_{s_{0,0}} \cdot (2 \cdot a) \cdot \frac{h_w}{2} + P_{s_{0,2}} \cdot (l - (2 \cdot a)) \cdot \frac{h_w}{2} - P_{s_{0,1}} \cdot (2 \cdot a) \cdot (h_p - h_w) - P_{s_{0,3}} \cdot (l - (2 \cdot a)) \cdot (h_p - h_w)$$

$W_T = 8346$ Total transverse load (lbs) to roof diaphragm

Longitudinal loading:
Wind loads from top HALF of wall must be considered for roof diaphragm loads.

$$W_L := P_{s_{0,2}} \cdot w \cdot \frac{h_p + h_w}{2} + \left(P_{s_{0,0}} - P_{s_{0,2}}\right) \cdot (2 \cdot a) \cdot \frac{h_p}{2} = 9343.7$$ Total longitudinal load (lbs)

$W_{design} := \max(W_L, W_T, W_{min})$

$W_{design} = 13585$ lbs

Uplift loading:

$W_{OH} := 0.6 \left(P_{s_{0,9}} \cdot OH\right) = -76.5$ Max uplift (plf) at Zone Eoh

Transverse: Overhang @ trusses

$$W_{T_uplift} := 0.6 \left(P_{s_{0,5}} \cdot \frac{w}{2}\right) + 0.6 \left(12 \cdot \frac{w}{2}\right) + W_{OH} = -141.8$$ Max uplift (plf) at Zone E and Eoh minus 12 psf Truss DL

Need 142plf x 2 = 284 lbs capacity per single truss connection.
Use Simpson H2.5A for roof hold downs @ each truss end. OK for 535 lb each
See attached product sheets

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Lateral Analysis - Seismic - ASCE 7-16

$RC := 4$ — Risk Category from Table 1.5-1

$S_{ds} := 0.8$ — Design short period acceleration (g)

$S_{d1} := 0.357$ — Design long period acceleration (g)

$I_E := 1.5$ — Seismic Importance Factor from Table 1.5-2

$DC :=$ "D" — Seismic design category from Tables 11.6-1 & 2

$R := 5$ — Response Modification factor Table 12.2-1 (Special Reinf. Masonry Shear Walls.)

Equivalent Lateral Force Procedure - ASCE 12.8

$C_t := 0.02$ $\quad x := 0.75$ — Parameters used to calculate fundamental period (ASCE Table 12.8-2)

$T := C_t \cdot h^x \quad T = 0.1$ — Approximate Fundamental Period (sec)

$T_L := 16$ — Long-period transition period, sec (Fig.22-15)

$$C_{max} := \left| \begin{array}{l} \text{if } T \le T_L \\ \quad \left\| \dfrac{S_{d1} \cdot I_E}{T \cdot R} \right. \\ \text{if } T > T_L \\ \quad \left\| \dfrac{S_{d1} \cdot T_L \cdot I_E}{T^2 \cdot R} \right. \end{array} \right. = 1.9$$

Maximum Value of response coefficient (Equations 12.8-3 and 12.8-4)

$$C_s := \left| \begin{array}{l} \text{if } \dfrac{S_{ds} \cdot I_E}{R} \le C_{max} \\ \quad \left\| \dfrac{S_{ds} \cdot I_E}{R} \right. \\ \text{else} \\ \quad \left\| C_{max} \right. \end{array} \right. = 0.2$$

Seismic Response Coefficient (Equation 12.8-5)

$R_w := DL \cdot (w + 2 \cdot OH) \cdot (l + 2 \cdot OH) = 23577$ — Total roof dead load (lbs)

$W_w := \left((2 \cdot l + 2 \cdot w) \cdot h_w + (h_w \cdot w)\right) \cdot CMU = 123436$ — Weight of CMU walls, ignoring openings (lbs)

$W_t := R_w + W_w = 147012.6$ — Total considered building weight (lbs)

$V := C_s \cdot W_t = 35283$ — Seismic Base Shear (lbs)

$\rho := 1.3$ — Redundancy factor for seismic category D (ASCE 12.3.4).

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$E_h := 0.7 \cdot \rho \cdot V = 32108$

Total Horizontal seismic effect (lbs) 0.7 factor for working stress design

$Check :=$ if $E_h > (0.6 \cdot W_{design})$ "SEISMIC CONTROLS" else "WIND CONTROLS"

$Check =$ "SEISMIC CONTROLS"

Roof Diaphragm Design

$V_d := C_s \cdot \left(R_w + \frac{1}{2} \cdot W_w\right) \cdot 0.7 = 14330$

Load to Diaphram (lbs) 0.7 factor for ASD

$w_{ns} := \frac{V_d}{l} = 294$

Uniform lateral load to roof diaphragm applied perpendicular to North/South walls (plf)

$w_{ew} := \frac{V_d}{w} = 537$

Uniform lateral load to roof diaphragm applied perpendicular to East/West walls (plf)

Distribute lateral loads from roof level to shear walls

$v_{ew} := \frac{w_{ns} \cdot l}{2 \cdot w} = 269$

Max diaphragm load over east and west walls (plf)

$v_{ns} := \left(\frac{w_{ew} \cdot w}{2 \cdot l}\right) = 147$

Max diaphragm load over north and south walls (plf)

Use 19/32" sheathing grade diaphragm panels w/ 10D nails @ 6" o.c. over walls and at panel edges. OK for 285 plf.

Diaphragm capacity is reduced by the skylight openings:

$S := \frac{(w - 6)}{w} = 0.78$

Percent Sheathed (%)

$t := 21.5$

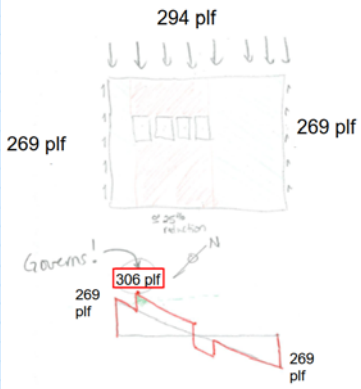
Opening location from centerline of building (ft)

$v_{max} := (v_{ew}) \cdot \left(\frac{t}{l \cdot 0.5}\right) \cdot \frac{1}{S} = 306.2$

Capacity required (plf)

Use blocked diaphragm at the north side of the roof from the wall to the first skylight. OK for 320 plf

Shear - Moment Diagram:



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Check ASCE 12.11.2 for minimum capacity CMU wall to flexible diaphragm

$k_a := min\left(2, w + \frac{w}{100}\right) = 2$ Amplification factor

$w_w := CMU \cdot \frac{h_w}{2} = 348$ Weight of cmu walls tributary to roof anchorage (plf)

$F_p := 0.4 \cdot S_{ds} \cdot k_a \cdot I_E \cdot \frac{w_w}{2} = 167$ Required direct connection capacity for out-of-plane loads (plf)

Out-of-plane anchorage:
- Use Simpson A34 @ 24" o.c., truss to top plate. OK for 400 lbs each, 200 plf > 167 plf

Load Transfer to Walls:
- Use Simpson A34 with #9 x 1 1/2" SD @ 24" o.c., truss to top plate. OK for 550 each, 275 plf > 269 plf

See attached product sheets

CMU Wall Top Plate

5/8" Anchor Bolt Capacity: 2012 NDS Table 11E

$t_s := 1.5$ Side member Thickness (in)

$Z_p := 890$ Bolt PARALLEL design value for 6" embedment depth (lbs)

$Z_{pe} := 470$ Bolt PERPENDICULAR design value for 6" embedment depth (lbs)

$C_D := 1.6$ Load duration factor

$Z_p \cdot C_D = 1424$ Allowable parallel load (lbs)

$Z_{pe} \cdot C_D = 752$ Allowable perpendicular load (lbs)

$S_1 := 32$ Bolt spacing (in)

$C_1 := \frac{Z_p \cdot C_D \cdot 12}{S_1}$ $C_1 = 534$ Parallel capacity based on spacing #1 (plf)

$C_2 := \frac{Z_{pe} \cdot C_D \cdot 12}{S_1}$ $C_2 = 282$ Perpendicular capacity based on spacing #1 (plf)

Use 32" anchor bolt spacing all around. OK for 534 plf parallel > 269 plf
OK for 282 plf perpendicular > 167 plf

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CMU Shear Walls - Amrhein Ch 11, Table T-1

- Wall with most openings is critical

$v_{ns} := \frac{1}{2} \cdot V_d = 7165$ — Total shear load transferred from roof diaphragm from seismic loads (lbs)

$f_m := 1500$ — Compressive strength of CMU (psi)

$v_{allowed} := min\left(35 , \sqrt{f_m}\right) = 35$ — Allowable shear stress in CMU walls (psi)

$b_{CMU} = 7.6$ — Width of CMU (in)

$l_w := 16.75$ — Length of critical wall pier (between door way and louver, west wall) (ft)

$\sigma := \frac{v_{ns}}{b_{CMU} \cdot l_w \cdot 12} = 4.67$ — Max shear stress in wall (psi)

$Check := \text{if } \sigma \le v_{allowed}$ "OK" else "NG"

$Check =$ "OK"

Other walls OK by inspection

Check out of plane loading on wall

- *Assume wall acts as simple span beam*
- *Use seismic pressures for design*

$P_e := 0.4 \cdot S_{ds} \cdot I_E \cdot 58 = 28$ — Max seismic out of plane load to wall (psf)

$M_{max} := \frac{P_e \cdot h_w^{\,2}}{8} = 501.1$ — Maximum bending moment at midspan of wall (ft-lbs/ft)

$d := \frac{7.625}{2} = 3.8$ — Depth to reinforcing (assume centered in wall) (in) (Amrhein E-1B)

$b_{CMU} = 7.6$ — Thickness of CMU block (in)

$K := \frac{M_{max} \cdot 12}{b_{CMU} \cdot d^2} = 54.3$ — Flexural Coefficient

$\rho := 0.002511$ — Reinforcing ratio required (Amrhein E-1B)

$A_s := \rho \cdot b_{CMU} \cdot d = 0.073$ — Required area of reinforcing steel (in^2)

$RST_{std} := 0.307$ — Standard RST with #5 (in^2)

$Check := \text{if } \frac{12 \cdot RST_{std}}{24} \ge A_s$ "OK" else "NG"

$Check =$ "OK"

Standard RST check with #5 @ 24" O.C. (in^2/ft)

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Roof Ventilation Calculations (IBC 1203.2)

Roof and Ridge Dimensions: $w = 26.7$ $l = 48.7$ $l_r := 43.5$

$Area := w \cdot (l)$ $Area = 1298$

$V_{req} := \frac{Area}{150}$ $V_{req} = 8.7$ Total ventilation area required(Sq ft, half must be in upper portion of roof)

$\frac{V_{req}}{2} = 4.3$ Required ventilation in upper portion of roof (sq ft)

$v_{ridge} := \frac{V_{req}}{2} \cdot \frac{144}{l_r} = 14.3$ Required NFVA for ridge vents (in^2/ft)

Provide 20 NFVA per foot in ridge vent

Check requirements for Special Reinforced Masonry per ACI 530-13

Must meet requirements of ACI Chapter 8 (Allowable Stress Design) or 9 (Strength Design).

Must meet requirements of ACI 7.3.2.3.1 (minimum reinforcement).

Provide As .2in min. at corners, edges of openings.

Provide As at bond beams, top and bottom of openings. Shall extend 24" min. past opening.

Must meet requirements of ACI 7.4.3.2.1 (connectors).

Maximum spacing of wall to horizontal elements 200 lb/ft min. and 4 ft. o.c. min.

Must meet requirements of ACI 7.3.2.6 (minimum reinforcement).

Checked on p. 2 of structural calculations.

7.3.2.6 (a/b.) Maximum Spacing of Reinforcement: critical at shortest considered shearwall.

$l_a := \frac{l_w \cdot 12}{3}$ length of the shearwall /3 $l_a = 67$

$l_b := \frac{h_w \cdot 12}{3}$ height of the shearwall/3 $l_b = 48$

$l_c := 48$ 48 inches maximum $l_c = 48$

$l_{max} := min(l_a, l_b, l_c)$ $l_{max} = 48$

(c.) min. cross-sectional area of vertical reinforcement shall be 1/3 the required shear reinforcement.

(d.) shear reinforcement shall be anchored around vertical reinforcing bars with a standard hook.

We are providing #5 @ 24" O.C. Vertical and #5 @ 48" O.C. Horizontal, which exceeds the shear strength requirements per 7.3.2.8.1. The shear strength of the CMU alone is adequate to resist shear loads so no additional shear reinforcement is required. Reinforced bond beams are provided at 48" o.c. maximum and standard detailing (including standard 90 deg. hooks at wall intersections) is adequate.

All requirements are met for use of Special Reinforced Masonry

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Seismic and Hurricane Ties (cont.)

These products are available with additional corrosion protection. For more information, see p. 15.

SS For stainless-steel fasteners, see p. 21.

SD Many of these products are approved for installation with Strong-Drive® SD Connector screws. See pp. 335–337 for more information.

Model No.	Ga.	Fasteners (in.)			DF/SP Allowable Loads			Uplift with 0.131" x 1½" Nails (160)	SPF/HF Allowable Loads			Uplift with 0.131" x 1½" Nails (160)	Code Ref.
		To Rafters/ Truss	To Plates	To Studs	Uplift (160)	Lateral (160) F_1	Lateral (160) F_2		Uplift (160)	Lateral (160) F_1	Lateral (160) F_2		
H1	18	(6) 0.131 x 1½	(4) 0.131 x 2½	—	480	510	190	455	425	440	165	370	IBC, FL, LA
H1.81Z	18	(6) 0.131 x 1½	(4) 0.131 x 2½	—	350	335	195	330	300	290	150	260	—
H2A	18	(5) 0.131 x 1½	(2) 0.131 x 1½	(5) 0.131 x 1½	525	130	55	—	495	130	55	—	IBC, FL, LA
SS H2ASS	18	(5) 0.131 x 1½	(2) 0.131 x 1½	(5) 0.131 x 1½	400	130	55	400	345	130	55	345	—
H2.5A	18	(5) 0.131 x 2½	(5) 0.131 x 2½	—	565	110	110	575	535	110	110	495	IBC, FL, LA
SS H2.5ASS	18	(5) 0.131 x 2½	(5) 0.131 x 2½	—	440	75	70	365	380	75	70	310	—
H2.5T	18	(5) 0.131 x 2½	(5) 0.131 x 2½	—	495	135	145	420	495	135	145	420	IBC, FL, LA
SS H3	18	(4) 0.131 x 2½	(4) 0.131 x 2½	—	400	210	170	415	365	180	145	290	
H6	16	—	(8) 0.131 x 2½	(8) 0.131 x 2½	1,230	—	—	—	1,055	—	—	—	IBC, FL
H7Z	16	(4) 0.131 x 2½	(2) 0.131 x 1½	(8) 0.131 x 2½	830	410	—	—	715	355	—	—	
SS H8	18	(5) 0.148 x 1½	(5) 0.148 x 1½	—	780	95	90	630	710	95	90	510	IBC, FL, LA
H10A Field Bent	18	(9) 0.148 x 1½	(9) 0.148 x 1½	—	855	590	285	—	760	505	285	—	
H10A	18	(9) 0.148 x 1½	(9) 0.148 x 1½	—	1,040	565	285	—	1,015	485	285	—	
SS H10ASS	18	(9) 0.148 x 1½	(9) 0.148 x 1½	—	970	565	170	—	835	485	170	—	—
H10AR	18	(9) 0.148 x 1½	(9) 0.148 x 1½	—	1,050	490	285	—	905	420	285	—	
H10S	18	(8) 0.131 x 1½	(8) 0.131 x 1½	(8) 0.131 x 2½	910	660	215	550	785	570	185	475	IBC, FL, LA
H10A-2	18	(9) 0.148 x 1½	(9) 0.148 x 1½	—	1,080	680	260	—	930	585	225	—	
H11Z	18	(6) 0.162 x 2½	(6) 0.162 x 2½	—	830	525	760	—	715	450	655	—	—
H14	18	(12) 0.131 x 1½	(13) 0.131 x 2½	—	1,275	725	285	—	1,050	480	245	—	IBC, FL, LA
		(12) 0.131 x 1½	(15) 0.131 x 2½	—	1,340	670	230	—	1,050	480	245	—	
TSP	16	(9) 0.148 x 1½	(6) 0.148 x 1½	—	755	310	190	—	650	265	160	—	FL
		(9) 0.148 x 1½	(6) 0.148 x 3	—	1,015	310	190	—	875	265	160	—	

1. See pp. 260–261 for Straps and Ties General Notes.
2. Allowable loads are for one anchor. A minimum rafter thickness of 2½" must be used when framing anchors are used on each side of the joist and on the same side of the plate (exception: connectors installed such that nails on opposite side don't interfere).
3. Allowable DF/SP uplift load for stud-to-bottom plate installation (see detail 15) is 390 lb. (H2.5A); 265 lb. (H2.5ASS); and 310 lb. (H8). For SPF/HF values, multiply these values by 0.86.
4. Allowable loads in the F_1 direction are not intended to replace diaphragm boundary members or cross-grain bending of the truss or rafter members.
5. When cross-grain bending or cross-grain tension cannot be avoided in the members, mechanical reinforcement to resist such forces shall be considered by the Designer.
6. Hurricane ties are shown on the outside of the wall for clarity and assume a minimum overhang of 3½". Installation on the inside of the wall is acceptable (see General Instructions for the Installer, note "s" on p. 18). For uplift continuous load path, install connectors in the same area (e.g., truss-to-plate connector and plate-to-stud connector) on the same side of the wall, unless detailed by designer. See technical bulletin T-C-HTIECON at **strongtie.com** for more information.
7. Southern pine allowable uplift loads for H10A = 1,340 lb. and for the H14 = 1,465 lb.
8. Refer to Simpson Strong-Tie® technical bulletin T-C-HTIEBEAR at **strongtie.com** for allowable bearing enhancement loads.
9. H10S can have the stud offset a maximum of 1" from the rafter (center to center) for a reduced uplift of 890 lb. (DF/SP) and 765 lb. (SPF).
10. H10S nails to plates are optional for uplift but required for lateral loads.
11. Some load values for the stainless-steel connectors shown here are lower than those for the carbon-steel versions. Ongoing test programs have shown this also to be the case with other stainless-steel connectors in the product line that are installed with nails. Visit **strongtie.com/corrosion** for updated information.
12. The allowable loads of stainless-steel connectors match carbon-steel connectors when installed with stainless-steel Strong-Drive® SCNR Ring-Shank Connector nails. For more information, refer to engineering letter L-F-SSNAILS at **strongtie.com**.
13. Allowable DF/SP/SPF uplift load for the H2.25A fastened to a 2x4 truss bottom chord and double top plates using (5) 0.131" x 1½" nails in the top plates and (3) 0.131" x 1½" nails in the lowest three flange holes into the truss bottom chord is 260 lb. (160).
14. For TSP installed stud to single plate see p. 276.
15. **Fasteners:** Nail dimensions in the table are listed diameter by length. See pp. 21–22 for fastener information.

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LTP4/LTP5/A34/A35

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Framing Angles and Plates (cont.)

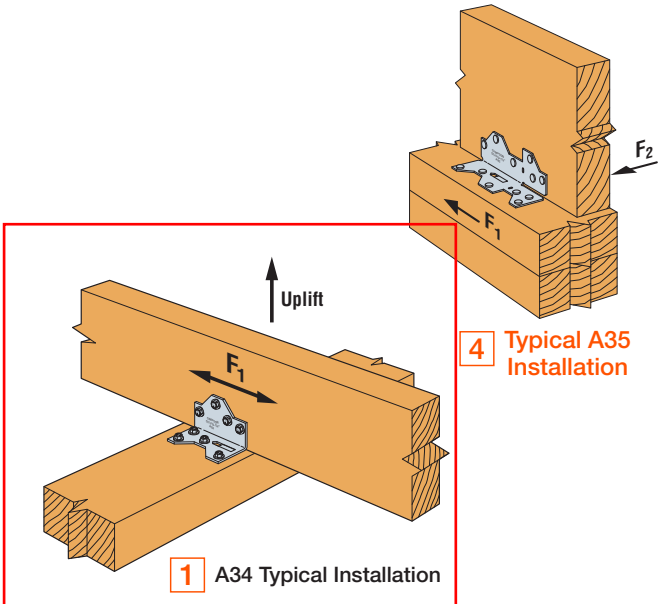
These products are available with additional corrosion protection. For more information, see p. 15.

SS For stainless-steel fasteners, see p. 21.

SD Many of these products are approved for installation with Strong-Drive® SD Connector screws. See pp. 335–337 for more information.

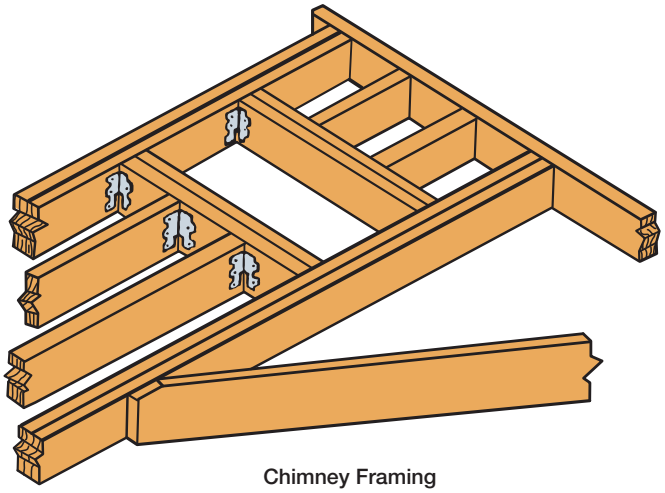
Model No.	Type of Connection	Fasteners (in.)	Direction of Load	DF/SP Allowable Loads			SPF/HF Allowable Loads			Code Ref.
				Floor (100)	Roof (125)	(160)	Floor (100)	Roof (125)	(160)	
	1	(8) 0.131 x 1½	F_1	395	480	545	340	415	480	IBC, FL, LA
			F26	395	430	430	340	370	370	
SS A34	1	(8) #9 x 1½ SD	F_1	640	640	640	550	550	550	
			F_2	495	495	495	425	425	425	
			Uplift	240	240	240	170	170	170	—
A35	2	(9) 0.131 x 1½	A_1	295	350	350	255	300	300	IBC, FL, LA
			E	295	360	385	255	310	330	
			C_1	185	185	185	160	160	160	
SS	3	(12) 0.131 x 1½	A_2	295	325	325	255	280	280	
			C_2	295	330	330	255	285	285	
			D	225	225	225	195	195	195	
	4	(12) 0.131 x 1½	F_1	590	650	650	510	560	560	
			F26	590	670	670	510	575	575	
	5	(12) PH612I	F_1	420	420	420	360	360	360	—
LTP4	6	(12) 0.131 x 1½	G	580	625	625	500	540	540	IBC, FL, LA
			H	525	525	525	450	450	450	
LTP5	7	(12) 0.131 x 1½	G	565	565	565	485	485	485	
			H	490	490	490	420	420	420	

1. Allowable loads are for one angle. When angles are installed on each side of the joist, the minimum joist thickness is 3".
2. Some illustrations show connections that could cause cross-grain tension or bending of the wood during loading if not reinforced sufficiently. In this case, mechanical reinforcement should be considered.
3. LTP4 can be installed over ⅜" wood structural panel sheathing with 0.131" x 1½" nails and achieve 0.72 of the listed load, or over ½" sheathing and achieve 0.64 of the listed load. 0.131" x 2½" nails will achieve 100% load.
4. LTP4 satisfies the IRC continuously sheathed portal frame (CS-PF) framing anchor requirements when installed over raised wood floor framing per Figure R602.10.6.4.
5. The LTP5 may be installed over wood structural panel sheathing up to ½" thick using 0.131" x 1½" nails with no reduction in load.
6. Connectors are required on both sides to achieve F_2 loads in both directions.
7. A34 and A35 installed with 0.131" x 1½" nails onto 1¼" LSL material will achieve 0.90 of the listed F_1 and F_2 loads.
8. **Fasteners:** Nail dimensions in the table are diameter by length. SD screws are Simpson Strong-Tie® Strong-Drive® screws. PH612I is a pan-head #6 x ½" screw available from Simpson Strong-Tie. See pp. 21–22 for other nail sizes and information.



4 Typical A35 Installation

1 A34 Typical Installation



Chimney Framing

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Mechanical Summary — MECH-SUM

2015 Washington State Energy Code Compliance Forms for Commercial Buildings including R2 & R3 over 3 stories and all R1 — Revised January 2017

Project Information

Project Title:	**Judy Reservoir Raw WTP Water Pump Station**
Applicant Information. Provide contact information for individual who can respond to inquiries about compliance form information provided.	
Company Name:	**RH2 Engineering**
Company Address:	**300 Simon St SE, Suite 5, East Wenatchee, WA 98802**
Applicant Name:	**Paul Young**
Applicant Phone:	**509-886-6763**

Date: 1/29/2020

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Project Description

Briefly describe mechanical systems in the text box provided

☐ Total Bldg Performance (TBP)

This path includes all mandatory provisions per C401.2 Option 2. MECH-SUM, MECH-CHK, and C407 Energy Analysis forms required.

☑ New Building ☐ Building Addition ☐ Tenant Improvement ☐ System Retrofit ☐ No System Changes

Design Load Calculations

☑ Load calculation summary ☐ MECH-LOAD-CALC Form

Provide design load calculations for all mechanical systems and equipment serving the building heating, cooling or ventilating needs. If a load calculation summary is provided with the permit documents that includes all applicable compliance information then the MECH-LOAD-CALC form is not required.

Mechanical Schedules

☑ Mechanical Plans ☐ MECH-EQ Forms (TBD)

Indicate location of equipment compliance information. If provided on plans then MECH-EQ forms are not required, however, include on plans all applicable compliance information listed in MECH-EQ tables.

Dedicated Outdoor Air System Requirements and High Efficiency VAV Alternate

☐ DOAS is required per C403.6 effective July 1, 2017 (office, retail, education, library and fire station occupancies)

All occupied, conditioned areas shall be served by a DOAS that delivers required ventilation air in a manner that does not require space conditioning fan operation. Space conditioning fans cycled off when no heating or cooling is

- ☐ Ventilation provided via natural ventilation per 2015 IMC in lieu of DOAS (C403.6, Exception 1)
- ☐ Ventilation and space conditioning provided by a HEVAV system per C403.7 in lieu of DOAS (C403.6, Exception 2)

☐ DOAS included in project, although not required (occupancy not office, retail, education, library or fire station)

☐ DOAS related allowances included in project:

- ☐ Prescriptive vertical fenestration maximum area allowance increased to 40% per C402.4.1.4 with 100% of conditioned floor area in building served by DOAS.
- ☐ Exception to air economizer per C403.3 Exception 1, include MECH-ECONO form.

Fan Power

☑ Project includes HVAC air distribution systems that provide heating and/or cooling

If yes, provide a MECH-FANSYS -SUM form.

☐ For one or more systems, the total fan motor nameplate hp of all fans in HVAC system exceeds 5hp.

If yes, provide a seperate MECH-FANSYS form for each HVAC system exceeding the 5 horsepower threshold. Refer to Section C403.2.11 and MECH-FANSYS-DOC for requirements and exceptions.

HVAC Hydronic Systems

☐ Hydronic chilled water ☐ Water-loop heat pump ☑ No hydronic systems

☐ Hydronic heating water ☐ Geothermal

C406 Additional Efficiency Options - Mechanical

☑ C406.2 More efficient HVAC equipment and fan systems

Requires 90% of heating and cooling capacity to be equipment listed in tables C403.2.3(1)-(9) or air-to-water heat pumps and heat recovery chillers. All equipment listed in tables C403.2.3(1)-(7) must be 15% more efficient than minimum requirements. All stand alone supply, return, and exhaust fans over 1hp must have FEQ ≥ 71 and must be selected within 10% of maximum total or static pressure.

☐ C406.6 Dedicated outdoor air system (DOAS)

Requires 90% of conditioned floor area to be served by a DOAS per C403.6 that delivers required ventilation air in a manner that does not require space conditioning fan operation.

☐ C406.7 Reduced energy in service water heating

Requires 90% of floor area be in occupancy types listed in C406.7.1 and that 60% of annual hot water energy use be provided by heat pump, waste heat recovery or solar water-heating systems.

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Service Water Heating Systems

Equipment Type (s)

- ☐ Hot water heating tank(s)
- ☐ Instantaneous
- ☑ No service water systems
- ☐ Dedicated boiler
- ☐ Heat exchange from space heat boiler or central hot water/steam

Distribution Type (s)

- ☐ Circulation System
- ☐ On-demand

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Commissioning

Commissioning is required for:

- ☐ Mechanical systems per C408.2
- ☐ Service water heating systems per C408.4

If required, commissioning shall be performed for all applicable systems regardless of individual equipment capacity.

Exceptions to commissioning requirements:

- ☑ Total output capacity of all mechanical space conditioning systems in the building do not exceed 240,000 Btu/h cooling or 300,000 Btu/h heating. Mechanical systems commissioning not required.
- ☐ Capacity of largest service water heating system in building does not exceed 200,000 Btu/h. Service water heating systems commissioning not required.

Low Energy and Semi-Heated Spaces (Note 6 and 7) *

Space Type	Location in Plan(s)	Space(s) Served	Area Served, square feet	Heating Capacity, Btu/h (Note 4)	Cooling Capacity, Btu/h (Note 5)	Peak Space Conditioning Capacity, Btu/h-sf	Compliance Check	Notes

Note 4 - Provide total installed heating output capacity of systems serving Low Energy or Semi-Heated space(s) in btuh.
Note 5 - Provide total installed cooling capacity of system serving Low Energy space(s) in Btu/h. Not allowed for semi-heated spaces. Enter 0 if no cooling.
*Note 6 - Refer to Section C402.1.1 Low Energy Building. Intalled peak space conditioning capacity, heating or cooling, may not exceed 3.4 Btu/h*sf.*
*Note 7 - Refer to Section C402.1.1.1 and Semi-Heated Space definition in Chapter 2. Total heating output capacity may not exceed 8 Btu/h*sf. Only systems without electric resistance heating and no cooling are eligible for the wall insulation exception under semi-heated.*

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Mechanical Permit Plans Checklist — MECH-CHK

2015 Washington State Energy Code Compliance Forms for Commercial Buildings including R2 & R3 over 3 stories and all R1 — Revised January 2017

Project Title: Judy Reservoir Raw WTP Water Pump Station — Date 1/29/2020

The following information is necessary to check a permit application for compliance with the mechanical systems and equipment requirements of the Washington State Energy Code, Commercial Provisions.

Applicable (yes,no,na)	Code Section	Code Provision	Information Required - *Must be in permit documents*	Location in Documents	Building Department Notes
Equipment - Sizing, Performance and Type					
NA	C403.1	Exempt process equipment	Identify equipment to be used in manufacturing, industrial or commercial processes that do not provide space conditioning; identify provisions applicable to this equipment per C403.1 exception		
Yes	C403.2.1	Load calculations	Provide load calculations performed per ASHRAE Std 183 or equivalent, using design parameters per C302 and Appendix C; include load adjustments to account for energy recovery	Attached	
Yes	C403.2.2	Equipment and system sizing	Indicate that output capacities of heating and cooling equipment and systems are no greater than the smallest available equipment size that exceeds the calculated loads; note exceptions taken	Plans	
Yes	C403.2.3 C403.2.3.2 C403.2.13.1	HVAC equipment performance requirements (efficiency)	Provide equipment schedules on plans or complete MECH-EQ forms indicating type, capacity, rated and WSEC minimum efficiencies for all heating and cooling equipment; include supply and OSA cfms and operating hours for all air systems; identify heating and cooling equipment that does not have a corresponding WSEC minimum efficiency (manufacturer rated)	Plans	
NA	C405.8 C403.2.14	Electric motor efficiency	List all motors ≥ 1/12 hp (that are not integral to a rated piece of equipment) in the mechanical or electrical equipment schedules on plans; indicate hp, rpm, number of poles and rated efficiency, or exception applied For fractional hp motors (1/12 - 1 hp), indicate whether they are an electronically commutated motor, have rated efficiency of at least 70%, or exception taken		
NA	C403.2.11.1	Fan power limitation	For all HVAC fan systems that provide heating and / or cooling, provide system total nameplate hp in MECH-FANSYS-SUM form For all applicable HVAC systems with total fan motor hp > 5hp, verify fan system motor hp or bhp complies with fan power limits per equations in Table C403.2.11.1(1), provide MECH-FANSYS form for each system		
NA	C403.2.11.2	Motor nameplate hp	For all applicable HVAC systems with total fan motor hp > 5hp, indicate fan motors specified are the smallest available motor hp size greater than fan bhp, note exceptions taken		
NA	C403.2.11.3	Fan efficiency	For all applicable HVAC systems with total fan motor hp > 5hp, identify in equipment schedule all fans required to comply with fan efficiency grade and indicate rated FEG is ≥ 67, or exception taken; indicate these fans are sized so total efficiency is within 15% of the fan maximum total efficiency		
NA	C403.2.11.4	Group R occupancy exhaust fan efficacy	For all exhaust fans < 400 cfm in Group R occupancies, indicate in equipment schedule the fan flow rate and efficacy (cfm/watt), or exception taken; refer to Table C403.2.11.4 (CE-57)		
NA	C403.2.13	Variable flow capacity - fans	For fan motors ≥ 7.5 hp, indicate method of variable flow control (VSD or equivalent method) in equipment schedule, or exception taken; for equivalent method for an HVAC system refer to HVAC System Controls for additional requirements		
NA	C403.2.3	Maximum air cooled chiller capacity	For chilled water plants and buildings with > 500 tons of cooling capacity, indicate air-cooled chiller capacity is ≤ 100 tons, or exception taken		
NA	C403.4	Large capacity cooling systems	For buildings with ≥ 300 tons of cooling capacity, indicate method of multi-stage or variable capacity control (VSD, multiple staged compressors, or max capacity of any single unit < 66% of the total)		
NA	C403.2.3.1	Non-standard water-cooled centrifugal chillers	For water-cooled centrifugal chillers not designed for operation at standard conditions, provide calculations documenting maximum full load and part load rated equipment performance requirements		
NA	C403.2.13.1 C403.4.3.2	Centrifugal fan open-circuit cooling towers	For open-circuit centrifugal fan cooling towers with ≥ 1,100 gpm capacity, indicate cooling towers comply with efficiency requirements for axial fan open circuit cooling towers		
NA	C403.4.2 C403.4.2.5	Large capacity boiler systems	For single boilers with > 500,000 Btu/h capacity, indicate multi-stage or modulating burner For boiler system (single or multiple) with > 1,000,000 Btu/h capacity, indicate turndown ratio per Table C403.4.2.5 and method (multiple single input boilers, modulating boilers, or combination)		
NA	C403.2.13	Variable flow capacity - pumps	For pump motors ≥ 7.5 hp, indicate method of variable flow control (VSD or equivalent method) in equipment schedule, or exception taken; for equivalent method for a hydronic system refer to Hydronic System Controls for additional requirements		
NA	C403.2.3	Gas and oil-fired forced air furnace and unit heaters	For forced air furnaces with capacity ≥ 225,000 Btu/h and all unit heaters, indicate in equipment schedule intermittent ignition or IID, flue or draft damper, and rated jacket loss		
NA	C403.2.4.8	Combustion heating equipment	For combustion heating equipment with output capacity > 225,000 Btu/h, indicate modulating or staged combustion control		
Yes	C403.2.3.3	Packaged electric heating / cooling equipment	Verify all packaged electric equipment with > 6,000 Btu/h cooling capacity and any amount of heating is a heat pump; include in equipment schedules	Plans	
NA	C403.2.12	Heating outside a building	Indicate systems providing heating in non-enclosed outdoor occupied spaces are radiant systems; refer to HVAC System Controls for additional requirements		
NA	C403.2.7.1	Kitchen exhaust hoods	Indicate on plans the type, duty and exhaust air rate of each kitchen hood, refer to HVAC System Controls for additional requirements		
NA	C403.2.4.3	Outdoor supply air, exhaust and relief dampers	Indicate locations of OSA intake, and exhaust and relief outlet dampers on plans; indicate whether dampers are Class 1 motorized, or gravity and exception taken (include leakage rating, cfm/sf); refer to HVAC System Controls for additional requirements for OSA dampers		
NA	C403.2.4.3	Return air dampers	Indicate locations of return air dampers that are integral to economizer operation; verify dampers are motorized; indicate whether dampers are Class 1, or within packaged equipment eligible for leakage rating exception (include leakage rating, cfm/sf)		
NA	C403.2.4.3	Stairway and shaft vent dampers	Indicate location of stairway and shaft vent dampers on plans; verify dampers are Class 1 motorized; refer to HVAC System Controls for additional requirements		
NA	C403.2.4.4	Zone isolation dampers	For systems serving areas > 25,000 sf or spanning more than one floor, that include areas that are expected to be occupied non-simultaneously; identify isolation zone areas on plans and locations of associated isolation dampers in HVAC distribution system; refer to HVAC System Controls for additional requirements		
NA	C403.2.3.4	Humidification	For cooling systems with humidification equipment that are also required to have air economizer, indicate humidifier is adiabatic (direct evaporative or fog atomization), or exception taken		
Additional Efficiency Package Option, More Efficient HVAC Equipment & Fan Performance - Must comply with all 3 provisions to be eligible					
NA	C406.2.1 C403.2.3	HVAC system selection	To comply with additional efficiency package option, calculate the percentage of heating and cooling equipment in the project (based on output capacity) that do not have a corresponding WSEC listed efficiency; shall be less than 10% to comply		
Yes	C406.2.2 C403.2.3	Minimum equipment efficiency	To comply with additional efficiency package option, indicate that all listed heating and cooling equipment have a rated efficiency that exceeds WSEC listed efficiency by at least 15%	Plans	
NA	C406.2.3 C403.2.11.3	Minimum fan efficiency	To comply with additional efficiency package option, indicate rated FEG of stand alone fans is ≥ 71; indicate these fans are sized so the fan efficiency at design conditions is within 10% of the maximum total or static efficiency		
HVAC System Controls					
Yes	C403.2.4.1	Thermostatic controls (thermostats and humidistats)	Indicate locations of thermostatic and humidity control devices and the zones they serve on plans, including perimeter system zones Where adjacent (neighboring) zones are controlled by separate thermostats (including perimeter systems used to offset heat gain or loss), and are connected by permanent openings > 10% of either zone sf area, indicate controls configured to prevent adjacent zones from operating in conflicting modes (one in heat, other in cool); applies to adjacent perimeter zones, adjacent nonperimeter zones, and adjacent perimeter and nonperimeter zones If applying Exception 2 to nonperimeter zones adjacent to perimeter zones, indicate that setpoints and deadband settings in these zones are coordinated so cooling in a nonperimeter zone does not occur until the temperature in that zone is 5°F higher than the adjacent perimeter zone temperature in heating	Plans NA NA	
NA	C403.2.4.1.1	Heat pump supplementary heat	Indicate staged heating operation with compression as the first stage of heating and supplemental heating controlled with outdoor lock-out temperature set to 40°F or less		
Yes	C403.2.4.1.2	Deadband	Indicate zone thermostatic controls configured with 5°F minimum deadband for systems that control both heating and cooling	Specifications	
NA	C403.2.4.1.3	Setpoint overlap restriction (thermostats)	If separate heating and cooling systems with separate thermostatic control devices are used to serve a zone, indicate locations of both thermostatic control devices and the zone they serve on plans Indicate a limit switch, mechanical stop or DDC control with programming to prevent simultaneous heating and cooling		
NA	C403.2.4.2 C403.2.4.2.1 C403.2.4.2.2	Automatic setback and shutdown	Indicate zone thermostatic controls configured with required automatic setback and manual override functions, setback temperatures, and control method (automatic time clock or programmable controls); note exceptions taken		
NA	C403.2.4.2.3	Automatic (optimum) start	Indicate system controls that adjust equipment start time required to bring each area served up to design temperature just prior to scheduled occupancy		
NA	C403.2.4.3	Outdoor supply air dampers	Indicate automatic controls configured to close OSA damper during unoccupied equipment operation; not including economizer cooling, night flush or IMC required OSA / exhaust		

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Mechanical Permit Plans Checklist — MECH-CHK

2015 Washington State Energy Code Compliance Forms for Commercial Buildings including R2 & R3 over 3 stories and all R1 — Revised January 2017

Project Title: **Judy Reservoir Raw WTP Water Pump Station** — Date 1/29/2020

The following information is necessary to check a permit application for compliance with the mechanical systems and equipment requirements of the Washington State Energy Code, Commercial Provisions.

Applicable (yes,no,na)	Code Section	Code Provision	Information Required - *Must be in permit documents*	Location in Documents	Building Department Notes
NA	C403.2.4.3	Stairway and shaft vent dampers	Indicate method of activation of stairway and shaft vent dampers (fire alarm or interruption of power)		
NA	C403.2.4.4	Zone isolation controls	For systems serving areas > 25,000 sf or spanning more than one floor, that include areas that are expected to be occupied non-simultaneously; indicate controls that allow for independent space conditioning of isolation zones; or exception taken		
NA	C403.2.12	Heating outside a building	Indicate occupancy sensing or timer switch controls configured to automatically shut off heating system when area served is unoccupied		
NA	C403.2.4.5	Snow melt systems	Indicate automatic controls configured to shut off system when pavement temperature exceeds 50°F and no precipitation is falling, and when outdoor air temperature exceeds 40°F		
NA	C403.2.4.6	Freeze protection system controls	Indicate automatic controls to shut off system when outdoor temperature exceeds 40°F, or conditions protect fluid from freezing		
NA	C403.2.4.9	Group R1 hotel / motel guest rooms	For hotels and motels with over 50 guest rooms, indicate automatic controls serving guest rooms that are capable of setback (heating) and set-up (cooling) of temperature setpoint by at least 5°F; indicate control method - activated by room entry or occupancy sensor		
NA	C403.2.4.10 C403.2.4.11	Group R2 / R3 dwelling units, Group R2 sleeping units	For primary space conditioning system, indicate 5-2 programmable thermostats capable of two setback periods per day; for all thermostats indicate purpose (heating only, cooling only, or both), required temperature range and at minimum a 10°F deadband; or exception taken		
Yes	C403.2.6 C403.2.11.4	Ventilation	Indicate method of ventilation air delivery (natural or mechanical) for each zone If mechanically delivered, indicate that systems are configured to provide not more than 150% of, but at least the minimum required volume of outdoor air to each zone per IMC, ASHRAE 62.1 or other applicable code (WAC, OSHA, etc); or exception taken If delivered via natural ventilation, identify required elements per IMC including minimum openable area to the outdoors or qualifying adjoining spaces	Plans Specs Plans	
NA	C403.2.6.2	Demand controlled ventilation	Identify spaces > 500 sf with occupant load > 25 people/1,000 sf per IMC; for each space indicate whether it is served by an HVAC system with total design OSA > 3,000 cfm, and / or the system has airside economizer or automatic modulating OSA damper; indicate OSA controls are configured to provide demand controlled ventilation or provide supporting documentation for applied exception		
NA	C403.2.6.3	Occupancy sensors	For gyms, classrooms, auditoriums and conference rooms > 500 sf, indicate occupancy-based OSA control when space is unoccupied and method (closes OSA damper or shuts-off equipment); or alternate means provided to automatically reduce OSA when space is partially occupied		
NA	C403.2.6.4 C403.2.6.4.1	Enclosed loading dock ventilation	For enclosed loading docks, indicate ventilation / exhaust system method of activation (gas detection system for CO and NO2, or occupancy sensors), and control method (staged or modulating)		
NA	C403.2.6.4 C403.2.6.4.2	Enclosed parking garage ventilation	For enclosed parking garages, indicate ventilation / exhaust system activated by gas detection system for CO and NO2, and control method (staged or modulating); or exception taken		
NA	C403.2.7.1	Kitchen exhaust hoods	Provide calculations that show a balanced accounting of total kitchen exhaust (include all hoods) with % of: supply air, transfer air from adjacent spaces, and make-up air; if applicable, indicate that direct make-up air to each hood does not exceed 10% of hood exhaust For kitchens with total hood exhaust exceeding 2,000 cfm, indicate exhaust air rate per Table C403.2.7.1 and compliance method (DCV, energy recovery, or transfer air that would otherwise be exhausted)		
NA	C403.2.7.2	Laboratory exhaust systems	Refer to Systems Requiring Energy Recovery for requirements		
NA	C403.2.13	Variable flow capacity - HVAC system fans	For HVAC fan motors ≥ 7.5 hp, indicate method of variable flow control (VSD, or equivalent control method that reduces design air volume by 50% at 1/3 static design pressure); note exception taken		
NA	C403.3.1	DX air handler variable cooling control (Under Integrated Economizer)	For DX air handlers with economizer and cooling capacity ≥ 65,000 Btu/h, indicate number of cooling stages provided and method (multiple compressors and / or variable speed compressors); indicate minimum displacement (capacity reduction) as % of full load Indicate control method (cooling capacity controlled in response to space temperature, space temperature controlled by modulating supply airflow, or both)		
NA	C403.2.11.5	Fan airflow control	For DX air handling units with cooling capacity ≥ 65,000 Btu/h and evaporative and chilled water air handling units with fan ≥ 0.25 hp, indicate whether system is single zone or multiple zone and related control method (cooling capacity controlled in response to space temperature, space temperature is controlled by modulating supply airflow, or both) For mechanical cooling systems (includes DX and chilled water coils) that control cooling capacity in response to space temperature - Provide a minimum of two stages of fan control; indicate minimum fan speed is ≤ 66% of full speed drawing ≤ 40% of full speed fan power during periods of low cooling or ventilation only For other mechanical cooling systems (includes DX and chilled water coils) that control space temperature by modulating airflow (in lieu of, or in addition to, controlling capacity in response to space temperature) - Provide fan controls for modulating supply airflow; indicate minimum fan speed is ≤ 50% of full speed drawing ≤ 30% of full speed fan power during periods of low cooling or ventilation only; or exception taken		
NA	C403.2.4.12	DDC system capabilities	Provide central and zone level DDC controls as required based on system application, capacity or size thresholds and other qualification per Table C403.2.4.12.1 Identify all DDC system input / output control points; indicate capability for trending and graphical display		
Ducting Systems					
NA	C403.2.8.1 C403.2.8.3	Duct construction	Indicate on plans that all ductwork is constructed and sealed per IMC For OSA ductwork, also indicate on plans that ductwork meets air leakage requirements per C402.5 and vapor retarder requirements per the IBC		
NA	C403.2.8.3	Duct pressure classifications	Identify location of low, medium and high pressure ductwork on plans		
NA	C403.2.8.3.3	High pressure duct leakage test	Indicate high pressure duct leakage testing requirements on plans; provide test results to jurisdiction when completed		
NA	C403.2.8.1 C403.2.8.2	Duct insulation	For supply and return ductwork located in unconditioned space or outdoors, indicate R-value of insulation on ductwork on plans; identify climate zone; note exceptions taken For supply ductwork located in conditioned space, identify if design supply temperature is < 55°F or > 105°F and indicate R-value of insulation on this ductwork on plans; note exception taken For OSA ductwork, shafts and plenums, indicate R-value of insulation on these elements on plans per Table C402.1.3 for steel-framed walls; note exception taken		
Piping Systems					
NA	C403.2.9	Piping insulation	Indicate design temperature range of fluid conveyed in piping and thickness of insulation (in inches) on hydronic piping plans; or exception taken		
NA	C403.2.9.1	Piping insulation exposed to weather	Indicate method of protection of pipe insulation from damage / degradation on hydronic piping plans		
Economizers					
No	C403.3	Air economizer required	Identify in equipment schedules on plans or in MECH-EQ forms all cooling systems requiring air economizer controls Provide MECH-ECONO form indicating systems utilizing air economizer exceptions, including those with water-side economizer in lieu of air economizer; indicate on plans eligible exception(s) taken and measures to comply with exception(s)	Plans Plans	
NA	C403.3.1	Integrated economizer operation - air and water	Indicate air and water-side economizers are configured for partial cooling operation even where additional mechanical cooling is required to meet the load		
NA	C403.3.2	Economizer heating system impact - air and water	Verify control method of HVAC systems with economizers does not increase building heating energy usage during normal operation		
NA	C403.3.3.1	Air economizer capacity	Indicate modulating OSA and return air dampers are configured to provide up to 100% OSA for cooling		
NA	C403.3.1 C403.3.3.2	Integrated air economizer	Verify mechanical cooling controls are interlocked with air economizer controls so the outside air damper remains in 100% open position when mechanical cooling is also required to meet the cooling load, until the leaving air temperature is < 45°F For systems with cooling capacity ≥ 65,000 Btu/h, verify that control of economizer dampers is not based only on mixed air temperature; or exception taken		
NA	C403.3.3.3	Air economizer high limit controls	Indicate high limit shut-off control method and required high limit per Table C403.3.3.3		
NA	C403.3.4.1	Water economizer capacity	For eligible systems where water-side economizer may be provided in lieu of air economizer, indicate system is capable of 100% design cooling capacity at 50°F db / 45°F wb OSA temperatures		
NA	C403.3.4.2	Water economizer maximum pressure drop	Indicate pressure drop across precooling coils and heat exchangers in water economizer system do not exceed pressure drop limit		
NA	C403.3.1	DX air handling equipment control	For DX air handlers with economizer and cooling capacity ≥ 65,000 Btu/h, refer to HVAC System Controls for requirements		

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Applicable (yes,no,na)	Code Section	Code Provision	Information Required - *Must be in permit documents*	Location in Documents	Building Department Notes
NA	C403.2.4.7	DX equipment economizer fault detection and diagnostics	For DX air handlers with economizer and cooling capacity ≥ 54,000 Btu/h, provide a fault detection and diagnostics (FDD) system to monitor economizer system operation and report faults		
Systems Requiring Energy Recovery					
NA	C403.5.1	Energy recovery (ER) - ventilation / exhaust systems	For systems with design OSA > 5,000 cfm, or design supply air cfm and % OSA exceeding the values in Tables C403.5.1(1) or (2), indicate exhaust air ER method; or exception taken with supporting calculations For rooms served by multiple systems with aggregate design OSA > 5,000 cfm, or aggregate design supply air cfm and % OSA exceeding the values in Tables C403.5.1(1) or (2), indicate exhaust air ER method; or exception taken with supporting calculations Indicate ER rated effectiveness that increases OSA enthalpy by ≥ 50% based on delta between OSA and return air enthalpies at design conditions		
NA	C403.2.7.2	Laboratory exhaust systems (energy recovery)	For buildings with total lab exhaust > 5,000 cfm, indicate method of energy recovery used to pre-condition laboratory make-up air; ER effectiveness (min 25°F); or alternative method per exception (VAV exhaust, semi-conditioned makeup, or CERM calculation)		
NA	C404.10.4 (under C404.11)	Pools and permanent spas exhaust systems (energy recovery)	For buildings with pools or spas with water surface area > 200 sf, indicate exhaust air ER method and use of waste heat (preheat ventilation air, pool water or service hot water); or exception taken Indicate ER system has the rated effectiveness and is configured to decrease the exhaust air temperature at design conditions by ≥ 36°F		
NA	C403.5.2	Energy recovery - steam condensate systems	For buildings with on-site steam heating systems, indicate condensate water ER For buildings that use off-site generated steam where condensate is not returned to the source, indicate on-site condensate water ER		
NA	C403.5.3	Energy recovery - cooler / freezer condensers	For buildings with food service, meat or deli departments that have ≥ 500,000 Btu/h of remote refrigeration capacity for coolers / freezers, indicate condenser ER and use of captured energy (service water heating, space heating, or dehumidification reheating) For buildings with ≥ 40,000 sf conditioned floor area and with ≥ 1,000,000 Btu/h of remote refrigeration capacity for coolers / freezers, indicate condenser ER and use of captured energy for service water heating and also for space heating, or dehumidification reheating		
NA	C403.5.4	Energy recovery - condenser systems	For buildings with 24-hour operation and with > 1,500,000 Btu/h of heat rejection capacity and design service hot water load > 250,000 Btu/h, indicate condenser ER to pre-heat service water; or exception taken. Provide calculations showing the amount of recovered heat that is utilized (60% of peak heat rejection load or pre-heat service water to 85°F).		
Hydronic System Controls					
NA	C403.2.13 C403.4.2.7	Variable flow control - hydronic system pumps	For hydronic system pump motors ≥ 7.5 hp, indicate method of variable flow control (VSD or equivalent method that requires ≥ 30% design wattage at 50% design fluid flow); note exception taken Identify whether hydronic coils have DDC controls and associated manner of pump speed control (differential pressure, zone hydronic demand, etc)		
NA	C403.2.5 C403.4.2.4	Hydronic system setback and part load controls	For boilers that provide building heating, indicate controls that provide heating water temperature setback based on outdoor temperature For heating and chilled water systems ≥ 300,000 Btu/h, indicate systems are configured to automatically reset supply water temperature based upon demand; or exception taken. If system pump motor hp ≥ 3 hp, also indicate controls automatically reduce flow by ≥ 50%. For chilled water systems (≥ 300,000 Btu/h, pump motor hp ≥ 3 hp) that serve water-cooled unitary air conditioners, indicate VSD or staged pumps in chilled water system and heat rejection loop that reduce pump flow so that one control valve is nearly wide open, or to maintain a minimum differential pressure; or exception taken		
NA	C403.4.2	Boiler sequencing	Indicate automatic controls that sequence operation of multiple boilers		
NA	C403.4.6	Hot gas bypass limitation	For cooling equipment with hot gas bypass, provide either multiple step unloading or continuous capacity modulation; indicate bypass capacity per Table C403.4.6		
NA	C403.4.2.2	Two-pipe changeover systems	Indicate changeover deadband (min 15°F), heating / cooling mode scheduling and changeover temperature range (limit 30°F)		
NA	C403.4.2.6	Chiller / boiler plant pump isolation	Indicate controls are configured to automatically reduce overall plant flow and shut-off flow through individual chillers and boilers when not in use		
NA	C403.2.13.1.1 C403.4.3.1.1 C403.4.3.1.2	Heat rejection equipment - variable flow control	For cooling towers with fan motors ≥ 7.5 hp, indicate VSD and method to adjust fan speed (adjusted based on leaving fluid temperature or condenser temperature / pressure of heat rejection device) For multiple-cell heat rejection equipment with VSD, indicate controls that ramp all fans in unison		
NA	C403.4.3.3	Heat rejection equipment - cooling tower flow turndown	Indicate open-circuit cooling towers with multiple pumps or VSD control are designed so all cells can be run in parallel		
NA	C403.4.2.3.1	Water loop heat pump - deadband	Indicate capability of central equipment to provide minimum 20°F water supply temperature deadband between heat rejection and heat addition modes; or exception taken		
NA	C403.4.2.3.2.1	Water loop heat pump - heat rejection equipment, Zone 4	Indicate type of cooling tower (open- or closed-circuit) in equipment schedule; indicate method used to limit system heat loss when heat rejection is not needed		
NA	C403.4.2.3.2.2	Water loop heat pump - heat rejection equipment, Zone 5	For open- or closed-circuit cooling towers, provide a heat exchanger that separates the cooling tower and heat pump loop		
NA	C403.4.2.3.3	Water loop heat pump - isolation valves	For hydronic heat pump systems with total system power > 10 hp, indicate 2-way isolation valves on each heat pump and variable flow system control		
Dedicated Outdoor Air Systems (DOAS) - Optional through 6/30/16, Prescriptive 7/1/2016					
NA	C403.6 C403.6.3	Dedicated outdoor air systems	For buildings with office, retail, education, library and fire station spaces, identify these spaces on plans; indicate that ventilation air in each occupied space is provided via a DOAS system; or document compliance with C403.6.3 Impracticality; or exception taken (buildings complying with C402.4.1.4 or C406.6 may not utilize exceptions)		
NA	C403.6.1	Energy recovery ventilation with DOAS	For all DOAS systems, indicate exhaust air ER method; or exception taken with supporting calculations. Indicate ER rated effectiveness that increases OSA enthalpy by ≥ 50% based on delta between OSA and return air enthalpies at design conditions.		
NA	C403.6.2	Heating / cooling system controls with DOAS	Indicate equipment associated with the delivery of zone level heating and cooling (fans, hydronic pumps, primary air dampers, etc) are configured to shut off, and central equipment is configured to turn down, when there is no call for heating or cooling in the zone they serve If applying Exception to heating / cooling fans used for air mixing in the space during deadband periods, include fan watts per cfm in equipment schedule		
NA	C402.4.1.4 C403.6	Increased prescriptive maximum vertical fenestration area with DOAS	Indicate that all occupied, conditioned spaces are served by a DOAS per C403.6		
Additional Efficiency Package Option, Dedicated Outside Air Systems (DOAS)					
NA	C406.6	Building provided with DOAS	To comply with additional efficiency package option, indicate that 90% or more of all occupied, conditioned spaces are served by a DOAS per C403.6		
Multiple Zone Air Systems					
NA	C403.4.4	Air systems serving multiple zones	Identify supply air systems serving multiple zones and the zones they serve on plans; indicate whether system is VAV and method of primary air control; or provide supporting documentation for applied exception to VAV		
NA	C403.4.4	VAV systems serving multiple zones	Provide equipment schedules on plans or MECH-EQ form that list all VAV air terminals and types For each air terminal include: maximum airflow rates for primary supply air during zone peak heating and zone peak cooling; maximum airflow during reheating, recooling or mixing; minimum airflow rate to maintain required ventilation, and the basis for these values; if IMC or ASHRAE 62.1 multiple zone equation is basis for minimum flow rates, provide calculation on plans		
NA	C403.4.4.1	Single duct VAV terminal units	Indicate single duct terminal units are configured to reduce primary supply air before reheating or recooling		
NA	C403.4.4.2	Dual duct systems - terminal units	For systems with separate warm air and cool air ducts, indicate terminal units are configured to reduce the flow from one duct to minimum before mixing with air from the other duct		
NA	C403.4.1.1 C403.4.1.2	VAV system static pressure sensors - sensors and DDC set points	Indicate locations of duct static pressure sensors on plans; include at least one sensor per major duct branch; verify controller setpoint pressure at each sensor is ≤ 1.2 inch w.g. For systems with zone level DDC, indicate controls are configured to monitor zone damper positions and reset static pressure setpoint based on the zone requiring most pressure; include control logic that automatically detects and generates an alarm if any zone excessively drives reset logic, and allows building operators to exclude zones from reset logic		

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Mechanical Permit Plans Checklist — MECH-CHK

2015 Washington State Energy Code Compliance Forms for Commercial Buildings including R2 & R3 over 3 stories and all R1 — Revised January 2017

Project Title: **Judy Reservoir Raw WTP Water Pump Station** — Date 1/29/2020

The following information is necessary to check a permit application for compliance with the mechanical systems and equipment requirements of the Washington State Energy Code, Commercial Provisions.

Applicable (yes,no,na)	Code Section	Code Provision	Information Required - *Must be in permit documents*	Location in Documents	Building Department Notes
NA	C403.4.4.3	Multiple-zone VAV system ventilation optimization controls	For systems with zone level DDC controls, indicate controls are configured to automatically reduce outdoor airflow in response to changes in system ventilation efficiency; or exception taken		
NA	C403.4.4.4	VAV system supply air reset	Indicate controls automatically reset supply air temperature in response to building loads or outdoor air temperature; or exception taken		
Multiple Zone HVAC Systems, High Efficiency VAV - Required for systems utilizing C403.6 DOAS Exception 2, must comply with all 16 provisions					
NA	C403.7, Item 1	Air economizer	Indicate system is configured for 100% air economizer operation and complies with all related economizer requirements per C403.3 (without economizer exceptions)		
NA	C403.7, Item 2	Direct digital controls (DDC)	Provide DDC controls for all components of system; identify all DDC system input / output control points; indicate capability for trending and graphical display		
NA	C403.7, Item 3	Outdoor airflow measurement and reduction	For systems with minimum OSA > 2,500 cfm, indicate outdoor airflow monitoring station that measures OSA intake under all load conditions; indicate control sequence that increases or reduces system OSA cfm based on VAV terminal feedback of ventilation efficiency (per C403.4.4.3 without exceptions) or DCV (per C403.2.6.2)		
NA	C403.7, Item 4	Supply airflow measurement	For systems with minimum OSA > 2,500 cfm, indicate supply airflow monitoring station capable of measuring supply air delivered to VAV terminals under all load conditions		
NA	C403.7, Item 5	Zone isolation and maximum area served	Verify maximum area served by a single HEVAV system is ≤ 50,000 sf, or one entire floor, whichever is greater; in addition if a system serves > 25,000 sf, that includes areas that are expected to be occupied non-simultaneously, indicate zone isolation controls per C403.2.4.4		
NA	C403.7, Item 6	Interior / exterior zone design supply air temperature	Verify that VAV terminals serving interior cooling driven loads are sized per design supply air temperature that is 5°F higher than VAV terminals serving exterior zones		
NA	C403.7, Item 7	Maximum air terminal inlet velocity	Identify air terminals with minimum primary airflow setpoints > 50% of maximum setpoint in equipment schedule or MECH-EQ form; indicate air terminal inlet velocity does not exceed 900 fpm		
NA	C403.7, Item 8	Sequence of operation	Indicate DDC system sequences of operation are designed and configured per ASHRAE GPC 36		
NA	C403.7, Item 9	Maximum allowable system brake horsepower	Verify fan system bhp is ≤ 90% of the bhp limit per Option 2 equation in Table C403.2.11.1(1), provide MECH-FANSYS form for each system		
NA	C403.7, Item 10	Fan-powered terminal unit motor and control	Indicate all series and parallel terminal fans have electronically commutated motors; indicate DDC control system is configured to vary air terminal fan speed as a function of the load; indicate fan speed during periods of low heating, low cooling, or ventilation only is ≤ 66% of peak design air flow or provide supporting documentation for applied exception		
NA	C403.7, Item 11	Application of single duct and fan-powered terminal units	Indicate VAV terminal types on plans; verify fan-powered terminal units only serve perimeter zones with envelope loads; verify all other zones are served by single duct terminal units		
NA	C403.7, Item 12	Fan-powered terminal unit primary air reset	Indicate DDC controls are configured to automatically reset the primary supply air cfm setpoint of all fan-powered terminal units to the minimum required to maintain ventilation during occupied heating or deadband, based upon the VAV air handling unit OSA ventilation fraction		
NA	C403.7, Item 13	High occupancy space controls	For spaces > 150 sf with occupant density ≥ 25 people / 1000 sf, indicate space is served by a dedicated terminal unit with DCV control that resets terminal unit ventilation setpoint; also indicate occupancy sensor control that automatically reduces minimum ventilation to zero and sets back room heating and cooling setpoints by ≥ 5°F		
NA	C403.7, Item 14	Dedicated HVAC systems	For server, electronic equipment, telecom or similar spaces with cooling loads > 5 W/sf, indicate spaces are served by independent HVAC systems that are separate from HPVAV systems serving rest of building; indicate dedicated HVAC systems have air economizer controls or energy recovery per C403.3 Exception 9		
NA	C403.7, Item 15	Central plant efficiency	Indicate whether systems are served by a high efficiency heating water plant, or a high efficiency chilled water plant If complying via high efficiency heating water plant: Indicate all VAV terminals have hydronic heating coils served by heating water system with either gas-fired boiler(s) with thermal efficiency ≥ 90%, air-to-water heat pumps, or heat recovery chillers If complying via high efficiency chilled water plant: Indicate all VAV air handlers have cooling coils served by chillers with rated IPLV efficiency that exceeds WSEC listed IPLV by at least 25% per Table C403.2.3(7) (note water-cooled IPLV is max, all others are min); indicate smallest chiller or compressor in plant is ≤ 20% of total plant capacity, or provide thermal storage sized for ≤ 20% of total plant capacity		
NA	C403.7, Item 16	Fault detection and diagnostics	Indicate DDC system includes a fault detection and diagnostics (FDD) system configured to monitor operation and provide fault reporting of required parameters for all VAV air handlers and VAV air terminal units in the HPVAV system		
HVAC Equipment Energy Use Metering					
NA	C409.3.1	HVAC equipment energy use metering	For new buildings > 50,000 sf and building additions > 25,000 sf, verify energy use metering of all equipment used to provide space heating and cooling, dehumidification and ventilation will be provided per C409; indicate equipment eligible for exception		
Documentation and System Specific Requirement To Support Commissioning					
NA	C408.2	Scope of mechanical systems commissioning	Indicate that all mechanical systems, equipment, and controls for which the WSEC requires control functions and / or configuration to perform specific functions are required to be commissioned; For buildings with ≥ 240,000 Btu/h total output cooling capacity or ≥ 300,000 Btu/h total output heating capacity, indicate that all mechanical systems regardless of individual capacity are required to be commissioned; or provide building heating / cooling capacity calculation demonstrating eligibility for exception		
NA	C403.2.10 C408.1.1 C408.1.2 C408.1.4.2 C103.6	Commissioning requirements in construction documents	Indicate in plans and specifications that Cx per C408 is required for all applicable mechanical systems; Include general summary with at a minimum of Items 1 thru 4 of the Cx plan per C408.1.2 including: narrative description of activities, responsibilities of the Cx team, schedule of activities including verification of project close out documentation per C103.6, and conflict of interest plan (if required); Include in general summary that a Cx project report or Compliance Checklist (Figure C408.1.4.2) shall be completed by the Certified Cx Professional and provided to the owner prior to the final mechanical inspection.		
NA	C408.2.2	Air system and hydronic system balancing	Indicate in plans that air and fluid flow rates shall be tested and balanced within the tolerances defined in the specifications; indicate systems shall be balanced in a manner to first minimize throttling losses, then adjusted to meet design flow conditions		
NA	C408.2.2.1	Air system balancing devices	Indicate devices that provide the capability to balance all supply air outlets, zone terminals and air handling equipment requiring system balancing		
NA	C408.2.2.2	Hydronic system balancing devices	Indicate devices that provide the capability to isolate, balance and measure flow across all hydronic equipment requiring system balancing including heating and cooling coils and pumps		
NA	C408.2.3	Functional performance testing criteria	Identify in plans and specifications the intended operation of all equipment and controls during all modes of operation, including interfacing between new and existing-to-remain systems		
Project Close Out Documentation					
NA	C103.6	Documentation and project close out submittal requirements	Indicate in plans that project close out documentation and training of building operations personnel is required for all mechanical components, equipment and systems governed by this code; indicate close out documentation shall include: record documents, O&M manuals, applicable WSEC compliance forms and calculations		

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Economizer Exceptions — MECH-ECONO

2015 Washington State Energy Code Compliance Forms for Commercial Buildings including R2 & R3 over 3 stories and all R1 Revised January 2017

Project Title: Judy Reservoir Raw WTP Water Pump Station

Date 1/29/2020

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All cooling systems shall be configured to provide air economizer operation, regardless of system capacity, for new construction and mechanical system alterations. Various exceptions to this requirement are available. Identify all systems that an economizer exception will be applied to and additional information as noted below.

Economizer Exception Summary

Refer to Section C403.3 for descriptions of economizer provisions and exceptions. For alterations refer to Section C503.4 and Table C503.4.

ECONOMIZER EXCEPTIONS - NEW CONSTRUCTION AND ADDITIONS

Exp 1 *Cooling equipment serving spaces that are provided with a dedicated outdoor air system (DOAS) per C403.6.* Spaces served shall have year-round design cooling loads from lights and equipment less than 5 watts per square foot.

System ID	Lighting + Equipment Loads (W/sf)

Exp 2 *Single zone unitary or package systems with dehumidification* that affect other systems such that air economizer would increase energy consumption.

System ID	

Exp 3 *High efficiency single zone unitary or packaged systems.* Equipment cooling efficiency shall be better than the WSEC required minimum efficiency by at least 64% in Climate Zone 4C and 59% in Climate Zone 5B per Table C403.3.

System ID	

Exp 4 *Equipment that provides hydronic chilled water for chilled beams and chilled ceiling systems* that is served by a water economizer system per C403.3.4 in lieu of air economizer.

System ID	

Exp 5 *Water-source heat pumps with heat recovery.* Heat pump efficiency shall be 15% better than WSEC required minimum efficiency. Provide at minimum 60% air economizer. Energy recovery to preheat OSA shall have at least 50% effectiveness. Additional system requirements apply.

System ID	

Exp 6 *Cooling equipment serving Group R occupancies.* Per unit limit is less than 20,000 Btu/h cooling capacity for equipment installed outdoors or in a mech room adjacent to the outdoors. For cooling equipment installed in other locations the unit limit is less than 54,000 Btu/h. Efficiency shall be 15% better than WSEC required minimum efficiency.

System ID	Equipment Location	Cooling Capacity (Btu/h)

Exp 7 *Variable refrigerant flow (VRF) systems with energy recovery.* Outdoor unit shall be a reverse-cycle heat pump with variable speed compressor(s) and condenser fan(s). Outdoor unit cooling capacity shall be not less than 65,000 Btu/h. Energy recovery to preheat outdoor air shall have at least 50% rated effectiveness. System shall be capable of providing simultaneous heating and cooling by tranferring recovered energy from zone(s) in cooling mode to other zone(s) that are in heating mode.

Outdoor Unit System ID	Cooling Capacity (Btu/h)

Exp 8 *Cooling equipment serving Controlled Plant Growth Environments.* Equipment cooling efficiency shall be better than WSEC required minimum efficiency by at least 20%. Not eligible: unitary and applied heat pumps.

System ID	SEER, EER, & IEER

Exp 9 *Cooling equipment with energy recovery.* Spaces served shall have year-round design cooling loads from lights and equipment greater than 5 watts per square foot. Energy recovery system shall utilize recovered energy for on-site space heating or preheating of service hot water. Provide calculations to the code official that demonstrate the amount of recovered energy used for on-site heating purposes is equivalent to the annual energy that would be saved by the cooling system with air

System ID	Lighting + Equipment Loads (W/sf)

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annual energy that would be saved by the cooling system with an economizer per C403.3.

Economizer Exceptions, cont. MECH-ECONO

2015 Washington State Energy Code Compliance Forms for Commercial Buildings including R2 & R3 over 3 stories and all R1 Revised January 2017

Project Title: Date 1/29/2020

Economizer Exception Summary

Refer to Section C403.3 for descriptions of economizer provisions and exceptions. For alterations refer to Section C503.4 and Table C503.4.

ECONOMIZER EXCEPTIONS - NEW CONSTRUCTION AND ADDITIONS, CONTINUED

Exp 10 *Cooling equipment for dedicated server, electronic equipment or telecom switch rooms.* Per building limit for this exception is 240,000 Btu/h cooling capacity or 10% of required building air economizer capacity, whichever is greater. Part load control required over 85,000 Btu/h. Additional requirements apply.

Option a - Cooling equipment efficiency shall be 15% better than the WSEC required minimum efficiency..

Option b - Waterside economizer required. Cooling equipment efficiency shall be 5% better than the WSEC required minimum efficiency.

Option c - Waterside economizer required. All cooling equipment is subject to ASHARE Standard 127.

System ID	Compliance Option	Cooling Capacity (Btu/h)
HP-1	Option a	36,000
HP-2	Option a	36,000
HP-3	Option a	24,000

Total Claimed Exempt Capacity: 96,000

Total building air economizer capacity (if claimed > 240 kBtu/h):

Alternate Exp 10 Capacity Limit:

ECONOMIZER EXCEPTIONS - MECHANICAL SYSTEM ALTERATIONS OR REPLACEMENT

C503.4 Exp 1 *Pre-approved design alternative to full compliance with air economizer requirement.* An alternative for mechanical system alterations where existing building constraints make full compliance with air economizer requirement impractical. Provide calculations to the code official that demonstrate the proposed alternate design strategy provides similar energy savings to the annual energy that would be saved by the cooling system with air economizer per C403.3.

System ID	Alt. Strategy

ECONOMIZER EXCEPTIONS - SIMPLE SYSTEMS

C503.4 Exp 2 *Qualifying small equipment.* Per unit limit less than 33,000 Btu/h. Per building limit for this exception is 72,000 Btu/h cooling capacity or 5% of required building air economizer capacity, whichever is greater. Cooling equipment efficiency shall be 15% better than WSEC required minimum efficiency. Not eligible: non-unitary equipment, unitary equipment installed outdoors or in mech room adjacent to outdoors, equipment installed during new construction, shell-and-core construction, or initial tenant improvement.

System ID	Cooling Capacity (Btu/h)

Total Claimed Exempt Capacity:

Total building air economizer capacity (if claimed > 72,000 Btu/h):

Alternate C503.4 Exp 2 Capacity Limit:

C503.4 Exp 3 *Equipment that provides hydronic chilled water for chilled water terminal units.* Equipment part load cooling efficiency (IPLV) shall be better than WSEC required minimum efficiency by at least 25%. Per building limit for this exception is 480,000 Btu/h cooling capacity or 20% of required building air economizer capacity, whichever is greater. Chilled water terminal units serving Group R occupancies are not included in the building capacity total.

System ID	Cooling Capacity (Btu/h)

Total Claimed Exempt Capacity:

Total building air economizer capacity (if claimed > 480,000 Btu/h):

Alternate C503.4 Exp 3 Capacity Limit:

Table C503.4 *Compliance Options for alteration or replacement of existing mechanical cooling equipment per Table C503.4.* Refer to table and all applicable table footnotes for full requirements. Applies to the following retrofit conditions:

Option a - Any new or replacement equipment

Option b - Replacement equipment of same type with same or smaller cooling output capacity.

Option c - Replacement equipment of same type with large cooling output capacity.

Option d - New equipment added to existing system or replacement equipment that is different than existing

System ID	Equipment Type	Compliance Path

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Mechanical Fan System Power Allowance — MECH-FANSYS

2015 Washington State Energy Code Compliance Forms for Commercial Buildings including R2 & R3 over 3 stories and all R1 Revised January 2017

Project Title:	Judy Reservoir Raw WTP Water F	Date	1/29/2020

A separate MECH-FANSYS form must be completed for every HVAC system that exceeds the 5 hp threshold.

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Fan System ID		
System Supply Fan Speed Control		*Constant Volume (CV), Variable Air Volume (VAV), or Hospital/Lab CV system that qualifies for VAV budget per C403.2.11.1, Exception 1*
Compliance Option		*Compliance is based upon either the fan motor nameplate horse power (Option 1), the fan brake horsepower (Option 2), or C403.7 high efficieny VAV fan brake horsepower (10% less than Option 2). The bhp calculation provides adjustments for special equipment per Table C403.2.11.1(2).*
Fan System Supply CFM Total	-	*In Fan Equipment Schedule below, provide maximum design supply airflow rate (CFM) of all supply fans serving the conditioned space in Fan Equipment Schedule below. Fan System CFM Total is the supply airflow of the central air handler at peak design conditions. Additional volumetric air flow provided at zone fan terminals, booster fans, or through induction is not included in the supply CFM total. However, the fan power of this equipment is included in the HP and BHP calculations.* ***Fan System Supply CFM Total is automatically calculated by the form.***

Fan Equipment Schedule

Fan ID and Location	Fan Type	Quantity of Fan Type	Total CFM (Note 1)	Total Nameplate HP (Note 2)	Total BHP (Note 3)

Note 1 - Total CFM is the maximum CFM of the listed fan(s) when operating at peak design operating conditions.
Note 2 - Total namplate hp of the listed fan(s).
Note 3 - Total brake horsepower (bhp) of the listed fan(s) at peak design operating conditions. Not required if Nameplate HP compliance option chosen.

Total Proposed:

Total Allowance:

Compliance Message:

Brake Horsepower Allowance Adjustments

Device Type	Description and Location	CFM thorough this device (CFMD)	Assigned Pressure Drop, PD in w.c. (Note 6)	Calculated Pressure Drop, PD in w.c. (Note 7)	Adjustment, A in bhp (Note 8)

Total Adjustment (bhp):

Note 4 - Bhp allowance for energy recovery devices and run around coil loops includes both air streams, so the CFMD is the sum of the supply CFM and exhaust CFM if both go through the device.
Note 5 - Energy recovery effectiveness is defined as change in the enthalpy of the outdoor air supply divided by the enthaply difference between the outdoor air and return air at design conditions.
Note 6 - Assigned pressure drop (PD) adjustment per Table C403.2.11.1(2).
Note 7 - Pressure drop (PD) adjustment shall be calculated per the applicable method defined in Table C403.2.11.1(2) based on specific system conditions.
*Note 8 - A = PD * CFMD/4131 where A is the allowed system brake horse power adjustment, PD is pressure drop allowance, and CFMD is the cfm through the device.*

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General Instructions:

A. Include all fans directly associated with the delivery and removal of conditioned air to the zones served by the system. Enter CFM and brake horsepower (bhp) of each fan at peak design conditions and the nameplate horsepower (hp). Include supply, return and relief fans, exhaust and exhaust hood fans (>1 hp), booster fans and fans included as part of make-up air units, dedicated outside air systems (DOAS), energy recovery ventilators (ERV), and series fan-powered terminal equipment.

B. VAV parallel fan-powered terminals and economizer relief fans do not need to be included if the fans do not operate at peak conditions.

C. Fans not directly associated with the delivery and removal of conditioned air, such as condenser fans, do not need to be included in the fan power total.

D. Fan power calculations are not required for non-central air HVAC systems such as 4-pipe fan coils and variable refrigerant flow (VRF) systems unless individual fan systems are greater than 5hp.

E. In the Brake Horsepower Allowance Adjustments table, if a Device Type is selected that has an Assigned Pressure Drop, this value will autofill into the Assigned Pressure Drop cell and the Calculated Pressure Drop cell will be write-protected. If the Device Type requires a Calculated Pressure Drop, then enter this value into the Calculated Pressure Drop cell and the Assigned Pressure Drop cell with be write-protected.

F. Refer to FAQ section of MECH-FANSYS-DOC for additional instructions.

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COOLING LOAD DATA

BUILDING OUTLINE

W

SW NW

S N

SE NE

E

CALC. BY:	Paul Young
DATE:	1/17/2020
PROJECT:	Skagit PUD
LOCATION:	Bellingham, WA
LATITUDE:	46
TIME:	1500
WALL GROUP (TABLE 11):	C17
ROOF NUMBER (TABLE 31):	4
DB TEMPERATURE INDOORS (Ti):	80
DB TEMPERATURE OUTDOORS (To):	79.4
WB TEMPERATURE OUTDOORS (To):	65.1
DAILY RANGE (Dr):	26.5
AVERAGE TEMPERATURE OUTDOOR = ATo	
ATo= To - Dr/2 =	66.15
CLIMATE ZONE	1

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TABLE VALUES FROM ASHRAE 1997 FUNDAMENTALS HANDBOOK

CONDUCTION

WALLS	TABLE 32	TABLE 333		
ORIENT.	CLTD	CLTD	CF	CLTDC
NORTHWEST	19		-20.85	-1.85
SOUTHEAST	46		-20.85	25.15
SOUTHWEST	27		-20.85	6.15
WEST	12		-20.85	-8.85
ROOF	TABLE 30	TABLE 32		
	CLTD	CLTD	CF	CLTDC
	65	2	-20.85	46.15

GLASS CONDUCTION (CHAPTER 28, TABLE 34)

	CLTD	CF	CLTDC
WINDOW	14	-20.85	-6.85

GLASS SOLAR

ORIENT.	CH 29 TABLE 19	TABLE 36
GLASS	SHG	CLF
NORTH	27	0.29
SOUTH	102	0.29
WEST	27	0.29
EAST	192	0.29

LIGHTING & EQUIP.HEAT GAIN

LIGHTING:	1.08	WATTS/SF
EQUIP.	0	WATTS/SF

CF=(78-Ti) + (ATo-85)= -20.85

OUTSIDE AIR

MIN. CFM/OCCUPANT:	0
#OCCUPANTS:	0
TOTAL OUTSIDE AIR:	0

OCCUPANT HEAT GAIN
CHAP. 26, TABLE 3

SENSIBLE:	250
LATENT:	200
CLG. LOAD FACTOR:	1

WINDOW
CHAP. 27, TABLE 13

U WINDOW	0.48

GLASS SHADING COEFFICIENTS
CHAP. 29, TABLE 11

GLASS SC:	0.75

BUILDING ELEMENT "U" VALUES:

CMU WITH PERLITE	0.229
ROOF	0.020
H.MTL. DOOR 1	0.6

SPACE: Electrical Room

CALC.BY:	Paul Young	OUTSIDE DBT:	79.4	WBT:	65.1
PROJECT:	Skagit PUD	INSIDE DBT:	80	WBT:	65
LOCATION:	Bellingham, WA				
DATE:	1/17/2020	TEMP. DIFF.	-0.6	TIME:	1500

TRANSMISSION

ORIENT.	SOURCE	AREA	CLTDC	U	BTU	TOTAL
South East	WALL	178	-1.85	0.229	-76	
	DOOR	0	25.15	0.6	0	
	WINDOW	0	-6.85	0.48 .30	0	
Northwest	WALL	129	25.15	0.229	744	
	DOOR	49	-2	0.600	-54	
	WINDOW	0	-6.85	0.48 .30	0	
South West	WALL	320	6.15	0.229	452	
	DOOR	0	-7	0.48 .40	0	
SOUTH	WALL	0	6.15	0.229	0	
	Door	0	-6.85	0.48 .40	0	
Roof	ROOF	396	65	0.020	516	
	FLOOR	396	-6.85		0	
TOTAL TRANSMISSION						1,582

SOLAR RADIATION

ORIENT.	SOURCE	AREA	SC	SHG	CLF	BTU	TOTAL
North	WINDOWS	0	0.75	27	0.29	0	
South	WINDOWS	0	0.75	102	0.29	0	
West	WINDOWS	0	0.75	27	0.29	0	
East	WINDOWS	0	0.75	192	0.29	0	
							0

INTERNAL LOADS

PEOPLE	NUMBER	0	250	BTU/PERSON		0
LIGHTS	WATTS	427	3.41	BTU/WATT		1,457
EQUIPMENT	WATTS	20,194	3.41	BTU/WATT		68,862
OUTSIDE AIR	CFM	0	1.08	TEMP DIFF	-0.6	0
TOTAL						70,318

LATENT LOADS

PEOPLE	NUMBER	0	200	BTU/PERSON		0
OUTSIDE AIR	CFM	0	0	GR/LB	0.68	0
TOTAL						0

TOTAL COOLING LOAD:	71,901
TOTAL COOLING LOAD (120%):	86,281
NUMBER OF TONS:	7.19
CFM:	**2900**

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enter data only in blue shaded cells

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building size

26.67 ft	width
34.00 ft	length
12.00 ft	height
9475 cf	total volume
0.0750 lb/cf	weight of air
711 lb	total weight of air

Motor heat generation

600 hp	power	
95%	motor efficiency	*efficiency of motor (<20hp=91%, 25-50hp=92%, 60-125hp=94%, >125hp=95%)*
76350 BTU/hr 6.36 tons	heat generated	*Pump efficiency ignored; assumed heat is transferred into the water, not the building.*

Light heat generation

1126 W	light power
4611 BTU/hr 0.38 tons	heat generated
80961 BTU/hr 6.75 tons	total heat generated

Air flow required to remove excess heat

10 deg F	max permissible temp rise in building due to equipment	*recommend keeping this value around 10 deg F*
0.24	BTU/lb F specific heat of air	
1705.5	BTU total specific heat allowed	
1.3 min	Time it will take to raise building air temp by the permissible amount	
7496 cfm	Air rate required for heat dissipation	

Pick the larger of the two

fan

10.0	air changes per hour for air quality *	* *previous values used*
6.0 min	per air change	*24/hr - EWW regional booster*
1579 cfm	total air flow required at .25" sp	*20/hr - CC1 Lovell booster*

louver

900	fpm free area velocity for .15" pressure with static louver	*Water Penetratrion for Pottorff EFD-445 is 1026 FPM*
45%	avg percentage of free area to full area	*verify with catalog info*
405	fpm actual velocity required	
8.3	sf louver free area required	Use Pottorff EFD-445 cutsheet to determine louver size

Air quality requirements - see WAC 51-13-304

6 assumed max number of persons (startup or training)

air supply rate	**Classification (pump station class doesn't exist)**	Total cfm
0.15 cfm/sf	Shipping/receiving area	136
20.0 cfm/person	Gathering rooms	120
15.0 cfm/person	General workroom	90

Equipment Selections

Pottorff Louvers

Intake	56"wide x 48" high, EFD-445 @ 0.1" WG	8.1 SF of free area, 1026 FPM beginning water penetration
Exhaust	56"wide x 48" high, EFD-445 @ 0.1" WG	

Pottorff Motorized Dampers

Intake	CD-52. @ 0.05" WG
Exhaust	CD-52. @ 0.05" WG

Filters

Camfil Farr 30/30, 1" Filter	0.23" WG (initial)

Total Static Pressure 0.53 INWG

Greenheck Fan Selection

Greenheck SBE-3H30, 0.60 " WG, 1.5 HP motor, 460V/3ph, dimensions 38"x38"x21.5", weight 112 lbs

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Building Permit Plans Checklist, pg. 1 — ENV-CHK

2015 WSEC Compliance Forms for Commercial Buildings including R2, R3, & R4 over 3 stories and all R1 — Revised Oct 2017

Project Title: **Judy Reservoir Raw WTP Water Pump Station** — Date 01/29/2020

The following information is necessary to check a building permit application for compliance with the building envelope requirements in the Washington State Energy Code, Commercial Provisions.

Applicability (yes,no,na)	Code Section	Component	Compliance information required in permit documents	Location in Documents	Building Department Notes
SCOPE					
na	C402.1.1	Low energy spaces	Identify low energy spaces on plans; include project information, and calculations if applicable, that demonstrate spaces are eligible for envelope provisions exemption		
na	C402.1.1.1	Semi-heated spaces	Identify semi-heated spaces on plans, include calculations that demonstrate spaces are eligible for wall insulation exemption		
na	C402.1.2	Equipment Buildings	Provide building area, average wall and roof U-factor, and installed equipment information that demonstrates equipment building is eligible for envelope provision exemption		
na	C410.2	Walk-in and warehouse cooler and freezer spaces	Identify walk-in and warehouse cooler and freezer spaces on plans		
na	C101.4.1	Mixed occupancy	Identify spaces with different occupancy requirements on plans		
na	C503.2	Change of space conditioning	Identify on plans existing unconditioned spaces changing to semi-heated or conditioned space, and existing semi-heated spaces changing to conditioned space; provide calculations for existing and final level of space conditioning, and calculations that demonstrate alteration complies with current WSEC		
na	C505.1	Change of occupancy	Identify on plans existing F, S and U-occupancy spaces undergoing a change in occupancy; provide calculations that demonstrate alteration complies with the current WSEC	.	
			Identify on plans pre-2002 Group R spaces undergoing a change to a commercial occupancy; provide calculations that demonstrate alteration complies with the current WSEC		
			Identify on plans non-Group R occupancy spaces undergoing a change to Group R; provide calculations that demonstrate alteration complies with the current WSEC		
ENVELOPE PROVISIONS					
Yes	C103.2 C103.6.3	Compliance documentation	Indicate envelope insulation compliance path and provide applicable forms; ENV-PRESCRIPTIVE or ENV-UA / ENV-SHGC for component performance	**Attached**	
			If complying via total building performance, provide a list of all proposed envelope component types, areas and U-values		
Yes	C303.1.1 C303.1.2	Insulation identification	Indicate identification mark shall be applied to all insulation materials and insulation installed such that the mark is readily observable during inspection	**Specs**	
na	C303.1.3 C402.4.3	Fenestration product rating	Fenestration products shall be labeled with rated U-factor, SHGC, VT, and leakage rating		
Yes	C303.1.1 C402.2.1	General insulation installation	Indicate installation methods, thicknesses, densities and clearances to achieve the intended R-value of all insulation materials;	**Specs**	
			Where two or more layers of rigid insulation will be used, indicate that edge joints between layers are staggered		
Yes	C103.2 C402.2.2	Roof assembly insulation	Indicate R-value(s) of cavity/continuous insulation on roof sections;	**Plans and Specs**	
			Indicate framing materials on roof sections;		
			Indicate method of framing for ceilings below vented attics and vaulted ceilings per A102.2 (std, adv);		
			Provide area weighted average U-factor calculation for insulation whose thickness varies by 1 inch or less;		
			Indicate effective U-factors of tapered insulation entirely above deck per A102.2.6; include roof configuration and slope, maximum R-value at peak and minimum R-value at low point for all roof surfaces		
			Indicate R-values for thermal spacers and each insulation layer, and liner system (LS) method for metal building roofs		
na	C402.2.2	Skylight curb insulation	Indicate curb insulation R-value on roof section if not included in skylight NFRC rating		
Yes	C103.2 C402.2.3 C402.2.4 C303.2.1	Above/below grade wall insulation	Indicate R-value(s) of cavity/continuous insulation on wall sections;	**Plans and Specs**	
			Indicate framing materials on wall sections;		
			Indicate method of framing for wood construction per A103.2 (std, int, adv);		
			Indicate material density category, wall weight and heat capacity for qualifying mass walls;		
			For qualifying ASTM C90 masonry walls, indicate loose-fill core insulation material and percentage of cores filled including grouted cores, bond beams, vertical fills, headers and any other grouted cores;		

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Building Permit Plans Checklist, pg. 2 — ENV-CHK

2015 WSEC Compliance Forms for Commercial Buildings including R2, R3, & R4 over 3 stories and all R1 — Revised Oct 2017

Project Title: Judy Reservoir Raw WTP Water Pump Station — Date 01/29/2020

Applicability (yes,no,na)	Code Section	Component	Compliance information required in permit documents	Location in Documents	Building Department Notes
Yes	C103.2 C402.4.4	Opaque doors	Indicate rated U-factor (swinging) or R-value (non-swinging - roll-up/sliding) on wall sections or in door schedules - applies to doors with less than 50% glazed area	**Plans and Specs**	
na	C402.2.5	Floor over outdoor or unconditioned space insulation	Indicate R-value(s) of cavity/continuous insulation on floor sections; Indicate framing material on floor sections; Indicate material density category and weight of qualifying mass floors		
Yes	C402.2.6 C303.2.1	Slab-on-grade floor insulation	Indicate R-value of continuous insulation on wall section or foundation detail; Indicate insulation extends down vertically and/or horizontally the required distance from top of slab; Indicate method of protection of exposed exterior slab edge insulation	**Plans and Specs**	
na	C402.2.6 C303.2.1	Radiantly heated slab-on-grade floor insulation	Indicate R-value of continuous insulation on wall section or foundation detail; Indicate insulation extends down vertically from top of slab and then horizontally under the entire slab; Indicate method of protection of exposed exterior slab edge insulation		
na	C402.2.8	Radiant heating system insulation	Indicate insulation R-value behind radiant panels, U-bend/headers and bottom surface of radiantly heated floors (other than radiantly heated slab-on-grade)		
na	C402.4.1 C502.2.1 C503.3.2	Vertical fenestration maximum area	Provide calculation for total vertical fenestration area as a percentage of gross above grade wall area (WWR) for new construction, additions and alterations in ENV-SUM		
na	C402.4.1.1 C405.2.4.1 C502.2.1 C503.3.2	Increased prescriptive maximum vertical fenestration area with daylight zones and controls	Provide calculations showing that the percentage of overall conditioned floor area within daylight zones is equal to or greater than 50% in 1 and 2 story buildings; OR Provide calculations showing that the percentage of overall net floor area within daylight zones is equal to or greater than 25% in buildings 3 stories or more; include the gross floor area and list of spaces omitted for the net floor area; Note in envelope plans that all lighting fixtures located within daylight zones shall be provided with daylight responsive controls per WSEC Section C405.2.4.1; indicate method of control in lighting fixture schedules Indicate that the VT of vertical fenestration is at least 1.1 times the rated SHGC		
na	C402.4.1.3 C502.2.1 C503.3.2	Increased prescriptive maximum vertical fenestration area with high-performance glazing	Indicate high performance U-factors and SHGC values in fenestration schedules; Indicate if an area-weighted U-factor is used for multiple fenestration elements within the same fenestration category per Table C402.3; provide U-factor calculations		
na	C402.4.1.4 C403.6	Increased prescriptive maximum vertical fenestration area with DOAS mechanical systems	Indicate that for eligibility, all occupied, conditioned spaces will be served by a dedicated outside air system (DOAS) that delivers ventilation air without requiring operation of the heating/cooling system per Section C403.6		
na	C402.1.5	Wall/vertical fenestration target area adjustment	Indicate if component performance with target area adjustment will be used to account for vertical fenestration area in excess of the prescriptive maximum allowed		
na	C402.4.1 C502.2.2 C503.3.3	Skylight maximum area	Provide calculation for total skylight area as a percentage of gross roof area (SRR) for new construction, additions and alterations in ENV-SUM		
na	C402.1.5.2	Roof/skylight target area adjustment	Indicate if component performance with target area adjustment will be used to account for skylight area in excess of the prescriptive maximum allowed		
na	C402.4.3 C303.1.3	U-factors, SHGC and VT for all fenestration assemblies	Indicate U-factors, SHGC and VT values in fenestration schedules; Indicate if an area-weighted U-factor is used for multiple fenestration elements within the same fenestration category per Table C402.3; provide U-factor calculations Indicate if values are NFRC or default; if default then specify frame type, glazing layers, gap width, low-e coatings, gas-fill		
na	C402.4.3	Permanent shading devices	For windows with overhangs or permanent projection shading devices, provide projection factor calculations (Equation C4-6) and associated minimum SHGC for north and non-north orientations		

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Building Permit Plans Checklist, pg. 3 — ENV-CHK

2015 WSEC Compliance Forms for Commercial Buildings including R2, R3, & R4 over 3 stories and all R1 — Revised Oct 2017

Project Title: Judy Reservoir Raw WTP Water Pump Station — Date: 01/29/2020

Applicability (yes,no,na)	Code Section	Component	Compliance information required in permit documents	Location in Documents	Building Department Notes
na	C402.4.2	Spaces in single story buildings requiring skylights	In single story buildings, provide list of enclosed areas that exceed 2,500 sf; for each space identify the space use, floor area, floor to ceiling height, whether skylights are installed, and any exception taken;		BP20-0302 SITE COPY ACCEPTED BY SKAGIT COUNTY 07.10.2020
			Provide calculations for percentage of conditioned floor area located within a daylight zone including skylight and eligible sidelight daylight zones;		
			Provide calculations for percentage of skylight area in each space over 2,500 sf, OR;		
			Provide calculations for skylight effective aperture (Equation C4-5) for each space over 2,500 sf;		
			Indicate haze factor of skylight glazing material or diffuser		
ADDITIONAL EFFICIENCY PACKAGE OPTION - ENHANCED ENVELOPE PERFORMANCE					
na	C406.8	Enhanced envelope performance	To comply with additional efficiency package option, demonstrate envelope insulation compliance via component performance; provide ENV-UA / ENV-SHGC compliance forms; verify that building total UA is 15% lower than the Code target UA		
AIR LEAKAGE					
na	C402.5.1.1	Air barrier construction and sealing	Identify location and provide diagram of continuous air barrier in plans and sections;		
			Provide details for all joints, transitions in materials, penetrations in air barrier and note method of sealing (caulked, gasketed, or other approved method)		
na	C402.5.3	Rooms containing open combustion fuel burning appliances used for space conditioning	Indicate that room(s) containing non-direct vent appliances is isolated from conditioned space by the thermal envelope with a sealed air barrier, including doorway gasketing and sealing around ductwork and piping penetrations;		
			Indicate insulation provided in wall, floor and ceiling of the room envelope, and insulation required on combustion air ductwork		
na	C402.5.4	Access openings and doors to shafts, chutes, stairways and doors	Indicate locations of all access openings and doors to shafts, chutes, stairways and elevators;		
			Indicate method of gasketing, weatherstripping and sealing of these openings		
Yes	C402.5.5 C403.2.4.3	Outdoor air intakes, exhausts and relief openings	Indicate locations of all stairway enclosure, elevator shaft and building pressurization relief openings, outside air intakes and exhaust openings;		
			Note in envelope plans that all relief, outside air intake and exhaust openings shall be provided with dampers in accordance with Mechanical Section C403.2.4.3	**Plans**	
na	C402.5.8	Recessed lighting in building envelope	Indicate method of sealing between light fixture housing and wall or ceiling;		
			Note in envelope plans that all recessed lighting fixtures shall be IC rated and have an air leakage rating not greater than 2 cfm per ASTM E283 test; include these requirements in lighting fixture schedules		
na	C402.5.6	Loading dock seals	Indicate weather seal at cargo and loading dock doors		
na	C402.5.7	Vestibules	Indicate locations and dimensions of vestibules and air curtains;		
			Indicate exception and criteria utilized for all building entrances and exits that do not have a vestibule or air curtain;		
			Indicate required performance for air curtains installed per exception 7;		
			For unconditioned vestibules, indicate which envelope assembly (interior or exterior) complies with the requirements for a conditioned space		
na	C103.2 C402.5.1.2	Building air leakage test	Indicate on plans the location of air barrier boundaries and area calculations on all six sides of the air barrier;		
			Indicate air barrier test method in accordance with ASTM E779 or approved equivalent;		
			Indicate required maximum leakage rate for compliance.		
			Include the following requirements in project documents: (1) Submit air barrier test report to jurisdiction once test is completed; (2) If test results exceed 0.40 cfm/ft^2 (1.5 L/s*m^2) at 0.3 in. wg (75 Pa), then visually inspect air barrier and seal noted sources of leakage; (3) Submit a follow-up report to jurisdiction noting corrective measures taken; (4) Include air barrier test report in compliance documentation provided to building owner.		

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Building Permit Plans Checklist, pg. 4 — ENV-CHK

2015 WSEC Compliance Forms for Commercial Buildings including R2, R3, & R4 over 3 stories and all R1 — Revised Oct 2017

Project Title: Judy Reservoir Raw WTP Water Pump Station — Date: 01/29/2020

Applicability (yes,no,na)	Code Section	Component	Compliance information required in permit documents	Location in Documents	Building Department Notes
ADDITIONAL EFFICIENCY PACKAGE OPTION - REDUCED AIR INFILTRATION					
na	C406.9	Reduced air infiltration	To comply with additional efficiency package option, indicate in project documents that the air barrier test results shall not exceed 0.25 cfm/ft^2 (0.94 L/s*m^2) at 0.3 in. wg (75 Pa); indicate air barrier test report shall be submitted to the jurisdiction and building owner once test is completed		
ALTERATIONS					
na	C503.1 C503.3.1	Roof alteration - insulation	For a roof alteration where existing ceiling cavities are exposed, indicate cavities are insulated to full depth at R-3 per inch		
na			For a roof covering replacement where insulation is installed entirely above the roof deck, indicate insulation complies with requirements for new construction per Tables C402.1.3 or C402.1.4		
na	C503.1	Wall and floor alteration - insulation	For a wall or floor alteration (floor over outdoor or unconditioned space) where existing envelope cavities are exposed, indicate cavities are insulated to full depth at R-3 per inch		
na	C503.3.2	Addition of vertical fenestration	Where the addition of new vertical fenestration results in total building window-to-wall ratio (WWR) exceeding the maximum allowed per C402.4.1, demonstrate method of compliance (vertical fenestration alternate per C503.3.2, or component performance compliance with target area adjustment for the total building)		
na	C503.3.3	Addition of skylights	Where the addition of new skylights results in total building skylight-to-roof ratio (SRR) exceeding the maximum allowed per C402.4.1, demonstrate component performance compliance with target area adjustment for the total building		
PROJECT CLOSE OUT DOCUMENTATION					
na	C103.6.3	Project close out documentation requirements	Indicate in plans that project close out documentation is required including applicable WSEC envelope compliance forms and calculations, and fenestration NFRC rating certificates		

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End of Building Permit Plans Checklist

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Lighting, Motor, and Electrical Permit Checklist, Pg. 1 — LTG-CHK

2015 Washington State Energy Code Compliance Forms for Commercial Buildings including R2, R3, R4 over 3 stories and all R1 — Revised July 2016

Project Title:	**1 - Judy Pump Station**	Date	7/9/2016

The following information is necessary to check a permit application for compliance with the lighting, motor, and electrical requirements in the Washington State Energy Code, Commercial Provisions.

Applicability (yes,no,na)	Code Section	Component	Compliance information required in permit documents	Location in Documents	Building Department Notes
LIGHTING CONTROLS					
Yes	C405.2	Lighting controls, general	For all lighting fixtures, indicate lighting control method on plans for spaces and lighting zone(s) served, or exception taken		
NA	C405.2	Luminaire level lighting controls (LLLC)	Indicate on plans all fixtures provided with LLLC in lieu of C405.2 lighting controls; provide description of control capabilities and performance parameters		
NA	C405.1	Lighting in dwelling units	For permanently installed lighting fixtures in dwelling units, indicate lighting control method on plans for spaces and lighting zone(s) served, or demonstrate compliance with high efficacy exception		
Yes	C405.2.3 C405.2.1.1 C405.2.2.2 C405.2.4 C405.2.5	Manual controls	Indicate on plans the method of manual lighting control (whether combined with occupancy sensor, automatic light reduction, daylight responsive or specific application controls), location of manual control device and area or specifice application it serves		
NA	C405.2.2.1 C405.2.2.2 C405.2.3	Manual interior lighting controls	Indicate on plans which method of manual 50% lighting load reduction is provided, or whether lighting load is reduced via occupancy sensors or daylight responsive controls		
NA	C405.2.2	Method of automatic shut-off control	Indicate on plans the method of automatic shut-off control during unoccupied periods (occupancy sensor or time switch) for all lighting zones;		
			Indicate locations where automatic shutoff is provided by other methods (occupancy sensor or digital timer switch) or which time switch control exception applies		
NA	C405.2.1 C405.2.1.1	Occupancy sensor controls	Indicate on plans the spaces served by occupancy sensors;		
			Indicate whether occupancy sensor controls are configured to be manual-on, automatic 50%-on, or serve a space eligible for automatic 100%-on per exception		
NA	C405.2.1.2	Occupancy sensor controls - warehouses	Indicate aisleways and open areas in warehouse spaces provided with occupancy sensor controls that reduce lighting power by 50%		
NA	C405.2.6	Digital timer switch	Indicate required digital timer switch control function when control is used		
NA	C405.2.2.1	Automatic time switch controls	Indicate locations of override switches on plans and the lighting zone(s) served, include area sq. ft.		
NA	C405.2.4.2 C405.2.4.3	Daylight zones - Sidelight and toplight	Indicate primary and secondary sidelight daylight zone areas on plans, include sq. ft.;		
			Indicate toplight daylight zone areas on plans, include sq. ft.;		
			For small vertical fenestration assemblies (rough opening less than 10 percent of primary daylight zone) where daylight responsive controls are not required, provide fenestration area to daylight zone calculation(s)		
NA	C405.2.4	Daylight responsive controls	Indicate on plans lighting zone(s) served by daylight responsive controls;		
			Identify sidelight and toplight daylight zones that are not provided with daylight sensing controls and the exception(s) that apply;		
			Indicate on plans the lighting load reduction method - continuous dimming, or stepped dimming that provides at least two even steps between 0%-100% of rated power;		
			Indicate that daylight sensing controls are configured to completely shut off all controlled lights in the lighting zone		
NA	C405.2.5	Additional controls - Specific application lighting controls	Identify spaces and lighting fixtures on plans that require specific application lighting controls per this section		
NA	C405.2.5 - Items 1&2	Display and accent lighting	Indicate on plans that display and accent lighting, and display case lighting are controlled independently from both general area lighting and other lighting applications within the same space;		
			Indicate manual and automatic lighting control method		

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Lighting, Motor, and Electrical Permit Checklist, Pg. 2 — LTG-CHK

2015 Washington State Energy Code Compliance Forms for Commercial Buildings including R2, R3, R4 over 3 stories and all R1 — Revised July 2016

Project Title:	**1 - Judy Pump Station**	Date	7/9/2016

The following information is necessary to check a permit application for compliance with the lighting, motor, and electrical requirements in the Washington State Energy Code, Commercial Provisions.

Applicability (yes,no,na)	Code Section	Component	Compliance information required in permit documents	Location in Documents	Building Department Notes
NA	C405.2.5 - Item 3	Hotel/motel guest rooms	Indicate method of automatic control - vacancy or captive key control of all installed luminaires and switched receptacles in guest room		
NA	C405.2.5 - Item 4	Supplemental task lighting	Indicate method and location of automatic shut-off vacancy control for supplemental task lighting, including under-shelf or under-cabinet lighting		
NA	C405.2.5 - Item 5	Lighting for non-visual applications	Indicate on plans eligible non-visual lighting applications, include sq. ft. area of each lighting control zone;		
			Indicate on plans that non-visual lighting are controlled independently from both general area lighting and other lighting applications within the same space;		
			Indicate method of manual lighting control and applicable automatic lighting control		
NA	C405.2.5 - Item 6	Lighting equipment for sale or demonstration	Indicate on plans that lighting equipment for sale or demonstration are controlled independently from both general area lighting and other lighting applications within the same space;		
			Indicate method of manual lighting control and applicable automatic lighting control		
Yes	C405.2.5 - Item 7	Means of egress lighting	Identify on plans egress fixtures that function as both normal and emergency means of egress illumination;		
			Provide calculation of lighting power density of total egress lighting;		
			If total egress lighting power density is greater than 0.02 W/sq. ft., indicate on plans egress fixtures requiring automatic shut-off during unoccupied periods;		
			Indicate method of automatic shut-off control		
Yes	C405.2.7	Exterior lighting controls	Indicate on exterior lighting plans and fixture schedules the automatic lighting control method, control sequence, and locations served;		
			For building façade and landscape lighting, indicate automatic controls shut off lighting as a function of dawn/dusk and fixed opening/closing time;		
			For all other exierior lighting, indicate automatic controls shut off lighting as a function of available daylight; include control sequence that also reduces lighting power by at least 30% between 12am-6am, or from 1 hour after closing to 1 hour before opening, or based upon motion sensor		
NA	C405.5.1	Exterior building grounds lighting controls	For building grounds fixtures greater than 100 watts, indicate on plans whether fixtures have efficacy greater than 80 lumens or; are controlled by motion sensor, or are exempt lighting per C405.5.2		
NA	C405.2.5	Area controls - Master control switches and circuit power limit	Indicate location(s) of master control switch(es) intended to control multiple independent switches; circuit breaker may not be used as a master control switch;		
			Verify that no 20 amp circuit controlled by a single switch or automatic control is loaded beyond 80%		
NA	C406.4	Enhanced digital lighting controls	To comply with additional efficiency package option, indicate on plans all interior lighting fixtures that are individually addressed and provided with continuous dimming, or exception taken;		
			Include calculation of percent total installed interior lighting power that is configured with required enhanced lighting control functions (min 90% to comply with additional efficiency package option)		
NA	C405.13 C408.3	Lighting system functional testing	If claiming lighting system commissioning exemption provide supporting calculation;		
			Identify applicable commissioning documentation requirements per Section C408 or eligibility for exception;		
			Provide written procedures for functional testing of all automatic controls and describe the expected system response		

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Lighting, Motor, and Electrical Permit Checklist, Pg. 3 — LTG-CHK

2015 Washington State Energy Code Compliance Forms for Commercial Buildings including R2, R3, R4 over 3 stories and all R1 — Revised July 2016

Project Title:	**1 - Judy Pump Station**	Date	7/9/2016

The following information is necessary to check a permit application for compliance with the lighting, motor, and electrical requirements in the Washington State Energy Code, Commercial Provisions.

Applicability (yes,no,na)	Code Section	Component	Compliance information required in permit documents	Location in Documents	Building Department Notes
INTERIOR LIGHTING POWER & EFFICACY					
Yes	C405.4.1 C405.4.1 C405.4.2	Total connected interior lighting power	Include all luminaires in lighting fixture schedule; indicate fixture types, lamps, ballasts, and manufacturer's rated watts per fixture; Identify spaces eligible for lighting power exemption on plans and in compliance forms; indicate the exception applied; Identify lighting equipment eligible for lighting power exemption in fixture schedule and in compliance forms; indicate the exception applied; Indicate that exempt lighting equipment is in addition to general area lighting and is controlled independently	BP20-0302 SITE COPY ACCEPTED BY SKAGIT COUNTY 07.10.2020	
NA	C405.3	Exit signs	Indicate location of exit signs on plans and rated watts per fixture in lighting fixture schedule (maximum 5 watts per fixture)		
NA	C405.1	Lighting in dwelling units - lamp efficacy	If high efficacy exception is applied to permanently installed lighting fixtures in dwelling units, indicate in lighting fixture schedule if lamps in fixtures are high efficacy per R404.1. Calculate percentage of fixtures with high efficacy lamps in project (min 75% to comply with exception).		
NA	C406.3	Reduced lighting power density - dwelling unit lamp efficacy	For project with dwelling units, to comply with additional efficiency package option indicate in lighting fixture schedule if lamps in fixtures have efficacy rating of 60 lumens per watt or more. Calculate percentage of fixtures with lamps that have this efficacy rating (min 95% to comply with option).		
	Lighting Power Calculation - Indicate compliance path taken				
Yes	C405.4.2.1	Building Area Method	Complete required compliance forms – proposed wattage per building area does not exceed maximum allowed wattage per building area. Identify locations of building areas on plans		
NA	C405.4.2.2	Space-By-Space Method	Complete required compliance forms – total proposed wattage does not exceed maximum allowed wattage. Identify locations of space types on plans, including retail display areas, lobby art & exhibit display areas, and ceiling heights as applicable		
NA	C406.3	Reduced lighting power density	To comply with additional efficiency package option, demonstrate in compliance forms that total connected interior lighting wattage is 75% less than the total maximum allowed lighting wattage via Building Area Method or Space-By-Space Method		
EXTERIOR LIGHTING POWER & EFFICACY					
Yes	C405.5.2	Total connected exterior lighting power	Include all luminaires in lighting fixture schedule; indicate fixture types, lamps, ballasts, and manufacturer's rated watts per fixture; Identify exterior applications eligible for lighting power exemption on plans and in compliance forms; indicate exception applied; Indicate that exempt exterior lighting is controlled independently from non-exempt exterior lighting; include exception claimed for each fixture or group of fixtures under exception category		
Yes	Table C405.5.2(1)	Exterior lighting zone	Indicate building exterior lighting zone as defined by the AHJ		
Yes	C405.5.1	Exterior building grounds lighting	For building grounds fixtures rated at greater than 100 watts that are complying based on efficacy, indicate rated lamp efficacy (in lumens per watt) in fixture schedule		
Yes	C405.5.2	Exterior lighting power calculations	Complete required compliance form – proposed wattage for exterior lighting plus base site allowed does not exceed maximum allowed		

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Lighting, Motor, and Electrical Permit Checklist, Pg. 4 — LTG-CHK

2015 Washington State Energy Code Compliance Forms for Commercial Buildings including R2, R3, R4 over 3 stories and all R1 — Revised July 2016

Project Title:	**1 - Judy Pump Station**	Date	7/9/2016

The following information is necessary to check a permit application for compliance with the lighting, motor, and electrical requirements in the Washington State Energy Code, Commercial Provisions.

Applicability (yes,no,na)	Code Section	Component	Compliance information required in permit documents	Location in Documents	Building Department Notes
MOTORS & TRANSFORMERS					
Yes	C405.6	Electrical tranformers	Include electrical transformer schedule on electrical plans; indicate transformer size, efficiency, or exception taken		
NA	C405.7	Dwelling unit electrical energy consumption	Indicate on electrical plans that each dwelling unit in Group R-2 has a separate electrical energy meter		
NA	C405.8	Electric motor efficiency	Include all motors, including fractional hp motors, in electric motor schedule on electrical plans; indicate hp, rpm, rated efficiency, or exception applied		
NA	C405.9.1	Elevator cabs	For luminaires in each elevator cab, provide calculated average efficacy of combined fixtures that indicates efficacy is not less than 35 lumens per watt;		
			Indicate rated watts per cfm for elevator cab ventilation fans do not exceed 0.33 watts per cfm;		
			Indicate automatic controls that de-energize lighting and ventilation fans when elevator is stopped and unoocupied for a period of 15 minutes or more		
NA	C405.9.2	Escalators and moving walks	Indicate escalators comply with ASME A17.1/CSA B44; automatic controls are configured to reduce operational speed to the minimum permitted when not in use		
NA	C405.9.3	Regenerative drive	Indicate all one-way down or reversible escalators are provided with a variable frequency regenerative drive		
NA	C405.10	Controlled receptacles	Identify all controlled and uncontrolled receptables on electrical plans in each space in which they are required; include receptacle configuration such as spacing between controlled and uncontrolled, duplex devices, etc;		
			Indicate on plans whether the method of automatic control for each controlled receptable zone is by occupant sensor or programmable time-of-day control		

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If "no" is selected for any question, provide explanation:

End of Lighting, Motor & Transformer Permit Documents Checklist

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Planning & Development Services

1800 Continental Place • Mount Vernon, Washington 98273
office 360-416-1320 • pds@co.skagit.wa.us • www.skagitcounty.net/planning

CONSTRUCTION TIP SHEET #1
IBC Statement of Special Inspections
January 2019

2015 INTERNATIONAL BUILDING CODE

BP20-0302
SITE COPY
ACCEPTED
BY SKAGIT COUNTY
07.10.2020

PROJECT Judy Raw Water Pump Station PERMIT # BP20-0302
ADDRESS 12115 Morford Road, Sedro Woolley, WA 98284 DATE 7/2/2020

INSPECTION AGENCY Geotest PHONE # 360 733-7318
CONTACT Jeremy Wolf, Alisa O'Brien EMAIL alisao@geotest-inc.com

DESIGN PROFESSIONAL Dan Burwell PHONE # 360 684-1548
COMPANY RH2 EMAIL dburwell@rh2.com

Check Required Special Inspections - per International Building Code, Section 1704:

Seismic Force Resisting Systems requiring inspection (IBC 1705.11): _____

- ☐ 1. Structural Welding (Steel 1705.2.1)(AISC 360)
- ☐ 2. High Strength Bolting (Steel 1705.2.1)(AISC 360)
- ☐ 3. Cold Formed Steel Deck, Open Web Steel Joists and Trusses (1705.2)
- ☑ 4. Structural Concrete and Reinf. Steel (1705.3)
- ☑ 5. Anchor Bolts in Concrete (1705.3)
- ☐ 6. Prestressed Concrete and PT tendons (1705.3)
- ☐ 7. Shotcrete (1705.3, 1908.5)
- ☑ 8. Masonry (1705.4, ACI 530)
- ☐ 9. High Load Diaphragms (Wood 1705.5.1)
- ☑ 10. Grading, excavation, and filling (Soils 1705.6)
- ☐ 11. Driven Deep Foundations (1705.7)
- ☐ 12. Cast-in-place Deep Foundations (1705.8)
- ☐ 13. Sprayed Fire-Resistant Materials (1705.14)
- ☐ 14. Mastic and Intumescent Coatings (1705.15)
- ☐ 15. Ext. Insul. and Fin. System (EIFS 1705.16)
- ☐ 16. Post Installed Anchors (1705.3)
- ☐ 17. Smoke Control (1705.18)
- ☑ 18. Structural Wood (1705.11.2 & 1705.12.2)
- ☐ 19. Cold-Formed Steel Framing (1705.12.3)
- ☐ 20. Stor. Racks and Access Flrs. (1705.12.7)
- ☐ 21. Architectural Components. (1705.12.5)
- ☐ 22. Mech. and Elec. Components (1705.12.6)
- ☐ 23. Other inspections as required by the Design Professional or the Building Official (1705.1.1).

_____

- ☐ 24. Structural load bearing or lateral load-resisting members to be fabricated off-site (1704.2.5)**

_____

**(Note: Off-site special inspection is not required when approved by the building official.
See MBP construction tip sheet "Approved Fabricators" online.

☐ Section 1705.12-Structural Testing for Seismic Resistance when required shall be specified on the drawings.

☐ Section 1704.6-Structural Observations (List requirements): _____

☐ Section 1709-Preconstruction Load Test (List requirements): _____

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GENERAL INFORMATION:

- Obtain a building permit before starting construction.
- This construction bulletin is intended to provide guidelines and a checklist of some special inspections that may be required per 2015 IBC. Additional information can be found at your local building department.

STATEMENT OF SPECIAL INSPECTIONS GUIDELINES

In accordance to Section 1704 of the 2015 International Building Code (IBC), the ***owner***, or the ***registered design professional in responsible charge*** acting as the owner's agent, is required to hire an independent testing/inspection agency to perform required special inspections.

The independent agency hired to perform the duties of special inspection is required to be a registered agency with Washington Association of Building Officials (WABO), under the Special Inspection Registration Program (SIRP) Standard No. 1701 or most current adopted special inspection standard published by WABO.

The design professional shall complete the attached forms and submit them to the Building Department prior to issuance of the building permit. The inspectors assigned to any project within the Jurisdiction shall be currently registered with WABO, and certified for the disciplines assigned.

PLEASE CHECK WITH YOUR LOCAL JURISDICTION TO DETERMINE REQUIRED SIGNATURES

A. Owner Responsibilities

The owner or the design professional in responsible charge acting as the owner's agent, shall fund special inspection services. The owner is responsible for seeing that these requirements are met.

I have read and understand my responsibilities regarding special inspections.

Owner/ Agent: George Sidhu **By:** Pud No. 1 of Skagit County **Date:** 7/2/2020

B. Registered Design Professional Responsibilities

1. The registered design professional in responsible charge (engineer, or architect), shall include special inspection requirements and specifications on the plans.
2. Provide structural observation where required per IBC Section 1704.6.
3. Prepare the Statement of Special Inspections in accordance with IBC section 1704.3 and identify Structural Testing for Seismic Resistance per IBC section 1704.3.2 (When required). The statement of special inspections shall identify items fabricated on the premises of an approved fabricator where special inspections are not required by section 1704.2.5.
4. Review the special inspection reports and provide corrective action for work that may not conform to the approved plans.

I have read and understand my responsibilities regarding special inspections.

Registered Design Professional in Resp. Charge: Dan Burwell **By:** RH2 **Date:** 7/2/2020

C. Contractor's Responsibilities

1. Notify the agency:
   The contractor is responsible for notifying the inspection agency in sufficient time for scheduling personnel to perform required inspections.
2. Written statement of responsibility:
   Contractor shall complete this form to satisfy IBC 1704.4 Contractor responsibility for construction of designated main-wind or seismic force resisting system. Additional information shall be provided where requested by the jurisdiction.
3. Provide access to Jurisdiction approved plans:
   The approved plans shall be readily accessible at the job site.
4. Provide access to work:
   The contractor shall provide reasonable access to all work requiring special inspection.
5. Retaining special inspection reports at the job site:
   The contractor is also responsible for retaining at the job site all special inspection records submitted by the special inspector, and providing these records for review by the Building Department's inspector upon request.
6. Notify Jurisdiction of special inspections prior to scheduled inspection time.
7. Provide a copy of special inspector's credentials when requested by the jurisdiction.

I have read and understand my responsibilities regarding special inspections.

Contractor: TBD by bid **By:** _____ **Date:** 7/15/2020

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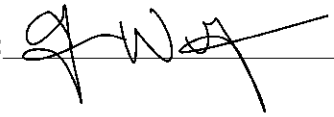
D. Duties of the Special Inspector

1. Inspect and/or test the work:
   The inspector shall inspect and /or test the work for compliance with the Jurisdiction approved plans, specifications, and applicable provisions of the IBC. The architect/engineer's reviewed shop drawings, and/or placement drawings, may be used only as an aid to inspections.
   - *Continuous Special Inspection* – The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.
   - *Periodic Special Inspection* – The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed and at the completion of the work report non-conforming items:

   The inspector shall bring non-conforming items to the immediate attention of the contractor, and note all such items in the daily report. If any item is not resolved in a timely manner and is about to be incorporated in the work, the special inspector shall immediately notify the Building Department, the engineer or architect, his/her office.
2. Furnish daily reports:
   The special inspector shall complete a daily report for each day's inspections. The daily reports shall remain at the job site with the contractor for the Building Department's inspector. The reports shall include the following:
   a. *Name of special inspector with WABO certification number and certification type, date, time, temperature and weather conditions.*
   b. *Description of the inspections, with locations and tests performed.*
   c. *Listing any non-conforming items.*
   d. *Include how items were resolved or unresolved.*
   e. *List any changes or corrections to non-conforming issues authorized by the engineer, architect, or Jurisdiction's building inspectors.*
3. Furnish weekly reports:
   The inspection agency shall furnish weekly reports of the tests and inspections performed directly to the Building Department, project engineer, architect, and/or others as designated.
4. Furnish final report
   The inspection agency shall submit a final signed report to the Building Department stating that all items requiring special inspections and testing were fulfilled, all discrepancies were corrected or resolved, and all work requiring special inspections is in conformance with the approved design drawings and specifications.
   - Any items unresolved or discrepancies in coverage (i.e., missed inspections, periodic inspections when continuous was required, etc.) shall be specifically itemized in this report.

I have read and understand my responsibilities regarding special inspections.

Inspection Agency: GeoTest **By:**  **Date:** 7/6/2020

Inspection Agency: _____ **By:** _____ **Date:** _____

E. Submittals to the Building Official

1. In addition to the submittal of reports of special inspections and tests by the approved special inspection agency in accordance with IBC Section 1704.2.4, reports and certificates shall be submitted by the owner or the owner's authorized agent to the building official for items listed in IBC 1704.5.

F. Jurisdiction

1. The Jurisdiction will review the implementation of Structural Tests and Special Inspection requirements.
2. Review special inspections:
   The Building Department shall review all special inspectors and special inspection requirements found in IBC Chapter 17 and the WABO - SIRP Standards 1701.
3. Monitor special inspections:
   Work requiring special inspections, and the performance of special inspectors, may be monitored by the Building Department's inspector. The jurisdiction's approval must be obtained prior to placement of concrete or other similar activities in addition to that of the special inspector.
4. Issue Certificate of Occupancy:
   The Building Department will only issue a Certificate of Occupancy after all special inspection reports and the final special inspection report, have been submitted and accepted.

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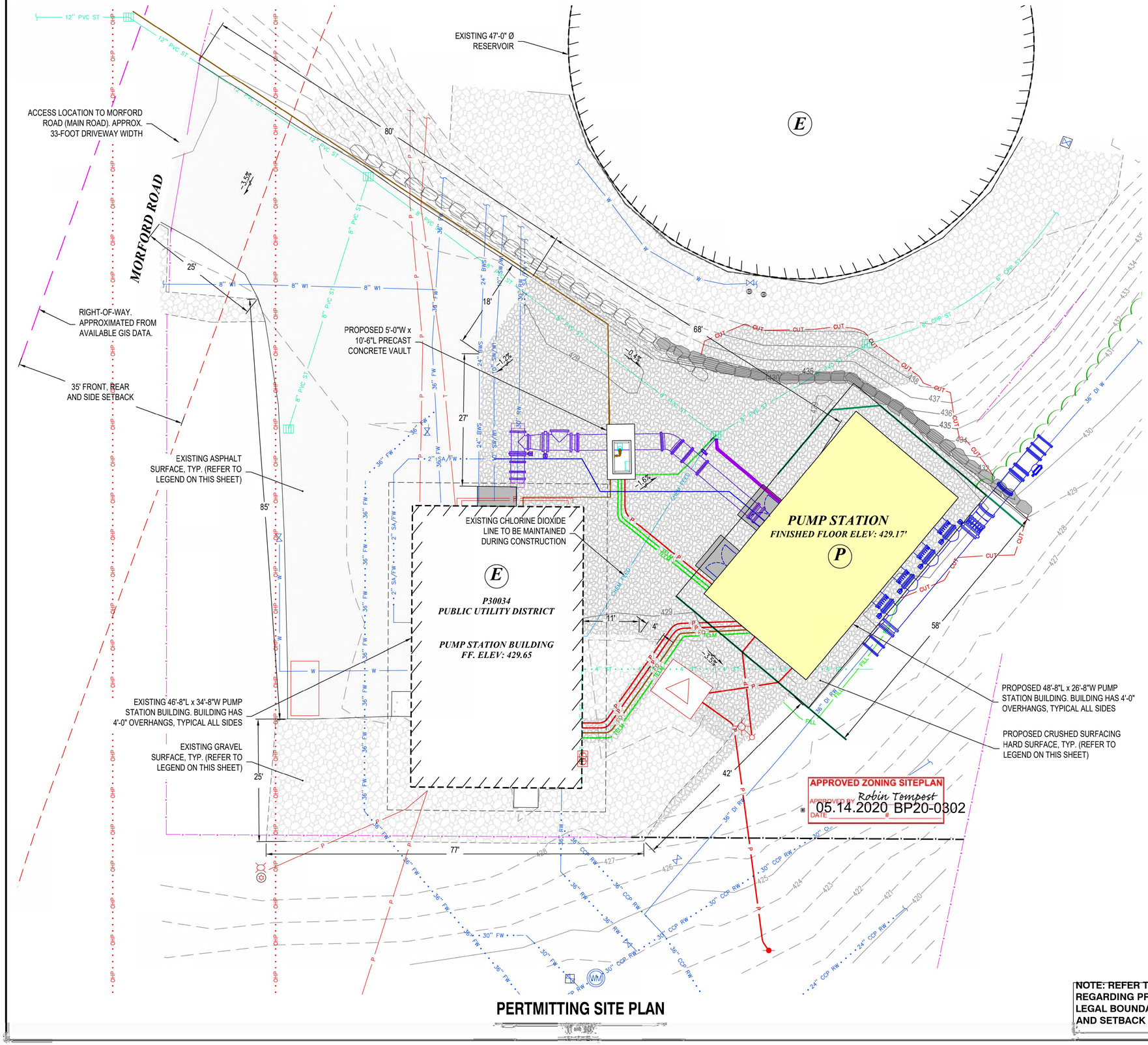


PERTMITTING SITE PLAN

EXISTING SITE LEGEND

- SET HUB AND MAG
- MAJOR CONTOUR
- MINOR CONTOUR
- WATER VALVE
- WATER MANHOLE
- WATER BLOWOFF
- WATER MAIN
- WATER MAIN FROM RECORD DRAWINGS
- WATER MAIN APPROX. OUTSIDE OF PIPE
- UTILITY POLE
- UTILITY POLE WITH STREET LIGHT
- GROUND GUY ANCHOR
- POWER METER
- TRANSFORMER
- OVERHEAD POWER
- OVERHEAD POWER FROM AERIAL RECORDS
- UNDERGROUND POWER
- UNDERGROUND TELECOMMUNICATION
- CATCH BASIN
- STORM PIPE
- DRAIN FROM DISTRICT RECORDS
- ROCKERY
- VEGETATION LIMITS
- CHAINLINK FENCE
- BUILDING EDGE
- TOE OF SLOPE
- TOP OF SLOPE
- GRAVEL
- ASPHALT

SITE UTILITY LEGEND

- MAJOR CONTOUR
- MINOR CONTOUR
- CUT LIMITS
- FILL LIMITS
- ELECTRICAL CONDUIT
- FIBER OPTIC CONDUIT
- TELEMETRY CONDUIT
- TRENCH DRAIN
- BUILDING DRAIN LINE
- CHLORINE INJECTION LINE
- ROCKERY
- BUILDING ROOF OUTLINE
- BUILDING
- CONCRETE
- CRUSHED SURFACING

NOTE: REFER TO NEXT SHEET REGARDING PROPERTY LINES, LEGAL BOUNDARY DIMENSIONS AND SETBACK LINES

PERMITTING SITE PLAN

PUD NO. 1 OF SKAGIT COUNTY

JUDY RAW WATER PUMP STATION REPLACEMENT

RH2 Skagit PUD PUBLIC UTILITY DISTRICT

SCALE: SHOWN

DRAWING IS FULL SCALE WHEN BAR MEASURES 1"

PLOT DATE: 4/24/2020

FILE PATH: J:\Data\SPUD\117-025\CAD\Exhibits\rwps-d-permit site plan.dwg

Skagit County Planning & Development Services
Commercial Inspection Record

Inspection Request Line: 360-416-1330

Office: 360-416-1320

Permit Number: **BP20-0302**	Owner: **PUBLIC UTILITY DISTRICT**
Judy Reservoir Raw Water Pump Station Replacement	Contractor: **Applicant**
Site Address: **12115 MORFORD ROAD SW**	

No concrete shall be placed or reinforcing steel covered without inspection & approval.

	Approved	Date
Foundation		
Address and access		
Location on property		
Floodplain requirements		
Footings		
Walls		
Erosion Control		
Plumbing		
Below-grade pipes,ducts		
Waste & drains		
Water distribution		
Sewer connection		
Mechanical		
Fuel gas piping		
Ducts & vents		
Htg & Cooling Equipment		
Range hoods		
Masonry		
Walls, veneers, stucco		
Reinforcement		
Shearwalls		
Special connectors		
Sheathing nailing		
Framing		
FEMA elevation certificate		
Framing		
Special Inspect. reports		

	Approved	Date
Insulation		
Floors		
Walls		
Ceiling		
Sprinkler tenting		
Penetration protection		
Drywall Nailing		

Occupancy Requirements

	Approved	Date
Fire Marshal (416-1841)		
Alarms		
Fire suppression systems		
Sprinkler systems		
Fire extinguishers		
Fire Marshal Final		
Public Works (416-1400)		
Grading permit #		
Drainage/LID work		
Access		
Public Works final		
Health Dept. (416-1555)		
Mt. Vernon (UGA only)		
Parking		
Landscaping		
Conditions - Flood - Yes No		
Final Inspection		

U.B.C. Section 109.1: No building or structure shall be used or occupied until final approval has been granted by the Building Official.

Sec	Item Id	Description	Approved	Req	Date	Items	Action	Inheritable	Item Origin
*	COVID19	The issuance or granting of this permit shall not be construed to be a permit for, or approval of, any violation of this Code or any other ordinance or order of the County, of any state or federal law, or of any order, proclamation, guidance advice or decision of the Governor of this State. To the extent the issuance or granting of this permit is interpreted to allow construction activity during any period of time when such construction is prohibited or restricted by any state or federal law, or order, proclamation, guidance advice or decision of the Governor of this State, this permit shall not authorize such work and shall not be valid. The building official is authorized to prevent occupancy or use of a structure where in violation of this Code, any other County ordinances of this jurisdiction or any other ordinance or executive order of the County, or of any state or federal law, or of any order, proclamation, guidance advice or decision of the Governor. The building official is authorized to suspend or revoke this permit if it is determined to be issued in error or on the basis of incorrect, inaccurate or incomplete information, or in violation of any County ordinance, regulation or order, state or federal law, or any order, proclamation, guidance or decision of the Governor.	No	O	05/14/2020	0		No	

*	INSPECTION	No item or element of construction shall be covered or concealed where inspections are required, before requesting such inspection and receiving approval from the building inspector. Inspections will be performed according to the current inspection schedule, except holidays and other days of office closure. Due to limited resources, requests for inspections at specific days, times or periods of time (such as a.m. or p.m.) will be reviewed daily but cannot be guaranteed and shall not reduce the requirement for inspection. If the construction is not ready for inspection at the time of building inspector arrival, re-inspection must be requested for the next, or other, day.	No	O	05/14/2020	0		No	
*	ADDRESS	The site address must be posted prior to the first inspection.	No	R	07/14/2020	0		No	
*	CON0024091	A Special Use modification will be required for the future tank and water line project.	No	R	05/14/2020	0		No	

*	SPECINSPN	Special Inspections Special inspections are required on the types of work listed under 2015 IBC Chapter 17. 1. Prior to start of construction of any type, the registered design professional in charge shall provide a list of Special Inspections as per IBC Sections 1704 and 1705 and submit it to the building official along with the agency that will perform the special inspections including credentials. 2. Perform all required special inspections listed in 2015 IBC -1704 & 1705 on and off site. 3. Special Inspectors shall furnish an inspection reports to the building official and registered design professional in charge within 7 calendar days indicating that work inspected was done in conformance to the approved documents submitted. 4. Any discrepancies shall be reported to the building official and registered design professional in charge for correction. 5. Submit a final report and Certificate of Compliance within 7 calendar days to the building official and the professional designer of record in charge documenting corrections of any discrepancies.	No	R	07/14/2020	0		No	
*	CON0024107	Install fire extinguishers to meet 2015' IFC, 906.1 standards. Contact Fire Marshal Office for required inspection prior to building final. 360-416-1842	No	R	05/27/2020	0		No	FD-2
*	COMPACTION	Any fill that will support a building requires proof of 90% compaction by an approved testing agency.	No	R	08/05/2020	0		No	
*	CON0024278	Sheet(s) titled "Stormwater Approval and Inspections Conditions", include additional permit conditions.	No	R	08/05/2020	0		No	

*	ENGINEER-1	The accompanying engineering is an intregal part of the approved plans. It is the responsibility of the builder and/or owner to read and understand the engineering and to comply with all requirements or conditions of the engineering.	No	R	08/05/2020	0		No	
*	ENGINEER-2	Any changes to the accompanying engineering, including substitution of materials such as holddown types, must have the written approval of the engineer of record as well as the approval of the plans examiner before the work changes are made. Changes or revisions to the engineering will not be approved in the field at the time of an inspection. It is the responsiblity of the builder and/or owner to provide the plans examiner with 2 copies of the intended revisions for review.	No	R	08/05/2020	0		No	
*	EROSION1	DISTURBED AREAS SHALL BE KEPT TO A MINIMUM DURING THE CONSTRUCTION PROCESS. DISTURBED AREAS MUST BE COVERED WITH STRAW DURING CONSTRUCTION AND SEEDED UPON PROJECT COMPLETION.	No	R	08/05/2020	0		No	
*	PROTECTION	All temporary erosion control devices must remain in place until permanent vegetation is re-established.	No	R	08/05/2020	0		No	
*	PW-1	This project shall comply with all requirements of Skagit County Code 14.32.060 Erosion and Sediment Control.	No	R	08/05/2020	0		No	
*	PW-2	All runoff from impervious surfaces and roof & footing drains shall be directed so as not to adversely affect adjacent properties.	No	R	08/05/2020	0		No	
*	SEDIMENT	Adjacent properties, roads, conveyances and water bodies shall be protected from sediment deposition by use of appropriate measures.	No	R	08/05/2020	0		No	

*	SEEDING	All soils exposed during construction must be seeded, planted, landscaped or provided with approved erosion and sedimentation control measures AT, OR PRIOR TO, the final inspection or approval for occupancy. Requests concerning alternatives or exemptions should be directed to a stormwater review technician at Skagit County Planning & Development Services. 360.416.1320	No	R	08/05/2020	0		No	
*	CON0024279	Provide "as-built" record drawings of the stormwater facilitie(s) consistent with the requirements of Skagit County Code Section 14.32.100. As-built record drawings shall be completed and submitted to Skagit County per the aforementioned requirements.	No	R	08/05/2020	1	REQD	No	

Total Rows: 17

Skagit County
Planning & Development Services

1800 Continental Place • Mount Vernon, WA 98273
360- 416-1320 • pds@co.skagit.wa.us • www.skagitcounty.net/planning

Building Permit #: BP20-0302

Status: Issued
Issue date: August 14, 2020
Expire date: August 14, 2023
Renewal Expire date:

Project Description: Judy Reservoir Raw Water Pump Station Replacement

Parcel No: p30034
Job address: 12115 MORFORD ROAD SW

Applicant: PUBLIC UTILITY DISTRICT
PO BOX 1436
Mount Vernon, WA 98273

Owner: PUBLIC UTILITY DISTRICT
PO BOX 1436
Mount Vernon, WA 98273

Contractor: Applicant

Zoning: Public Open Space
Setbacks: Front: 35 Side(s): 35 Rear: 35
Setback Comments:

Valuation:

Occupancy	Type	Factor	Sq Feet	Valuation
	Additional Amount...			2,300,000.00
	Totals...			$2,300,000.00*

"Construction or work for which a permit is required shall be subject to inspection by the building official and such construction or work shall remain accessible and exposed for inspection purposes until approved." IBC 109.1 "The final inspection shall be made after all work required by the building permit is completed." IBC 109.5. I hereby certify that I am the owner or I am an authorized representative of the owner of the property for which this permit is issued. This permit does not grant any right to trespass on another's property. This permit will expire three years from the date of issuance.

Owner/agent: _____ Date: 8/17/2020

Department agent: Deepti Uhanne Date: 08/17/2020

BP20-0302

Additional requirements:1 The issuance or granting of this permit shall not be construed to be a permit for, or approval of, any violation of this Code or any other ordinance or order of the County, of any state or federal law, or of any order, proclamation, guidance advice or decision of the Governor of this State. To the extent the issuance or granting of this permit is interpreted to allow construction activity during any period of time when such construction is prohibited or restricted by any state or federal law, or order, proclamation, guidance advice or decision of the Governor of this State, this permit shall not authorize such work and shall not be valid. The building official is authorized to prevent occupancy or use of a structure where in violation of this Code, any other County ordinances of this jurisdiction or any other ordinance or executive order of the County, or of any state or federal law, or of any

order, proclamation, guidance advice or decision of the Governor. The building official is authorized to suspend or revoke this permit if it is determined to be issued in error or on the basis of incorrect, inaccurate or incomplete information, or in violation of any County ordinance, regulation or order, state or federal law, or any order, proclamation, guidance or decision of the Governor.

2 No item or element of construction shall be covered or concealed where inspections are required, before requesting such inspection and receiving approval from the building inspector. Inspections will be performed according to the current inspection schedule, except holidays and other days of office closure. Due to limited resources, requests for inspections at specific days, times or periods of time (such as a.m. or p.m.) will be reviewed daily but cannot be guaranteed and shall not reduce the requirement for inspection. If the construction is not ready for inspection at the time of building inspector arrival, re-inspection must be requested for the next, or other, day.

3 The site address must be posted prior to the first inspection.

4 A Special Use modification will be required for the future tank and water line project.

5 Special Inspections

Special Inspections are required on the types of work listed under 2015 IBC Chapter 17.
1. Prior to start of construction of any type, the registered design professional in charge shall provide a list of Special Inspections as per IBC Sections 1704 and 1705 and submit it to the building official along with the agency that will perform the special inspections including credentials.
2. Perform all required special inspections listed in 2015 IBC -1704 & 1705 on and off site.
3. Special Inspectors shall furnish an inspection reports to the building official and registered design professional in charge within 7 calendar days indicating that work inspected was done in conformance to the approved documents submitted.
4. Any discrepancies shall be reported to the building official and registered design professional in charge for correction.
5. Submit a final report and Certificate of Compliance within 7 calendar days to the building official and the professional designer of record in charge documenting corrections of any discrepancies.

6 Install fire extinguishers to meet 2015' IFC, 906.1 standards. Contact Fire Marshal Office for required inspection prior to building final. 360-416-1642

7 Any fill that will support a building requires proof of 90% compaction by an approved testing agency.

8 Sheet(s) titled "Stormwater Approval and Inspections Conditions", include additional permit conditions.

9 The accompanying engineering is an intregal part of the approved plans. It is the responsibility of the builder and/or owner to read and understand the engineering and to comply with all requirements or conditions of the engineering.

10 Any changes to the accompanying engineering, including substitution of materials such as holddown types, must have the written approval of the engineer of record as well as the approval of the plans examiner before the work changes are made. Changes or revisions to the engineering will not be approved in the field at the time of an inspection. It is the responsiblity of the builder and/or owner to provide

the plans examiner with 2 copies of the intended revisions for review.

11 DISTURBED AREAS SHALL BE KEPT TO A MINIMUM DURING THE CONSTRUCTION PROCESS. DISTURBED AREAS MUST BE COVERED WITH STRAW DURING CONSTRUCTION AND SEEDED UPON PROJECT COMPLETION.

12 All temporary erosion control devices must remain in place until permanent vegetation is re-established.

13 This project shall comply with all requirements of Skagit County Code 14.32.060 Erosion and Sediment Control.

14 All runoff from impervious surfaces and roof & footing drains shall be directed so as not to adversely affect adjacent properties.

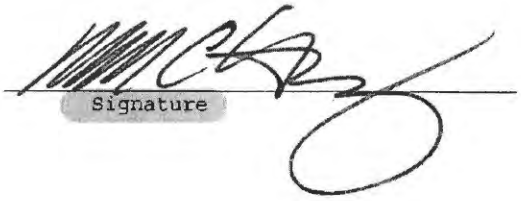
15 Adjacent properties, roads, conveyances and water bodies shall be protected from sediment deposition by use of appropriate measures.

16 All soils exposed during construction must be seeded, planted, landscaped or provided with approved erosion and sedimentation control measures AT, OR PRIOR TO, the final inspection or approval for occupancy. Requests concerning alternatives or exemptions should be directed to a stormwater review technician at Skagit County Planning & Development Services. 360.416.1320

17 Provide "as-built" record drawings of the stormwater facilitie(s) consistent with the requirements of Skagit County Code Section 14.32.100. As-built record drawings shall be completed and submitted to Skagit County per the aforementioned requirements.

DESCRIPTION:
08/05/2020: Req'd, not done

I have read and understand the conditions for this project.



Permit #: BP20-0302

Applicant: PUBLIC UTILITY DISTRICT
PO BOX 1436
Mount Vernon, WA

Assessor ID number and legal description:

340505-0-005-0005

(4.9200 ac) N1/2 LT 2 E OF B R R/W EXC RD

Fee Summary:

Description	Tot Fee	Paid
BCAC	25.00	25.00
Building Permits	10,224.00	10,224.00
Stormwater Review	458.64	458.64
Plan Check Fee/Deposit	6,656.48	6,656.48
Mechanical	43.50	43.50
FM Protective Inspection	95.00	95.00

Total fees: $17,502.62
Total payments: $17,502.62
Balance due: $0.00

Skagit County
Development Services
& Public Works
Receipt

RECEIPT # R20-1840

Commercial Bldg Permit
BP20-0302

PUD CHECK NUMBER # 18998

Transaction date:
08/14/2020

Total payment:
17,502.62

Check Permit Status
skagitcounty.net/
Permits